June 2020 Vol:9 No:2

Bartın University

Journal of Faculty of Education

International Refereed Journal

e-ISSN: 1308-7177

BARTIN UNIVERSITY JOURNAL OF FACULTY OF EDUCATION

INTERNATIONAL REFEREED JOURNAL

Volume: 9, Issue: 2, June 2020

Contact
Bartin University Faculty of Education
74100 BARTIN – TURKEY
e-mail: buefad@bartin.edu.tr
Tel: +90 378 223 54 59

Bartın University Journal of Faculty of Education (ISSN 1308-7177) is an online, open-access, free of charge, international and refereed journal which is published by Bartın University Faculty of Education.

Index List
The Scientific and Technological Research Council of Turkey (TÜBİTAK) Turkish Academic Network and Information Center (ULAKBİM) Social Sciences Database, Index Copernicus, ProQuest, EBSCOHost, CiteFactor, Modern Language Association, Open Academic Journal Index (OAJI Indexing), Ulrich's Periodicals Directory, Turkey Based Social Sciences Citation Index (SOBIAD), Turkish Education Index.

SCIENTIFIC BOARD

CONTENT

Assessment in EFL Classes Based on The CEFR Principles

İsmail Hakkı Mirici & Fatma Şengül

Research Article, http://dx.doi.org/10.14686/buefad.655985

Mirici, I. H., & Şengül, F. (2020). Assessment in EFL classes based on CEFR principles. *Bartın University Journal of Faculty of Education, 9*(2), 252-263..

Analysis, Evaluation, and Comparison of the 2007, 2013 and 2018 Chemistry Curriculum Learning Outcomes Based on the Revised Bloom's Taxonomy

Mehmet Diyaddin Yaşar & Sibel Sadi Yılmaz

Research Article, http://dx.doi.org/10.14686/buefad.590764

Yaşar, M. D., & Sadi Yılmaz, S. (2020). Analysis, evaluation, and comparison of the 2007, 2013 and 2018 chemistry curriculum learning outcomes based on the revised Bloom's taxonomy. *Bartın University Journal of Faculty of Education,* (2), 264-278.

Content Analysis of Research on Processes of Constructing Knowledge in Mathematics Education in Turkey

Faden Topuz & Berna Cantürk-Günhan

Research Article, http://dx.doi.org/10.14686/buefad.578076

Topuz, F., & Cantürk Günhan, B. (2020). Content analysis of research on processes of constructing knowledge in mathematics education in Turkey. *Bartın University Journal of Faculty of Education, 9*(2), 279-300.

Flipped Classroom Model in High School Mathematics

Oğuzhan Tekin & Esma Emmioğlu-Sarıkaya

Review Article, http://dx.doi.org/10.14686/buefad.559990

Tekin, O., & Emmioğlu-Sarıkaya, E. (2020). Flipped classroom model in high school mathematics. *Bartın University Journal of Faculty of Education*, 9(2), 301-314.

The Effect of Experimental Study Method on Teaching Basic Microbiology Concepts

Esin Atav & Dilek Sultan Acarlı

Review Article, http://dx.doi.org/10.14686/buefad.536955

Atav, E. & Acarlı, D.S. (2020). The effect of experimental study method on teaching basic microbiology concepts. *Bartın University Journal of Faculty of Education, 9*(2), 315-333.

Examination of Social Media Use of the Adults Over the Age of 50

Hatice Yıldız-Durak & Emel Tekin

Research Article, http://dx.doi.org/10.14686/buefad.618138

Yıldız Durak, H., & Tekin, E. (2020). Examination of social media use of the adults over the age of 50. *Bartın University Journal of Faculty of Education*, 9(2), 426-438.

The Effect of Argumentation-supported Problem Based Learning on the Achievements of Science Teacher Candidates Regarding the Subjects of Gases and Acids-Bases

Gülseda Eyceyurt-Türk & Ziya Kılıç

Research Article, http://dx.doi.org/10.14686/buefad.643630

Eyceyurt Türk, G., & Kılıç, Z. (2020). The effect of argumentation-supported problem based learning on the achievements of science teacher candidates regarding the subjects of gases and acids-bases. *Bartın University Journal of Faculty of Education*, 9(2), 439-462.

Özer, M. (2020). Vocational education and training as "a friend in need" during coronavirus pandemic in Turkey. *Bartın University Journal of Faculty of Education*, 9(2), 1-7.

Bartın University Journal of Faculty of Education, 9(2), 1-7

buefad.bartin.edu.tr

Vocational Education and Training as "A Friend in Need" During Coronavirus Pandemic in Turkey

Mahmut ÖZER*[a]

Article Info

DOI: 10.14686/buefad.713574

Article History:
Received: 02.04.2020
Accepted: 05.04.2020
Published: 05.06.2020

Keywords:
Vocational education and training,
Coronavirus,
COVID-19,
Pandemic.

Article Type:
Letter to the Editor

Abstract

The vocational education and training (VET) has been critical to Turkey's well-being in a time of coronavirus pandemic. With increased capacity in production, VET has become one of the main suppliers of society in these days. In this study, developments in production via VET within the scope of coronavirus measures are briefly reviewed. Additionally, improvement areas and steps that need to be taken to strengthen VET are discussed. In these pandemic days, cleaning materials, medical masks, and disposable materials are essential products, which are hard to procure. With the support of Ministry of National Education, 10 million masks are produced in VET high schools monthly. Cleaning material needs of all schools around Turkey can be met with the productions of VET high schools. Face protection shields, disposable materials, and face masks with N95 standard are produced via R&D studies in VET and they are shared with healthcare professionals. This study shows that VET in Turkey can respond to the needs of society quickly in pandemic days with developments in VET in the past two years following the announcement of *2023 Educational Vision*. A strengthened VET system with mentioned points in the study can play a major role in meeting the needs of the society during possible crisis periods.

Türkiye'de Koronavirüs Salgınında "Kara Gün Dostu" Mesleki ve Teknik Eğitim

Makale Bilgisi

DOI: 10.14686/buefad.713574

Makale Geçmişi:
Geliş: 02.04.2020
Kabul: 05.04.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Mesleki ve teknik eğitim,
Koronavirüs,
COVID-19,
Salgın.

Makale Türü:
Editöre Mektup

Öz

Mesleki ve teknik eğitimin (MTE) önemi Türkiye'de koronavirüs salgını sürecinde daha da öne çıkmıştır. Artan üretim kapasitesi ile MTE toplumun bu zor günlerdeki ihtiyaçlarını karşılayan ana aktörlerden biri haline gelmiştir. Bu çalışmada, koronavirüs salgını ile mücadele sürecinde MTE tarafından gerçekleştirilen üretimlerdeki gelişmeler ele alınmıştır. Ayrıca MTE'yi güçlendirmek için atılması gereken adımlar ve gelişim alanları da kısaca değerlendirilmiştir. Salgın günlerinde temizlik malzemeleri, tıbbi maskeler ve tek kullanımlık materyaller temini en zor olan ürünler arasında bulunmaktadır. Milli Eğitim Bakanlığının desteği ile Mesleki ve Teknik Anadolu Liselerinde (MTAL) ayda yaklaşık 10 milyon maske üretilmektedir. Türkiye'nin farklı bölgelerinde bulunan tüm okulların temizlik malzemesi ihtiyaçları MTAL'lerde gerçekleştirilen üretimlerle karşılanmaktadır. Ayrıca, yüz koruyucu siperler, tek kullanımlık malzemeler ve N95 standardında yüz maskeleri de MTE kapsamındaki Ar-Ge çalışmaları desteğiyle üretilmekte ve sağlık çalışanlarıyla paylaşılmaktadır. Bu çalışma *2023 Eğitim Vizyonu'nun* açıklanması sonrasındaki iyileştirmelerle birlikte MTE'nin salgın günlerinde toplumun ihtiyaçlarına hızla cevap verebildiğini göstermektedir. Çalışmada açıklanan unsurlarla güçlendirilmesi durumunda MTE sistemi kriz dönemlerinde toplumun ihtiyaçlarını karşılayan ana unsurlardan biri haline gelecektir.

***Corresponding Author:** mahmutozer2002@yahoo.com
[a] Prof. Dr., Ministry of National Education, Ankara/TURKEY, https://orcid.org/0000-0001-8722-8670

Introduction

Vocational education and training (VET) has been one of the most discussed type of education in Turkey for years. Expectations from VET have always been high, but finding solutions to the problems and systematic solution approaches have always been lacking (Ozer, 2018; Ozer, 2019a; Ozer, 2019b; Ozer & Suna, 2019; Ozer & Suna, 2020). The interventions in the past such as 'coefficient regulation', which prevented access to higher education, brought VET to the point of paralysis (Ozer, 2018). The steps taken later by the Ministry of National Education (MoNE) to reduce the effects of this negative intervention could not completely solve the problem because of the fact that the coefficient regulation has significantly reduced the tendency and selection of successful students to VET. In the following years, the practice of placing students in all schools by exam in transition to high school, similar to the coefficient regulation, led to the clustering of comparatively low-achieving students in VET. On the other hand, although very important projects regarding the improvement of VET have been carried out, not enough arrangements have been made in the labor market to improve the personal rights and conditions of VET graduates (Ozer & Suna, 2020).

Despite all these problems, MoNE followed a holistic approach for the solutions of VET-related problems, especially after announcing the *2023 Education Vision*, and addressing VET and its problems as a whole, and serious improvements appeared in diverse areas within a short time (Ozer, 2018; Ozer, 2019a; Ozer , 2019b; Ozer & Suna, 2019; Ozer & Suna, 2020). Especially the steps taken jointly with the sectors that are involved in cooperation in employment throughout the entire education process spread rapidly throughout Turkey. The right steps soon began to produce positive and solid results in a short while. The number of students enrolled in VET increased by 17% and the number of students enrolled in vocational training centers (VTCs) increased by 62%. Tendency and selection of high-achieving students to VET also increased in the same time interval, and students from the top 1% of achievement rankings are placed to VET high schools for the first time. Now, VET becomes an important option for academically high-achieving students, too. MoNE has made intensive efforts to increase production capacity, especially in VET. Necessary arrangements were made by MoNE and production in VET institutions increased by 40% a year. Although all these steps did not solve all the problems in VET, they showed that if right steps are taken towards the solution, the positive results are seen immediately and hopes for the future of VET increase.

Nowadays, we have been going through extraordinary days due to coronavirus pandemic. In this context, MoNE has activated the production capacity of VET in Turkey, and VET high schools has begun to produce the materials to prevent the spread of pandemic. They produced materials in diverse areas from cleaning materials to mask production, disposable aprons and overalls to face protection shields. Thus, it is seen that VET immediately produces the products, which are hard to supply otherwise, for society and presents them to the service of society. The R&D studies are also intensified to increase the variety of products produced in VET. The devoted teachers and students of VET have always prioritized the demands of society in such difficult conditions, have activated their production capacity and supported Turkey with their services. This behavior has increased the respectability of VET community, coming right after the healthcare professionals, among all segments of society have become thankful to staff and students of VET in Turkey.

Beyond these praises, it is useful to think once again about the problems of VET at such a time. The importance of strengthening VET and raising the human resources demanded by the labor market are accepted by all segments. All public institutions and organizations, business world, and non-governmental organizations have carried out important studies on solutions to the problematic areas of VET. However, VET has been perceived as a chronic problem for years in Turkey. Why are the desired results not achieved even though there is such a strong agreement regarding the strengthening of VET?

Like all countries, Turkey is going through a difficult process due to coronavirus. On the one hand, MoNE improves the large-scale service regarding distance education in this process by continuously improving the quality, and on the other hand, a different production move in VET by focusing on the products that are difficult to procure is realized. Today, the VET community has been mobilizing all its opportunities and facilities for Turkey. For this reason, this short article summarizes the production moves in VET within the scope of coronavirus measures and briefly reviews the areas of improvement that need to be handled in a short time in order to further strengthen VET, which functions as a protective shield in difficult days.

Background on Turkish VET

The period in which VET was remembered with gratitude more than today is 30-40 years ago. In this period, the government undertook almost all of the production and service sectors, therefore, the main source of employment was the government. On the other hand, VET schools were public schools, too. Therefore, planning was relatively easy when the source of employment and education were the same. Since the number of students especially in VET was compatible with the employment demand of government, the demand for VET was above the capacity and most schools accepted students according to their examination scores. Accordingly, VET graduates were also able to find jobs in public institutions easily. Therefore, this period maintains its place in memories as a period when there is no widespread problem related to the employment of VET graduates.

The strong relationship between education and employment has started to weaken with the growth of the education system. On the one hand, with the increasing demand for education, the education system is constantly growing, on the other hand, the government has gradually withdrawn from the production and service sectors and private sector has taken the place of government. In other words, the main source of employment for VET graduates is now the private sector, not the public institutions. The share of the private sector in VET stands out as an important parameter in country comparisons in this transition phase, which is experienced in parallel with the developments in the world. In particular, when looking at Continental Europe, the governments withdraw from the production and service sectors, while the private sector has also undertaken the burden of VET.

On the contrary, the private sector has not taken the burden of VET when entering the production and service sectors and the VET has continued to remain on the shoulders of the government in Turkey. By 2012, the share of the private sector in VET was below 1%. However, in the countries which are in the forefront of VET in Continental Europe, the share of the private sector in VET is well above 50%. Although incentive mechanisms have been generated to encourage the private sector to be deeply inclined to VET, share of private sectors in VET is approximately 6% in 2020 in Turkey, and it is still quite low compared to Continental Europe countries. Unlike the general trend in the world, the low share of private sector in VET services in Turkey has negatively affected the education-employment relationship and has made it difficult to VET graduates to work in their fields of education.

Increasing the scale and capacity of VET, without thinking or ignoring the employment capacity, has worked against the VET in the long term and has led to the supply of VET graduates more than that demanded by the labor market, which necessarily forced the VET graduates to be employed outside of their education areas (Ozer, 2019a; Ozer, 2019b; Ozer & Suna, 2020). As a result, skills mismatches in the labor market have now become a chronic problem. On the other hand, external interventions such as “coefficient regulation” shocked VET, which already had a problematic situation, and all the effort was put to take VET out of shock with the developments, however, previous experiences left in society traces of trauma (Ozer, 2018). This situation disrupted the flow of high achieving students towards VET, thereby reducing the likelihood of meeting expectations from VET graduates.

It is obvious that improving the quality of VET is quite important. However, the main parameter in re-strengthening VET is the matching capacity of employment and the labor market with VET. Otherwise, the steps to be taken to strengthen VET will be insufficient and permanent solutions will not be produced.

MoNE also intensified its efforts to pull the supply-demand relationship into a rational ground in order to strengthen the education-employment relationship. The relationship between levels of VET institutions and industry locations and capacities of VET is determined by plotting the Turkish VET Map (MEB, 2018). The current capacity is restructured within the framework of this map. Thus, both the employment rates of VET graduates in their field of education will improve and skill mismatch in the labor market and its cost will decrease.

MoNE in Turkey has taken very important steps to strengthen VET in recent years and it is still implementing these efforts with a systematic approach and determination. MoNE has developed a new approach especially in cooperation with sectors. In this collaborative approach, it is determined jointly to carry out training processes, to update the curriculum together, to support the students' skills training and teachers' on-the-job and professional development training, to give scholarships to successful students and to give priority to the employment of graduates. These efforts started to be productive and give tangible results in a short time. VET has become an important option for high-achieving students and students from the top 1% achievement rank are placed to VET high schools for the first time for many years.

Significant Productions by VET in a Time of Crisis

The Target is to Meet the Cleaning Material Needs of All Schools and Institutions

MoNE has focused on the production in VET high schools in order to maintain the hygiene, cleaning and disinfection works of all schools within the scope of coronavirus measures. While those products were being produced in 28 vocational and technical Anatolian high schools (VTAHs) before, this number has increased to 44 high schools now by making the necessary investments to meet the needs of all schools. MoNE made the necessary investments and increased the number of schools producing cleaning materials to 100 in April in order to meet the needs of other institutions beyond the schools. In addition, MoNE provided the raw material needs of VET high schools and delivered them to the schools. At present, VET high schools have reached a production capacity to meet all cleaning material needs of approximately 54 thousand schools in 81 provinces.

10 Million Masks will be Produced Monthly

The medical mask is the most needed product due to the coronavirus epidemic in these days. It is difficult to provide the necessary supply of masks and prices are constantly increasing. MoNE has taken a quick step in this regard. The necessary investments have been made to produce medical/surgical masks in 37 vocational high schools in 21 provinces and the first masks started to be produced. One million masks were produced in a very short time and delivered primarily to healthcare workers. The capacity to produce 10 million masks per month has been created. On the other hand, seven provinces are chosen to produce masks in N95 standard. Production is proceeding as it is planned. VET high schools are constantly working to meet the demands.

Priority was given to Production of Disposable Materials

In this process, the demand for disposable products has increased due to the importance of hygiene. In this regard, MoNE has invested in VET and started to produce products such as disposable gowns and overalls especially for healthcare workers. Production continues intensively in almost all provinces. On the other hand, manufacturing of products such as disposable forks and knives is started in selected pilot VET schools in Istanbul.

500 Thousand Face Protection Shields are Produced per Month

In order to contribute to the solution of the troubles in the production of face protection shields, which are especially important for healthcare workers, R&D studies have been completed and the production of face protection shields has started. In VET high schools, 500 thousand face shields can be produced per month. Face shields are produced both with an automated production line and by using 3-D (three-dimensional) printers. In addition, the molds of the face shields are created beyond the 3-D printer, and mass production of face shields started in the field of plastic technology of VET high schools.

Ultrasonic Surgical Mask Machine is Manufactured

R&D studies that have been going on for months have yielded results and an ‘Automatic 3-Layer Wire Ultrasonic Surgical Mask Machine’ was produced. The machine started to produce about 200 thousand masks per day. The machines are produced in Istanbul and they will be installed in other VET high schools and the monthly production will reach 10 million surgical mask capacity soon.

MoNE will Manufacture the Machine which Produces Masks in N95 standard

MoNE took a very important step while accelerating its production in VET high schools within the scope of coronavirus measures and began preparations for producing the machine that produces masks in N95 standard. While there is no problem in getting the equipment related to the production of surgical masks in the market, machines producing N95 masks are either very few or not accessible. For this purpose, MoNE started R&D for machinery production. The development process continues successfully and the first machine is set to be produced in April 2020. The purpose of this attempt is to have the 'know-how' of all stages of production and to contribute to the increase of production capacity by sharing this know-how with the companies producing in this field in Turkey.

Production-oriented R&D Studies are Emphasized

R&D studies focusing on the production of biomedical products are needed in the field of healthcare. In this context, an intensive R&D study was performed in order to produce the machine producing the surgical mask and the machines producing the mask in N95 standard. In addition, R&D studies are ongoing to produce respirators.

Produced Materials are Given Free of Charge to those in Need

MoNE tried to meet the needs of the market reliably, and on the other hand, launched a new social service project. The ***'VET High School Students Meet Our Families'*** project has been successfully implemented by the Ministry together with VET students and teachers for years. For example, in 2018-2019 academic year, 13.217 teachers and 39.197 students in 1.889 schools in 81 provinces participated in the project and 54.000 families are supported (Ozer, 2019a). Within the scope of the project, small maintenance and repairs, paint-whitewashing, furniture repairs, small repairs of the unusable or obsolete items at homes belonging to the elderly and needy families were taken care of. In addition, care and cleaning services, personal care and life-facilitating aids were provided for the elderly people who need personal care.

In this context, MoNE changed the scope of this project to fight with coronavirus pandemic in a more effective way. Within the new scope of project, the cleaning and disinfectant materials, and surgical masks have been produced and delivered to the elderly and needy families free of charge in 81 provinces with the coordination of Governorships. In addition, the face shields and masks have been delivered to healthcare workers free of charge with the coordination of Ministry of Health.

Discussion and Conclusion

Nowadays, millions of people struggle from coronavirus pandemic and it is effective on any aspect of our daily lives (Callaway et al, 2020; Gibney, 2020; Ting et al., 2020, UNESCO, 2020). Several precaution steps are taken against spreading the coronavirus to a larger extent by governmental authorities in diverse countries (Ting et al., 2020; ETF, 2020). Due to the scale and impact of pandemic, it is not possible to consider coronavirus pandemic just as a matter of public health (OECD, 2020). As a consequence of this precautions, education is one the most affected fields by coronavirus pandemic (UNESCO, 2020). In the last week of March 2020, it is estimated that 1.3 billion of children and youth, which is close to 80% of the student population of the world is affected by school closures in 138 countries (UNESCO, 2020). This huge effect of coronavirus on access to education created a big pressure on educational authorities all around the world. Most countries spend effort to establish and update distanced education platforms to sustain their educational processes (ETF, 2020; OECD, 2020). Concurrently, educational activities has started which aim to enlighten all educational stakeholders about the coronavirus pandemic (OECD, 2020).

Although there is a big crisis in education in global scale, vocational education and training (VET) has a great potential to contribute to the fight with coronavirus pandemic. A strong VET system can support the needs of society especially in the times of crisis by means of its production and adaptation capacity. Based to its importance and potential, VET continues to be an education path where intense discussions are concentrated all over the world (Ozer & Perc, 2020). With widespread use of automation, especially supported by artificial intelligence technologies, in the production and service sectors, the skills gained by VET have brought into question (Perc et al, 2019). In a new era of autonomy and artificial intelligence, VET systems around the world are restructured in a way that VET students can gain more general skills and train in broader vocational fields (Hanushek et al., 2017; Solga et al., 2014). Problem solving and adaptation skills of VET students according to changes in labor market will increase with restructuring. In times of crisis like today, it is apparently seen that needs of society and labor market can change dramatically within a short time. VET system can support the society with its production and adaptation capacity. To increase the production and adaptation capacity of VET and support R&D studies, it is quite important to equip students with general skills along with vocational skills and provide them flexible educational opportunities (Hanushek et al., 2017; Ozer & Suna, 2020; Solga et al., 2014).

A strong VET system can support the society with both its production capacity and social inclusion projects. As can be seen in this brief study, VET becomes an important source in the manufacturing of highly-demanded products in times of crisis. Using the R&D and diverse vocational skills of VET students and teachers, VET has

the power to adapt its processes in a quite short time to meet the need of the society. Additionally, VET has the capacity to support the people, especially those who need, with social inclusion projects based on vocational skills of students and teachers. In this manner, support of VET system for society is multidimensional and it becomes even important in times of crisis.

Considering the experience of these crisis days, the quick steps that need to be taken for removing the VET from being a problematic area have been mentioned briefly. The weakness of the relation between VET and employment is still at the center of many problems related to VET in Turkey (Ozer & Suna, 2020). Therefore, the main step to be taken in strengthening VET again is dependent on strengthening the education-employment relationship.

This study briefly shows how quickly the VET has responded to society in meeting the needs during the coronavirus pandemic in just two years after the Turkey's 2023 Educational Vision was declared. The points mentioned in this study underline how the strengthened VET can quickly respond to social demands especially in the days of crisis.

In sum, while MoNE successfully conducts this process by mobilizing all its facilities, it activates the production capacity of VET and makes a modest contribution on its own scale in the manufacturing of the products that are needed in Turkey now. Thus, while VET high schools are mobilized for the Turkey's urgent needs and support the society, they get out of the shadows of labeling such as coefficient regulation and "type of school that is not preferred" and become more and more normalized. MoNE aims to save the VET high schools from their historical burdens, to establish a genuine relationship with the production chain and to make VET high schools more respected in the society. All of devoted executives, teachers and students in VET are currently doing R&D studies in all provinces of Turkey in order to increase the production capacity and diversity. All other units of MoNE also provide all kinds of support to VET high schools. In addition to diversifying production and placing products on the market, it is essential to continue efforts to attract high-achieving students to VET and to increase employment of VET graduates in their field of education.

In order to strengthen the VET-employment relationship and further align the supply of graduates with the demands of the business world, steps towards the labor market are also needed. When incentive mechanisms are created in the salaries of VET graduates working in their field of education and when the labor market has the appropriate mechanisms, this upside trend in VET will be sustainable and it will be discussed how VET can be higher quality rather than being remembered with old problems.

References

Callaway, E., Cyranoski, D., Mallapaty, S., Stoye, E., & Tollefson, J. (2020). The coronavirus pandemic in five powerful charts. *Nature 579,* 482-483 (2020). doi: 10.1038/d41586-020-00758-2.

ETF (2020). *Coping with COVID-19: Mapping education and training responses to the health crisis in ETF partner countries.* Torino, Italy: ETF Publishing.

Gibney, E. (2020). Coronavirus lockdowns have changed the way Earth moves. *Nature.* doi: 10.1038/d41586-020-00965-x. Retrieved from https://www.nature.com/articles/d41586-020-00965-x.

Hanushek, E.A., Schwerdt, G., Woessman, L., & Zhang, L. (2017). General education, vocational education, and labormarket outcomes over the life-cycle. *The Journal of Human Resources, 52*(1), 48–87.

OECD (2020). A framework to guide an education response to the COVID-19 Pandemic of 2020. Paris: OECD Publishing.

Ozer, M. (2018). The 2023 Education Vision and new goals in vocational and technical education. *Journal of Higher Education and Science, 8*(3), 425–435.

Ozer, M. (2019a). Reconsidering the fundamental problems of vocational education and training in Turkey and proposed solutions for restructuring. *İstanbul Üniversitesi Sosyoloji Dergisi, 39*(2), 1–19.

Ozer, M. (2019b). Background of problems in vocational education and training and its road map to solution in Turkey’s Education Vision 2023. *Journal of Higher Education and Science, 9*(1), 1–11.

Ozer, M., & Suna, H. E. (2019). Future of vocational and technical education in Turkey: Solid steps taken after Education Vision 2023. *Journal of Education and Humanities, 10*(20), 165–192.

Ozer, M., & Perc, M. (2020). Dreams and realities of school tracking and vocational education. *Palgrave Communications, 6,* 34.

Ozer, M., & Suna, H. E. (2020). The linkage between vocational education and labor market in Turkey: Employability and skill mismatch. *Kastamonu Education Journal, 28*(2), 558–569.

Perc, M., Ozer, M., Hojnik, J. (2019). Social and juristic challenges of artificial intelligence. *Palgrave Communication 5,* 61.

Solga, H., Protsch, P., Ebner, C., & Brzinsky-Fay, C. (2014). *The German vocational education and training system: Its institutional configuration, strength, and challenges.* WZB Discussion Paper SP-I-2014-502.

Ting, D. S. W., Carin, L., Dzau, V., & Wong, T. Y. (2020). Digital technology and COVID-19. *Nature Medicine,* doi: https://doi.org/10.1038/s41591-020-0824-5.

UNESCO (2020). *How are countries addressing the Covid-19 challenges in education? A snapshot of policy measures.* Global Education Monitoring Reports. France: United Nations Educational, Scientific and Cultural Organization.

Ölmez-Çağlar, F. & Saka, Ö. F. (2020). Perceived importance, use and instruction of vocabulary learning strategies from students' and teachers' perspectives. *Bartın University Journal of Faculty of Education*, *9*(2), 200-216.

Bartın University Journal of Faculty of Education, 9(2), 200-216

buefad.bartin.edu.tr

Perceived Importance, Use and Instruction of Vocabulary Learning Strategies from Students' and Teachers' Perspectives

Funda Ölmez-Çağlar*[a], F. Özlem Saka[b]

Article Info

DOI: 10.14686/buefad.660798

Article History:
Received: 17.09.2019
Accepted: 23.12.2019
Published: 05.06.2020

Keywords:
Vocabulary learning strategies,
Strategy instruction,
Lexical development.

Article Type:
Research Article

Abstract

This study aimed to unearth and compare students' and teachers' perspectives in relation to the perceived importance, use and instruction of vocabulary learning strategies (VLS). A total of 548 ninth grade students studying at ten different Anatolian high schools in Antalya, Turkey and 56 English language teachers working at these schools participated in the study. Data were collected by means of a questionnaire based on Schmitt's (1997) taxonomy of VLS. Following a validation process and conducting confirmatory factor analysis, further statistical analysis was carried out. The results indicated that the students and teachers who ascribed a higher level of importance to VLS used and taught them to a significantly larger extent. The study found no statistically significant difference between the levels of importance attached to the use and instruction of VLS by the students and teachers. However, teachers' frequency of strategy instruction appeared to be significantly higher than students' frequency of strategy use except for cognitive strategies. Therefore, it was concluded that while teachers reported actively teaching a wide variety of VLS, students implemented the strategies to a more limited extent. Based on the results, it was recommended to explore the reasons for this discrepancy between the students and teachers.

Öğrenci ve Öğretmen Bakış Açısıyla Kelime Öğrenme Stratejilerinin Algılanan Önemi, Kullanımı ve Öğretimi

Makale Bilgisi

DOI: 10.14686/buefad.660798

Makale Geçmişi:
Geliş: 17.09.2019
Kabul: 23.12.2019
Yayın: 05.06.2020

Anahtar Kelimeler:
Kelime öğrenme stratejileri,
Strateji öğretimi,
Kelime dağarcığının geliştirilmesi.

Makale Türü:
Araştırma Makalesi

Öz

Bu çalışmanın amacı, kelime öğrenme stratejilerinin algılanan önemi, kullanımı ve öğretimi konusundaki öğrenci ve öğretmen bakış açılarını saptamak ve karşılaştırmaktır. Türkiye'de, Antalya ilinde yer alan on farklı Anadolu lisesinde öğrenimlerini sürdüren toplam 548 dokuzuncu sınıf öğrencisi ile bu okullarda görev yapan 56 İngilizce öğretmeni çalışmaya katılmıştır. Schmitt'in (1997) kelime öğrenme stratejileri sınıflandırmasından yola çıkılarak oluşturulmuş bir anket aracılığıyla veri toplanmıştır. Geçerlilik çalışması ve doğrulayıcı faktör analizinin ardından diğer istatistiksel analizler gerçekleştirilmiştir. Elde edilen sonuçlar, kelime öğrenme stratejilerine daha çok önem veren öğrencilerin bu stratejileri daha fazla kullandığını, öğretmenlerin de daha fazla öğrettiğini göstermiştir. Öğrencilerin kelime öğrenme stratejilerinin kullanımına verdiği önem düzeyi ile öğretmenlerin bu stratejilerin öğretimine verdiği önem düzeyi arasında istatistiksel olarak anlamlı bir fark bulunmamıştır. Fakat bilişsel stratejiler dışında, öğretmenlerin stratejileri öğretme sıklığının öğrencilerin stratejileri kullanma sıklığından anlamlı ölçüde fazla olduğu görülmüştür. Bu nedenle, öğretmenlerin birçok farklı stratejiyi etkin biçimde öğrettiklerini ifade etmelerine karşın öğrencilerin stratejileri daha sınırlı bir oranda uyguladıkları sonucuna varılmıştır. Bu sonuçlardan yola çıkılarak, öğrenciler ve öğretmenler arasındaki bu uyuşmazlığın nedenlerinin araştırılması önerilmiştir.

***Corresponding Author:** fundaolmez@gmail.com; fundaolmezcaglar@akdeniz.edu.tr
[a] Dr., Akdeniz University, Antalya/Turkey, http://orcid.org/0000-0001-6114-8445
[b] Assist. Prof. Dr., Akdeniz University, Antalya/Turkey, http://orcid.org/0000-0003-0647-9983

Introduction

Among various aspects of a language, vocabulary, most probably, constitutes one of the elements that are of paramount importance. Therefore, the centrality of lexis in language learning is continually highlighted for decades even though it was once referred to as a neglected area (Meara, 1980). Vocabulary is even called "the heart of language comprehension and use" (Hunt & Beglar, 2005, p. 24), and it is pointed out that regardless of how adept a language learner is at grammar and pronunciation, meaningful communication in a second/foreign language (L2) is absolutely impossible without a certain amount of vocabulary knowledge to express oneself (McCarthy, 1990). Thus, developing lexical competence might be regarded as one of the major determinants of acquiring proficiency in an L2.

In addition to its significant role in L2 learning, the versatile nature of vocabulary learning sheds light on how worthy it is of being researched with its various aspects. Besides the need to learn a large number of lexical items, vocabulary learning requires mastering diverse elements involved in each of these items including meaning, form and contextual use, and given the multitude of lexical items in English, lexical development turns into a remarkably challenging task for English language learners (Schmitt, 2008, 2010). Moreover, vocabulary acquisition takes place incrementally with various aspects of lexical knowledge building on one another and proceeding on a continuum (Takač, 2008). Hence, the formidable development of vocabulary knowledge as a gradual process cannot be restricted to the classroom context. Indeed, language learners have to take control of their own vocabulary learning, and teacher guidance might help them get involved in this process and promote their learning of how to cope with it (Nation, 2008). The crucial role of vocabulary learning strategies, which form a subgroup of language learning strategies (Nation, 2001; Oxford, 1990; Takač, 2008), stands out at this juncture.

In the last decades, there has been an important shift from a teacher-centred approach to a learner-centred one emphasizing the role of individual language learner in the field of second/foreign language learning, and language learning strategies employed in this process have been a major concern in L2 research (Lessard-Clouston, 1997). Studies on language learning strategies started with an interest in how good language learners approach language learning (Rubin, 1975), and continue to be conducted for years. The rationale behind the use of language learning strategies is one's desire to facilitate and take control of the learning process. As highlighted by Oxford and Nyikos (1989), "Use of appropriate learning strategies enables students to take responsibility for their own learning by enhancing learner autonomy, independence, and self-direction." (p. 291). Thus, language learning strategies (LLS) are of considerable value particularly for the language learners aiming at attaining a high level of proficiency in an L2.

According to Klapper (2008), language learners implement strategies in vocabulary learning more often compared to any other aspects of language learning because they ascribe importance to vocabulary learning and the nature of vocabulary learning provides the opportunity to simply use strategies. Bearing in mind the complex construct of vocabulary knowledge as well as the abundance of lexical items in any language, it seems that vocabulary learning is one of the areas that require independent learning as well. Therefore, with the movement from a principally teacher-dominated language education to a learner-oriented perspective highlighting the way individual language learners approach and deal with language learning, vocabulary learning strategies (VLS) started to draw considerable interest (Schmitt, 2000). Vocabulary learning strategies have been constantly researched and further explored since then in order to benefit from these tools more. It has been recurrently pointed out that vocabulary learning strategies promote lexical development by helping learners take control of their vocabulary acquisition (Nation, 2001; Schmitt, 1997).

In an attempt to classify VLS, different taxonomies have been put forward in the last couple of decades (e.g., Fan, 2003; Gu & Johnson, 1996; Nation, 2001). Of all taxonomies of VLS, Schmitt's (1997) taxonomy might be the most comprehensive classification scheme as asserted by several researchers (Segler, Pain, & Sorace, 2002; Takač, 2008). In response to the need for an extensive VLS taxonomy, Schmitt (1997) initially compiled a list of VLS through literature review and by making use of students' self-reports on their ways of learning vocabulary as well as teachers' experiences, which resulted in a list of 58 VLS. During the classification process, these strategies were initially categorized according to Oxford's (1990) four categories of LLS, namely *social strategies* (SOC), *memory strategies* (MEM), *cognitive strategies* (COG) and *metacognitive strategies* (MET). This was followed by the addition of determination strategies (DET) as a fifth category. Moreover, a further distinction was made

between *discovery strategies* that are utilized to find out the meanings of lexical items and *consolidation strategies* that are employed to remember these items.

Even though vocabulary learning strategies prove to be invaluable tools for lexical development when effectively used, language learners need to strive for it in order to make the most of these strategies. However, students do not attain autonomy and take responsibility for their language learning on their own in the classroom context and need teacher guidance in learning about the strategies and putting them into practice (Little, 1995). Thus, strategy instruction is treated as a significant requirement for effective use of strategies. Anderson (2005) specifies the principal goal of strategy instruction as making language learners aware of potential strategies and subsequently giving them the opportunity to choose suitable ones for their own learning purposes. Pointing out the significant role of teacher guidance, Oxford (2003) concludes that L2 teachers should try to find ways of incorporating strategy instruction into their classes.

A review of the literature reveals the attention paid to VLS especially in the last couple of decades. Studies on vocabulary learning strategies have centered on topics such as strategy use of good and poor language learners (e.g., Gu, 1994; Lawson & Hogben, 1996), specific VLS and their effectiveness (e.g., Brown & Perry, 1991; Prichard, 2008; Sagarra & Alba, 2006; Sarıçoban & Başıbek, 2012; Walters & Bozkurt, 2009), the relationship between strategy use and learner-related variables (e.g., Catalán, 2003; Çelik & Toptaş, 2010; Gu, 2002; Üster, 2008), the relations between strategy use and learning outcomes or success (e.g., Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Sanaoui, 1995), and the comparison of perceived usefulness and frequency of use regarding VLS (e.g., Fan, 2003; Schmitt, 1997; Wu, 2005). Among the last group of studies, Schmitt's (1997) survey study on the strategy use of 600 EFL learners investigated the VLS found useful by the learners and the ones used for vocabulary development. The study found that the learners did not employ some certain strategies despite finding them effective. Accordingly, the study recommended that strategy training might be beneficial for language learners to try using various strategies. Similarly, Fan (2003) explored any potential discrepancies between perceived usefulness of VLS and students' frequency of use. The study revealed a disparity between the VLS found useful by L2 learners and the ones used regularly. The present study included a similar dimension by investigating the importance attached to the use of VLS by students and to the instruction of these strategies by teachers along with students' actual use and teachers' actual instruction of these strategies.

When the literature is reviewed, it is also seen that a variety of studies have been conducted on different groups of vocabulary learning strategies and their instruction (e.g., Akın & Seferoğlu, 2004; Atay & Ozbulgan, 2007; Kobayashi & Little, 2018; Mizumoto & Takeuchi, 2009; Rasekh & Ranjbary, 2003). Atay and Ozbulgan (2007) carried out an experimental study in relation to strategy instruction and focused specifically on memory strategies. They investigated the way training on memory strategies and contextual learning influenced the ESP vocabulary development of Turkish EFL learners. The results revealed that the treatment group that received the aforementioned training outperformed the control group that focused only on contextual learning. In a similar vein, Rasekh and Ranjbary (2003) carried out an experimental study which lasted ten weeks. The study sought for the influence of explicit strategy training on metacognitive strategies and unearthed the significant contribution of strategy training to EFL learners' lexical development. Likewise, Mizumoto and Takeuchi (2009) explored the impact of cognitive and metacognitive strategy training on vocabulary development. Therefore, they conducted an experimental study with university level Japanese EFL learners. The study found that the learners in the experimental group that were exposed to strategy instruction outperformed the control group in the post-test on vocabulary. The researchers underlined that strategy training promoted the development of students' strategy repertoire and frequency of strategy use.

Although strategy training has been one of the major concerns of researchers in VLS research, no studies incorporating teachers' perceptions of VLS instruction into the scope of the research and evaluating student perceptions along with teacher perceptions were encountered in the literature at the time of data collection. Lai (2005) included teacher beliefs in a descriptive study on strategy instruction, explored Taiwanese EFL teachers' instruction of VLS together with their awareness of and beliefs about the strategies, concluded that teachers were aware of various VLS, and detected positive correlations between teachers' beliefs about VLS and their instruction of the strategies. However, the scope of that study was restricted with teacher perspectives. Unlike previous research, this study sought to investigate how vocabulary learning strategies are addressed by both students and teachers by placing a particular emphasis on strategy instruction. Before starting a more systematic strategy

training, it would be more reasonable to investigate the current situation including both student and teacher perspectives.

The present study set out to pave the way for more systematic, organized and well-planned strategy training studies on vocabulary learning strategies by depicting the current situation about strategy instruction. Therefore, the aim of this study was to compare perceived importance, use and instruction of vocabulary learning strategies from students' and teachers' points of view. The study addressed the following research questions:

1. Is there a significant difference between the strategy use of students attaching a higher and lower level of importance to VLS?
2. Is there a significant difference between the strategy instruction of teachers attaching a higher and lower level of importance to VLS?
3. Is there a significant difference between the levels of importance attributed to the use and instruction of VLS by the students and teachers?
4. Is there a significant difference between the students' frequency of strategy use and the teachers' frequency of strategy instruction?

Method

Setting and Participants

For the current study, a research group involving 9th grade students and teachers of English was determined via purposeful sampling. In this study, it was deemed necessary to carry out the research on students and teachers of schools that place a high emphasis on English language teaching. While determining the specific schools, general characteristics of the schools were taken into account, and ten Anatolian high schools that have a deep-rooted background in terms of English language teaching were specifically chosen. After getting permission for conducting the research from the provincial directorate of national education, two classes were chosen randomly in each of these ten schools. Attention was paid to these two classes' having different English language teachers in order for the classes to better represent the 9th graders in a school. At the time of data collection, there were a total of 71 English language teachers in these ten schools, and 56 of these teachers (39 female, 17 male) voluntarily took part in the study. Demographic information about the participant teachers is provided in Table 1.

Table 1. Demographics of Participant Teachers

Variables	**n**
Age	
30-39 years	14
40-49 years	34
50 years and more	8
Gender	
Female	39
Male	17
Major	
English Language Teaching	42
English Language and Literature	5
Translation and Interpreting Studies	2
English Linguistics	2
Other	5
Graduation Degree	
BA	50
MA	5
PhD	1
Teaching Experience	
6-10 years	3
11-15 years	13
16 years and more	40
VLS training	
Received	37
Not received	19
Total	*56*

To determine the participant students, the two classes chosen randomly in these ten schools were taken as a basis. A total of 548 students participated in the study. Demographic information about participant students is illustrated in Table 2. The schools of the participant students are symbolized with numbers for confidentiality.

Table 2. Demographics of Participant Students

Variable	n	%
Gender		
Female	323	58.9
Male	225	41.1
School		
School 1	55	10
School 2	59	10.8
School 3	55	10
School 4	51	9.3
School 5	66	12
School 6	58	10.6
School 7	55	10
School 8	53	9.7
School 9	39	7.1
School 10	57	10.4
Total	*548*	*100*

Data Collection Tool

Two types of questionnaires were used in search of a general picture about 9th grade students' and English language teachers' perceptions and practices regarding the use and instruction of VLS. A student questionnaire was formed first according to Schmitt's (1997) taxonomy of vocabulary learning strategies involving a total of 58 strategies (14 for discovery and 44 for consolidation). As stated previously, Schmitt's taxonomy of VLS involves five strategy groups: determination strategies (9 items), social strategies (8 items), memory strategies (27 items), cognitive strategies (9 items) and metacognitive strategies (5 items). While forming the student questionnaire, Catalán's (2003) questionnaire of vocabulary learning strategies, which was designed based on Schmitt's taxonomy, was largely made use of. Permission for the use of the taxonomy and the questionnaire was obtained from both researchers through e-mail. While translating the questionnaire into Turkish, certain changes were made on some items in terms of wording, explanations and examples.

Apart from the changes in the expressions, another modification was made on scaling. While the respondents of the questionnaire indicated whether they used each strategy or not with "Yes" or "No" in Schmitt's (1997) study and by marking the strategies employed with a cross in Catalán's (2003), five-point likert scales were utilized in the present study so that a wider range of responses could be elicited from the participants. Rating scales such as likert scales are found beneficial for researchers as they provide the opportunity to reach a variety of responses with more subtlety (Cohen, Manion, & Morrison, 2007). In this study, two types of five-point likert scales indicating the level of importance (1: not important at all, 2: somewhat important, 3: important, 4: quite important, 5: extremely important) and the level of application (1: never apply it, 2: rarely apply it, 3: sometimes apply it, 4: usually apply it, 5: always apply it) of vocabulary learning strategies were used. Since the respondents were going to indicate how important they find the use of each strategy and to what extent they think they apply it during vocabulary learning strategies, the items were provided accordingly. The layout of the questionnaire was also adjusted according to these scales. In order to clarify the way the two scales were to be filled out, explanatory information was added to the introduction part and the scales were placed at the right and left sides of the items so that the respondents would follow each item with ease and indicate the level of importance and the level of application without interruption.

As for the teacher questionnaire on vocabulary learning strategies, the student questionnaire was taken as a basis while forming this questionnaire. The teacher questionnaire was administered in English; however, the changes about wording, explanations and examples were reflected on this questionnaire as well. As the purpose was to compare student and teacher perceptions and practices, special attention was paid to the equivalence of the

student and teacher questionnaires. Therefore, the same examples and explanations were used in the items of both questionnaires. Yet, since the teachers' perceptions regarding the instruction of each vocabulary learning strategy were sought for, wording was changed accordingly, and teachers were asked to what extent they find important teaching and creating awareness of each strategy and to what extent they think they implement the instruction of these strategies in their classes. After the two questionnaires were formed, expert opinion was received from academics with a PhD in English language teaching and Turkish language teaching for the equivalence of the resulting teacher and student questionnaires as well as the equivalence of English and Turkish versions. Experts were also provided with Schmitt's (1997) taxonomy of VLS and Catalán's (2003) questionnaire so that they would evaluate the modifications made on the questionnaires. Based on the feedback received from the experts, the necessary changes and corrections were made on both forms. After this process, Turkish version of the questionnaire prepared for students was translated back into English by a native speaker of English who has advanced speaking skills in Turkish and has been teaching English in Turkey for many years. As a result of the feedback acquired through back translation, some minor changes were made on the student form. Then, student and teacher forms were compared and checked for equivalence for the last time. By this way, the final forms of the questionnaires were constructed.

Data Collection

Data were gathered from students and teachers on a voluntary basis. The questionnaire was applied to students during class time in each school. Students were asked to pay particular attention to filling out both of the two scales, level of importance and level of application, for each item. The administration of the student questionnaire lasted approximately 30-35 minutes. As for the teacher questionnaire, it was administered to all volunteer English language teachers in these ten schools. The teacher questionnaire was administered to small groups of teachers successively in each school. It took about 25-30 minutes to administer each teacher questionnaire.

Data Analysis

The quantitative data were subjected to statistical analysis using two statistical software packages: LISREL and SPSS. As stated previously, VLS questionnaires used in this study are based on Schmitt's (1997) taxonomy of VLS. In addition to the distinction of discovery and consolidation strategies, Schmitt divided the vocabulary learning strategies into five categories. In this process, he grounded these categories on the groups of social strategies, memory strategies, cognitive strategies and metacognitive strategies in Oxford's (1990) taxonomy of language learning strategies and added determination strategies as a fifth group of VLS. However, the resulting categories were not validated through factor analysis. In order to see whether these categories occur statistically in the present research study, confirmatory factor analysis (CFA) was conducted using LISREL. The five-factor structure of Schmitt's taxonomy, which was taken as a basis for the questionnaires, was tested using CFA. Following an assumption check, the data gathered from students were subjected to a CFA. After the confirmation of the factor structure, the subscales were also checked for internal consistency reliability. To do this, the results obtained from the level of importance and application scales were checked in a row. Based on the level of importance scale, Cronbach's alpha coefficients were calculated for each strategy group as follows: DET = .70; SOC = .75; MEM = .90; COG = .83; MET = .53. The values were a bit lower based on the level of application scale. A reliability coefficient of .70 or greater is generally found adequate for the reliability of test scores (George & Mallery, 2016). Therefore, alpha values of the abovementioned four subscales can be considered as acceptable. As for the subscale of metacognitive strategies, the alpha coefficient was calculated as .53 for this subscale, which may have partly resulted from its consisting of only five items. However, this value increased to .61 in the case that the 57th item in the questionnaire was omitted. Nevertheless, the relevant item was not eliminated as it was thought that the item can yield different results with different samples.

Then, answers were sought for the research questions. For this purpose, higher and lower levels of importance were initially determined for the students by using mean values and standard deviations. For each subscale, higher level of importance was defined as the rounded form of the mean plus one standard deviation and above, and lower level of importance was defined as the rounded form of the mean minus one standard deviation and below. By this way, two groups of students attributing a higher and lower level of importance to the use of VLS were determined. For each subscale, the values used for the identification of these two groups are presented in Table 3.

Table 3. Identification of Higher and Lower Levels of Importance for Students

Subscale	M	SD	Higher Level	Lower Level
Determination Strategies	31.62	5.85	37 and above	26 and below
Social Strategies	27.40	6.06	33 and above	21 and below
Memory Strategies	92.27	17.96	110 and above	74 and below
Cognitive Strategies	33.63	7.31	41 and above	26 and below
Metacognitive Strategies	17.36	3.78	21 and above	14 and below

By using the values in Table 3, the two groups of students attaching a higher and lower level of importance to the use of VLS were determined and coded as upper group and lower group respectively. Then, for each subscale, an independent samples t-test was conducted to determine whether the application scores of the students attaching a higher and lower level of importance to the use of strategies significantly differ from each other. The same procedure for determining higher and lower levels of importance was followed for teachers. As in the identification of these levels for students, means and standard deviations were calculated and used for this purpose. In each subscale, higher level of importance was defined as the rounded form of the mean plus one standard deviation and above while low level of importance was defined as the rounded form of the mean minus one standard deviation and below. Accordingly, the two groups of teachers giving a higher and lower level of importance to the instruction of VLS were identified and coded as upper group and lower group. For each subscale, the values used in the identification process of these groups are shown in Table 4.

Table 4. Identification of Higher and Lower Levels of Importance for Teachers

Subscale	M	SD	Higher Level	Lower Level
Determination Strategies	30.79	4.67	35 and above	26 and below
Social Strategies	26.11	4.02	30 and above	22 and below
Memory Strategies	98.04	15.13	113 and above	83 and below
Cognitive Strategies	30.96	5.96	37 and above	25 and below
Metacognitive Strategies	18.18	4.03	22 and above	14 and below

The values illustrated in Table 4 were taken as a basis for comparing the VLS instruction of the teachers in the upper and lower groups. However, for teachers, it was not possible to carry out t-test as the sizes of upper and lower groups, namely the teachers ascribing a higher and lower level of importance to the instruction of VLS, were not sufficient for performing t-test based on a principle requiring a group size of at least 30 (Ravid, 2011). Therefore, a Mann-Whitney U test was used to compare VLS instruction of upper and lower groups. Lastly, an independent samples t-test was performed to test whether the levels of importance attributed to the use and instruction of VLS by students and teachers significantly differ from each other and whether there is a difference between these two groups' frequencies of VLS use and instruction. The five subscales within the student and teacher questionnaires of VLS were taken as a basis for all calculations since it would not be meaningful to calculate and interpret total scores with VLS. In addition, the significance level was set at $p<0.05$ for all the statistical analyses.

Findings

The Comparison of Strategy Use of Students Attaching a Higher and Lower Level of Importance to VLS

The aim of the first research question was to discover any significant differences between the strategy use of students attaching a higher and lower level of importance to VLS. After the identification of upper and lower groups, the application means of the students in these groups were compared through an independent samples t-test. The results are presented in Table 5 for the subscales of determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies respectively.

Table 5. The Differences between Application Means of the Students Attaching a Higher and Lower Level of Importance to VLS

Subscale	Upper Group			Lower Group						
	n	**M**	**SD**	**n**	**M**	**SD**	**df**	**t**	**p**	**η^2**
DET	117	34.12	4.86	107	23.45	4.91	222	16.335	.000	.546
SOC	122	25.77	5.61	90	16.11	4.18	209.970	13.616	.000	.469
MEM	101	96.43	17.51	93	57.61	10.26	163.725	19.010	.000	.653
COG	111	33.41	7.63	94	19.71	5.83	201.019	14.557	.000	.511
MET	115	16.65	4.11	124	11.54	2.73	195.964	11.235	.000	.348

As is clear from Table 5, regarding the determination strategies, the difference between the application means of students in the upper and lower groups was statistically significant with a large effect size, t(222)=16.335, p=.000, η^2=.546. Therefore, it was revealed that the students giving a higher level of importance to determination strategies had a higher mean score on the application of these strategies (M=34.12) compared to the application mean score of the students attaching a lower level of importance to determination strategies (M=23.45). Similarly, there was a statistically significant difference between application means of the students attributing a higher and lower level of importance to social strategies, which was evident with a large effect size, t(209.970)=13.616, p=.000, η^2=.469. Hence, it was found that the application mean of the students attaching a higher level of importance to social strategies (M=25.77) was higher than that of the students placing a lower level of importance on these strategies (M=16.11). As for memory strategies, a statistically significant difference showing a large effect size was similarly present between the application means of students in the upper and lower groups, t(163.725)=19.010, p=.000, η^2=.653. Consequently, it can be pointed out that the application mean of the students ascribing a higher level of importance to memory strategies (M=96.43) was higher than that of the students giving a lower level of importance to these strategies (M=57.61). For cognitive strategies, the difference between the application means of upper and lower groups was statistically significant with a large effect size too, t(201.019)=14.557, p=.000, η^2=.511. Thus, it can be noted that the students attaching a higher level of importance to cognitive strategies had a higher application mean (M=33.41) compared to application mean score of the students attaching a lower level of importance to these strategies (M=19.71). Lastly, for metacognitive strategies, a statistically significant difference with a large effect size was found between the application means of students giving a higher and lower level of importance to metacognitive strategies, t(195.964)=11.235, p=.000, η^2=.348. Therefore, it can be concluded that the application mean of the students ascribing a higher level of importance to metacognitive strategies (M=16.65) was higher than that of the students giving a lower a level of importance to these strategies (M=11.54). In sum, the results of the independent samples t-test performed on all five subscales indicated a statistically significant difference with a large effect size. Hence, for each subscale, it was concluded that the students attaching a higher level of importance to the use of VLS had a higher mean score on the application of these strategies compared to those attributing a lower level of importance to the use of the relevant strategies.

The Comparison of Strategy Instruction of Teachers Attaching a Higher and Lower Level of Importance to VLS

The second research question set out to determine any significant differences between the frequency of strategy instruction of teachers attaching a higher and lower level of importance to VLS. After the identification of upper and lower groups for teachers, the application mean scores of these two groups were compared. As the non-parametric equivalent of independent samples t-test, a Mann-Whitney U test was carried out for each subscale. The results are provided for the subscales of determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies in Table 6.

Table 6. The Differences between Application Mean Ranks of the Teachers Attaching a Higher and Lower Level of Importance to the Instruction of VLS

Subscale	Upper Group			Lower Group				
	n	Mean Rank	Sum of Ranks	n	Mean Rank	Sum of Ranks	U	p
DET	14	16.46	230.50	9	5.06	45.50	.500	.000
SOC	11	15.77	173.50	11	7.23	79.50	13.500	.002
MEM	9	14.00	126.00	10	6.40	64.00	9.000	.003
COG	13	17.92	233.00	11	6.09	67.00	1.000	.000
MET	11	16.86	185.50	11	6.14	67.50	1.500	.000

As demonstrated in Table 6, a statistically significant difference was present between the application mean ranks of the teachers in the upper and lower groups, U=.500, p=.000. When the teachers' mean ranks were evaluated, it was seen that the application mean rank of the teachers attaching a higher level of importance to the instruction of determination strategies (mean rank=16.46) was higher than that of the teachers placing a lower level of importance on the instruction of these strategies (mean rank=5.06). Social strategies constituted the second strategy group for the comparison of the application mean ranks of teachers. The difference between the application mean ranks of the teachers was also statistically significant in this strategy group, U=13.500, p=.002. Through the evaluation of the application mean ranks of the teachers, it was found that the teachers attributing a higher level of importance to the instruction of social strategies had a higher mean rank on the application of their instruction (mean rank=15.77) compared to the application mean rank of the teachers placing a lower level of importance on it (mean rank=7.23). As for memory strategies, a statistically significant difference was also revealed between the application mean ranks of the teachers in the upper and lower groups, U=9.000, p=.003. When the mean ranks of these two groups of teachers were examined, it was seen that the mean rank of the teachers placing a higher level of importance on the application of the instruction of memory strategies (mean rank=14.00) was higher than that of the teachers giving a lower level of importance to their instruction (mean rank=6.40). Similarly, a statistically significant difference existed between the application mean ranks of the teachers placing a higher and lower level of importance on the instruction of cognitive strategies, U=1.000, p=.000. Through the evaluation of the application mean ranks of these two groups of teachers, it was revealed that the mean rank of the teachers attaching a higher level of importance to the instruction of cognitive strategies (mean rank=17.92) was higher than that of the teachers placing a lower level of importance on their instruction (mean rank=6.09). Finally, the difference between application mean ranks of the teachers in the upper and lower groups in relation to metacognitive strategies was also statistically significant, U=1.500, p=.000. When these two groups of teachers' mean ranks of application were examined, it was seen that the mean rank of the teachers attaching a higher level of importance to the instruction of metacognitive strategies (mean rank=16.86) was higher than that of the teachers placing a lower level of importance on their instruction (mean rank=6.14). To conclude, the results of the Mann-Whitney U test demonstrated a statistically significant difference between the application mean ranks of the teachers in the upper and lower groups under each strategy group. The test results indicated that teachers attributing a higher level of importance to the instruction of VLS under each strategy group had a higher mean rank on the instruction of the relevant strategies compared to those attaching a lower level of importance to the instruction of these strategies.

The Comparison of the Levels of Importance Attributed to the Use and Instruction of VLS by the Students and Teachers

The third research question aimed to reveal whether there was a significant difference between the levels of importance ascribed to the use and instruction of VLS by the students and teachers. To do this, an independent samples t-test was performed for each strategy group. The results are provided for the subscales of determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies in Table 7.

Table 7. The Differences between the Levels of Importance Attributed to the Use and Instruction of VLS by the Students and Teachers

Subscale	Student			Teacher						
	n	M	SD	n	M	SD	df	t	p	η^2
DET	548	31.62	5.85	56	30.79	4.67	602	1.038	.300	–
SOC	548	27.4	6.06	56	26.11	4.02	83.038	2.164	.033	.008
MEM	548	92.27	17.96	56	98.04	15.13	602	2.318	.021	.009
COG	548	33.63	7.31	56	30.96	5.96	602	2.636	.009	.011
MET	548	17.36	3.78	56	18.18	4.03	602	1.534	.126	–

As can be seen in Table 7, the difference between students' and teachers' mean scores on the subscale of determination strategies was not statistically significant, t(602)=1.038, p=.300. A statistically significant difference was found between the mean scores of students and teachers on the subscale of social strategies, t(83.038)=2.164, p=.033, η^2=.008. However, the aforementioned difference was not found remarkable in practical terms as the effect size was small. As for the group of memory strategies, a statistically significant difference also existed between students' and teachers' mean scores on this subscale, t(602)=2.318, p=.021, η^2=.009. Yet, this difference was not regarded as considerable in practice since the effect size was small. When it comes to cognitive strategies, the mean score of the students on this subscale differed statistically significantly from that of the teachers, t(602)=2.636, p=.009, η^2=.011. However, as the effect size was small, the relevant difference was not acknowledged to be remarkable in practical terms. Lastly, the difference between the mean scores of students and teachers on metacognitive strategies was not statistically significant either, t(602)=1.534, p=.126. To sum up, as a result of the independent samples t-test conducted for all five subscales, no statistically significant difference was detected between students' and teachers' mean scores on the subscales of determination strategies and metacognitive strategies. As for the subscales of social strategies, memory strategies and cognitive strategies, there was a statistically significant difference between students' and teachers' mean scores; however, as the effect size was small for these subscales, the aforementioned difference was not considered to be remarkable in practical terms.

The Comparison of the Students' Frequency of Strategy Use and the Teachers' Frequency of Strategy Instruction

The fourth research question aimed to find out whether there was a significant difference between the students' frequency of strategy use and the teachers' frequency of strategy instruction. The data gathered from both students and teachers via the application scale were normally distributed and the group sizes were above 30. Therefore, it was deemed appropriate to compare the students' and teachers' application levels via independent samples t-test as in the comparison of the levels of importance. The t-test results related to the subscales of determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies are provided in Table 8.

Table 8. The Differences between the Students' Frequency Strategy Use and the Teachers' Frequency of Strategy Instruction

Subscale	Student			Teacher						
	n	M	SD	n	M	SD	df	t	p	η^2
DET	548	28.65	5.77	56	32.02	4.90	71.568	4.818	.000	.037
SOC	548	21.67	5.55	56	25.98	4.94	602	5.591	.000	.049
MEM	548	77.77	17.65	56	97.71	15.74	602	8.134	.000	.099
COG	548	27.12	7.80	56	30.66	6.17	74.195	3.979	.000	.026
MET	548	14.34	3.65	56	17.86	3.85	602	6.820	.000	.071

As displayed in Table 8, there was a statistically significant difference between students' and teachers' mean scores on the subscale of determination strategies with a medium effect size, t(71.568)=4.818, p=.000, η^2=.037. Accordingly, it was seen that the mean score of the teachers on the subscale of determinations strategies (M=32.02) was significantly higher than that of the students (M=28.65). A statistically significant difference with a medium effect size also existed between the mean scores of students and teachers on the subscale of social strategies,

t(602)=5.591, p=.000, η^2=.049. Therefore, it was found that the teachers had a significantly higher mean score on social strategies (M=25.98) compared to the students' mean score on this strategy group (M=21.67). As for the third group of strategies, the difference between students' and teachers' mean scores on the subscale of memory strategies was also statistically significant with a large effect size, t(602)=8.134, p=.000, η^2=.099. Thus, it was seen that the teachers' mean score on memory strategies (M=97.71) was significantly higher than that of the students (M=77.77). There was a statistically significant difference between the groups' mean scores on the subscale of cognitive strategies too, t(74.195)=3.979, p=.000, η^2=.026. Yet, the aforementioned difference was not found remarkable in practice as the effect size was small. Finally, the t-test results indicated a statistically significant difference with a medium effect size between the mean scores of students and teachers on the subscale of metacognitive strategies, t(602)=6.820, p=.000, η^2=.071. Accordingly, it was found that the teachers had a significantly higher mean score on metacognitive strategies (M=17.86) compared to the students' mean score on this subscale (M=14.34). In sum, the results of the independent samples t-test indicated a statistically significant difference between students' and teachers' application mean scores on memory strategies with a large effect size. As for determination strategies, social strategies and metacognitive strategies, a statistically significant difference was detected between students' and teachers' application mean scores on these three subscales with a medium effect size. Although a statistically significant difference was ascertained on the subscale of cognitive strategies as well, this difference was not found considerable in practice as the effect size was small. Hence, the teachers' application mean scores were significantly higher than those of the students for all strategy groups except for cognitive strategies.

Discussion and Conclusion

As the two integral parties of the teaching-learning process, students and teachers jointly shape and manage the process of language learning. Constituting one of the most crucial and challenging aspects of foreign language learning, vocabulary acquisition requires special attention from both students and teachers. Therefore, evaluating VLS utilized by language learners to foster vocabulary acquisition from the perspectives of both students and teachers might provide better insights into the importance and application of these tools. For this purpose, the present study investigated and compared student and teacher perceptions and practices in relation to the use and instruction of VLS.

Departing from the fact that language learners are mostly aware of the prominence of vocabulary knowledge for effective communication in a second language (Read, 2004), the study initially sought to reveal whether the importance attached to the VLS reflected on students' use of those strategies for language learning. The results indicated that the students attributing a higher level of importance to the use of VLS under each strategy group had a higher mean score on the application of these strategies compared to those giving a lower level of importance to the use of the relevant strategies. Therefore, this finding leads us to the fact that the students that attach a higher level of importance to the use of VLS have a significantly higher level of application regarding these strategies. This means that if the students attach a higher level of importance to the use of specific groups of VLS, they use them more for lexical development. This finding is congruent with the result reached by Fan (1999, cited in Fan, 2003) in a study investigating students' beliefs and strategy use, which indicated that language learners' beliefs in the importance of specific strategies foster and increase the use of those strategies. Indeed, learner beliefs are one of the individual learner differences that affect the learners' use of learning strategies together with the situational factors (Ellis, 1994). Therefore, if the students' beliefs in the importance of various VLS can be promoted, their implementation of a diverse range of strategies might be facilitated. Raising the learners' awareness of a wide variety of strategies might enable them to discover new strategies and use these strategies for their own lexical development.

As highlighted by Nunan (1995), we cannot expect students to automatically choose their own ways of learning. Hence, teachers have a crucial role in introducing and creating awareness of various VLS in order for students to realize the benefits of different strategies and apply them in their vocabulary learning process, which justifies the rationale behind this study. Thus, the present study also tested whether the strategy instruction frequency of the teachers who give a higher level of importance to VLS differed significantly from that of the teachers who attach a lower level of importance to VLS. The study found a significant difference between the application mean ranks of these two groups of teachers in each group of VLS. The results demonstrated that the teachers attaching a higher level of importance to the instruction of VLS under each strategy group had a higher mean rank on the instruction

of these strategies compared to those attributing a lower level of importance to the instruction of relevant strategies. This leads us to the conclusion that if the teachers attach a higher level of importance to the instruction of VLS, they teach or create awareness of the strategies to a larger extent. This finding is quite in line with those attained in Lai's (2005) study in which positive correlations were detected between teachers' beliefs in the effectiveness of VLS and their instructional practices regarding the strategies. The results of the current study also coincide with those of Şen's (2009) study in which EFL teachers' perceptions of LLS were compared with students' use of strategies, and it was ascertained that if the teachers are conscious of LLS, believe in their usefulness and find them practical, they employ them to a larger extent in their classes. In the present study, the consistency between the teachers' perceptions regarding the importance of VLS instruction and the teaching practices related to the strategies indicate that teachers' positive attitudes towards the instruction of VLS seem to reflect on their actual instruction of VLS. The fact that the teachers that attach a higher level of importance to the instruction of different groups of VLS teach those strategies to a larger extent justifies the need for raising the teachers' awareness of a variety of VLS before starting a systematic strategy training program because teachers might be convinced of the importance of various strategies and transfer these to their strategy instruction by this way. In this respect, it might be more beneficial if the teachers try to learn different strategies and do not limit strategy instruction with the VLS they personally find useful so that the students might get exposed to a wide variety of VLS.

As well as evaluating students' frequency of strategy use and teachers' frequency of strategy instruction in relation to the levels of importance attached to VLS, the present study also set out to compare student and teacher perspectives. To this end, the study sought to test whether there was a significant difference between the levels of importance attached to the use and instruction of VLS by the students and teachers. The results did not indicate a statistically significant difference between students' and teachers' mean scores on the subscales of determination strategies and metacognitive strategies. As for the subscales of social strategies, memory strategies and cognitive strategies, a statistically significant difference was detected between students' and teachers' importance mean scores on these subscales; however, as the effect size was small for all three subscales, the aforementioned difference was not found remarkable in practical terms. The significance of this difference may have resulted from the large sample size. Hence, the result that students and teachers have similar perspectives about the importance of VLS use and instruction with remarkably positive attitudes and assumedly no statistically significant difference between the levels of importance ascribed to them is quite promising as both parties are conscious of the crucial role of VLS in lexical development. This finding was in line with previous research on language learning strategies which indicated that teachers attribute great importance to strategies and that the ones frequently used by students are generally congruent with the ones the teachers regard as quite important (Griffiths, 2007).

Since students and teachers similarly believed in the prominence of VLS use and instruction, they were expected to reflect their ideas on their practices and actively implement VLS use and instruction. Thus, another major dimension of the study involved the comparison of students' frequency of strategy use and teachers' frequency of strategy instruction. As a result, it was revealed that teachers had significantly higher mean scores on determination strategies, social strategies, memory strategies and metacognitive strategies compared to the students, but the difference between these two groups on cognitive strategies was not considerable in terms of effect size. Hence, it can be concluded that teachers' frequency of strategy instruction was significantly higher than students' frequency of strategy use except for cognitive strategies. In other words, teachers reported teaching and creating awareness of the strategies to a significantly larger extent compared to the students' implementation of the VLS under each strategy group except for cognitive strategies. The results of the present study coincide with those of Şen's (2007) study which indicated that teachers have a significantly higher frequency of LLS instruction than the students' frequency of LLS use. Hence, it can be pointed out that a disparity might come out between student and teacher practices regarding LLS and VLS as a subgroup of LLS. Therefore, studies of strategy training should take this problem into account. The exception regarding cognitive strategies which involve verbal repetition of the word, written repetition, making and revising word lists, using flashcards, taking notes, revising vocabulary sections in textbooks, listening to recordings and CDs of word lists, putting English labels on physical objects and keeping a vocabulary notebook might stem from these strategies' being appropriate for students and teachers to implement together during class time. As most of these strategies might constitute an integral part of the vocabulary learning-teaching process in class, frequencies regarding students' strategy use and teachers' strategy instruction might not result in a big difference.

The incongruity between student and teacher practices demonstrates that although a wide variety of strategies were reported to be introduced and taught, this did not completely or properly reflect on students' use of VLS. Even though it was found through self-report data that various strategies were actively taught in English classes, strategy instruction may not have been pursued as efficaciously as needed or it may not have turned out to be effective enough to convince the learners of the usefulness of different kinds of strategies or to persuade them to use these strategies for lexical development. As underlined by Nation (2001), "…it is certainly not sufficient to demonstrate and explain a strategy to learners and then leave the rest to them." (p. 223). Therefore, just introducing strategies to the students might not yield favourable results in terms of strategy instruction. It is necessary for teachers to spend considerable time on strategy training and help learners to gain more insight into various strategies by focusing on both their benefits and implementation. The discrepancy between students' and teachers' practices may have resulted from students' not making the necessary efforts to incorporate these strategies into their vocabulary learning process as well. Hence, as a learner variable, VLS need to be ascribed a high level of importance. They should be practiced by the students to a large extent in order for these strategies to be automatically used during vocabulary learning. As learners' achievements in language learning largely depend on their own endeavours for making the most of the opportunities to learn (Oxford, 1990), success in vocabulary development via the effective use of VLS would be possible only if the students fulfil their own responsibilities and try to make good use of the strategies taught by the teachers. Otherwise, strategy training would not serve any purpose. However, it is the teacher's responsibility to guide the learners from the very beginning in order to help them gain this independence and learn how to learn.

In sum, this study indicated that the students and teachers who ascribed a higher level of importance to VLS used and taught them more frequently, which was a remarkably encouraging result. However, it seems that difficulties are encountered in reflecting these positive attitudes on strategy use and instruction since a significant difference was detected between student and teacher practices. In the light of all these findings, it can be concluded that both students and teachers need to pay close attention to vocabulary learning strategies and their instruction. In order for strategy training to achieve its purpose, it is essential to learn how to get rid of the problems related to the disparity between student and teacher practices regarding strategy use and instruction. Therefore, students' and teachers' joint endeavours are needed in order for successful strategy instruction and effective strategy use to come true.

Based on the results of the present study, it should be pointed out that students' general awareness of the importance of VLS for lexical development may not entirely reflect on their implementation of these strategies. Students might not manage independent learning and gain autonomy by themselves. Teachers' crucial role in promoting learner independence in terms of lexical development stands out at this point. In the present study, it was found that although students believe in the prominence of VLS, they apply them to a limited extent. However, it was also ascertained that if they attribute a higher level of importance to any group of strategies, they apply these strategies to a larger extent. These findings indicate that students need to be guided and convinced of the importance of various strategies so as to put them into practice. Therefore, certain steps need to be taken for promoting students' implementation of VLS. Hence, if such contextual factors as time constraints, intense curriculum, and crowded classes hamper effective instruction of VLS, the necessary precautions might be taken to eliminate these restrictions. Curriculum designers might try to include strategy training in regular English classes as it would prove to be much more beneficial in the long-term. The constraints related to weekly course hours might prevent the teachers from spending enough time on not only strategy training but also the other elements involved in an English course; therefore, some certain steps might be taken to find a solution to this problem. Moreover, if the teachers' instruction of VLS does not entirely reflect on students' application of these strategies or if these strategies are not effectively taught, teachers might try to improve themselves more in terms of strategy instruction. Strategy training might yield more favourable results if the instruction is carried out more systematically. Therefore, teachers might attempt to learn how to teach VLS more effectively. In this regard, VLS training courses might be incorporated into pre-service and in-service teacher training programs.

As the ultimate aim of the present study was to compare students' perceptions of VLS with those of their teachers, it was not possible to reach a large number of teachers. Therefore, further studies might be conducted by reaching a larger number of teachers. The present study indicated a discrepancy between the students' implementation of VLS and the teachers' instruction of VLS although both groups acknowledged the importance of VLS use and instruction. Therefore, the reasons for this disparity might be investigated through further research.

As the present research is based on self-report data gathered from students and teachers through questionnaires, further studies might be conducted by making use of other instruments such as think aloud protocols, diaries and journals. Lastly, task-specific use and instruction of VLS might be explored as well through longitudinal studies.

Acknowledgments

This article is based on the first author's M.A. thesis completed under the supervision of the second author at Akdeniz University, Antalya, Turkey.

References

Akın, A., & Seferoğlu, G. (2004). Improving learners' vocabulary through strategy training and recycling the target words. *Hacettepe University Journal of Education*, *27*, 1-10.

Anderson, N. J. (2005). L2 learning strategies. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 757-771). Mahwah, NJ: Lawrence Erlbaum Associates.

Atay, D., & Ozbulgan, C. (2007). Memory strategy instruction, contextual learning and ESP vocabulary recall. *English for Specific* Purposes, *26*, 39-51.

Brown, T. S., & Perry, F. L. (1991). A comparison of three learning strategies for ESL vocabulary acquisition. *TESOL Quarterly*, *25*(4), 655-670.

Catalán, R. M. J. (2003). Sex differences in L2 vocabulary learning strategies. *International Journal of Applied Linguistics, 13*(1), 54-77.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). London: Routledge.

Çelik, S., & Toptaş, V. (2010). Vocabulary learning strategy use of Turkish EFL learners. *Procedia Social and Behavioral Sciences*, *3*, 62-71.

Ellis, R. (1994). *The study of second language acquisition*. Oxford: Oxford University Press.

Fan, M. Y. (2003). Frequency of use, perceived usefulness, and actual usefulness of second language vocabulary strategies: A study of Hong Kong learners. *The Modern Language Journal*, *87*(2), 222-241.

George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 step by step: A simple guide and reference* (14th ed.). New York, NY: Routledge.

Griffiths, C. (2007). Language learning strategies: Students' and teachers' perceptions. *ELT Journal*, *61*(2), 91-99.

Gu, Y. (1994). Vocabulary learning strategies of good and poor Chinese EFL learners. Paper presented at the Annual Meeting of the Teachers of English to Speakers of Other Languages. Baltimore, MD. ERIC Document Reproduction Service No. ED 370 411.

Gu, Y. (2002). Gender, academic major, and vocabulary learning strategies of Chinese EFL learners. *RELC Journal*, *33*(1), 35-54.

Gu, Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. *Language Learning*, *46*(4), 643-679.

Hunt, A., & Beglar, D. (2005). A framework for developing EFL reading vocabulary. *Reading in a Foreign Language*, *17*(1), 23-59.

Klapper, J. (2008). Deliberate and incidental: Vocabulary learning strategies in independent second language learning. In S. Hurd & T. Lewis (Eds.), *Language learning strategies in independent settings* (pp. 159-178). Bristol: Multilingual Matters.

Kobayashi, K., & Little, A. (2018). Explicit instruction of memory vocabulary learning strategies in an ESP context. *Journal of Second Language Teaching and Research, 6*(1), 20-49.

Kojic-Sabo, I., & Lightbown, P. M. (1999). Students' approaches to vocabulary learning and their relationship to success. *The Modern Language Journal*, *83*(2), 176-192.

Lai, Y. L. (2005). *Teaching vocabulary learning strategies: Awareness, beliefs, and practices*. *A survey of Taiwanese EFL senior high school teachers.* Unpublished Master's Thesis, University of Essex, England.

Lawson, M. J., & Hogben, D. (1996). The vocabulary-learning strategies of foreign-language students. *Language Learning, 46*(1), 101-135.

Lessard-Clouston, M. (1997). Language learning strategies: An overview for L2 teachers. *The Internet TESL Journal*, *3*(12). Retrieved September 20, 2019, from http://iteslj.org/Articles/Lessard-Clouston-Strategy.html

Little, D. (1995). Learning as dialogue: The dependence of learner autonomy on teacher autonomy. *System*, *23*(2), 175-181.

McCarthy, M. (1990). *Vocabulary*. Oxford: Oxford University Press.

Meara, P. (1980). Vocabulary acquisition: A neglected aspect of language learning. *Language Teaching and Linguistics*, *13*, 221-246.

Mizumoto, A., & Takeuchi, O. (2009). Examining the effectiveness of explicit instruction of vocabulary learning strategies with Japanese EFL university students. *Language Teaching Research*, *13*(4), 425-449.

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

Nation, I. S. P. (2008). *Teaching vocabulary: Strategies and techniques*. Boston, MA: Heinle Cengage Learning.

Nunan, D. (1995). Closing the gap between learning and instruction. *TESOL Quarterly*, *29*(1), 133-158.

Oxford, R. L. (1990). *Language Learning Strategies: What Every Teacher Should Know.* Boston, MA: Heinle & Heinle.

Oxford, R. L. (2003). Language learning styles and strategies: An overview. GALA. Retrieved September 20, 2019, from http://web.ntpu.edu.tw/~language/workshop/read2.pdf

Oxford, R., & Nyikos, M. (1989). Variables affecting choice of language learning strategies by university students. *The Modern Language Journal*, *73*(3), 291-300.

Prichard, C. (2008). Evaluating L2 readers' vocabulary strategies and dictionary use. *Reading in a Foreign Language*, *20*(2), 216-231.

Rasekh, Z. E., & Ranjbary, R. (2003). Metacognitive strategy training for vocabulary learning. *TESL-EJ*, *7*(2), 1-15.

Ravid, R. (2011). *Practical statistics for educators* (4th ed.). Plymouth, UK: Rowman & Littlefield Publishers.

Read, J. (2004). Research in teaching vocabulary. *Annual Review of Applied Linguistics*, *24*, 146–161.

Rubin, J. (1975). What the "good language learner" can teach us. *TESOL Quarterly*, *9*(1), 41-51.

Sagarra, N., & Alba, M. (2006). The key is in the keyword: L2 vocabulary learning methods with beginning learners of Spanish. *The Modern Language Journal*, *90*(2), 228-243.

Sanaoui, R. (1995). Adult learners' approaches to learning vocabulary in second languages. *The Modern Language Journal*, *79*(1), 15-28.

Sarıçoban, A., & Başıbek, N. (2012). Mnemonics technique versus context method in teaching vocabulary at upper-intermediate level. *Education and Science*, *37*(164), 251-266.

Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 199-227). Cambridge: Cambridge University Press.

Schmitt, N. (2000). *Vocabulary in language teaching.* Cambridge: Cambridge University Press.

Schmitt, N. (2008). Review article: Instructed second language vocabulary learning. *Language Teaching Research*, *12*(3), 329-363.

Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. Basingstoke, UK: Palgrave Macmillan.

Segler, T. M., Pain, H., & Sorace, A. (2002). Second language vocabulary acquisition and learning strategies in ICALL environments. *Computer Assisted Language Learning*, *15*(4), 409-422.

Şen, H. (2009). *A comparison of EFL teachers' perceptions of language learning strategies (LLSs) and learners' reported use of LLSs in their English language classes.* Unpublished Master's Thesis, Middle East Technical University, Ankara, Turkey.

Takač, V. P. (2008). *Vocabulary learning strategies and foreign language acquisition*. Clevedon, UK: Multilingual Matters.

Üster, S. (2008). *The role of brain-based gender differences on the vocabulary learning and consolidation skills and strategies*. Unpublished Master's Thesis, Middle East Technical University, Ankara, Turkey.

Walters, J., & Bozkurt, N. (2009). The effect of keeping vocabulary notebooks on vocabulary acquisition. *Language Teaching Research*, *13*(4), 403-423.

Wu, W. S. (2005). Use and helpfulness rankings of vocabulary learning strategies employed by EFL learners in Taiwan. *Journal of Humanities and Social Sciences*, *1*(2), 7-13.

Özer, M. (2020). What does PISA tell us about performance of education systems? *Bartın University Journal of Faculty of Education*, 9(2), 217-228.

Bartın University Journal of Faculty of Education, 9(2), 217-228

buefad.bartin.edu.tr

What Does PISA Tell Us About Performance of Education Systems?

Mahmut ÖZER*[a]

Article Info

DOI: 10.14686/buefad.697153

Article History:
Received: 15.12.2019
Accepted: 05.03.2020
Published: 05.06.2020

Keywords:
assessment, PISA, school tracking, socioeconomic status, student achievement

Article Type:
Review Article

Abstract

The performance of education systems is an area where intense discussions take place around the world. Since international student achievement researches, such as the Program for International Student Assessment (PISA), provide information about readiness of students to modern society and participation to workforce differences in achievements between countries create great pressure for policy makers. Due to this pressure, many countries implement serious revisions in their education systems without adequately focusing on the national background of differences. Lack of national monitoring studies also increases the probability of inaccurate identifying the background of problems. In this study, the factors that function on the background of achievement differences between countries, especially in PISA studies, are tried to be determined and the most important factors that are effective in student achievement, which are independent of the cultural and social context differences of the countries, are tried to be specified. It is seen that the three major factors are teacher quality, delaying students' school tracking and allocating resources to schools, considering disadvantaged schools as priority. In addition, it is recommended to establish a national monitoring and evaluation system to evaluate international student achievement research results in healthier way and to develop more realistic policies.

PISA Eğitim Sistemlerinin Performansı Hakkında Bize Ne Söylüyor?

Makale Bilgisi

DOI: 10.14686/buefad.697153

Makale Geçmişi:
Geliş: 15.12.2019
Kabul: 05.03.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Değerlendirme, öğrenci başarısı, okul ayrıştırma, PISA, sosyoekonomik statü

Makale Türü:
Derleme Makalesi

Öz

Eğitim sistemlerinin performansı dünyada yoğun tartışmaların yapıldığı bir alanı oluşturmaktadır. Uluslararası Öğrenci Değerlendirme Programı (PISA) gibi uluslararası öğrenci başarı araştırmaları, öğrencilerin modern topluma ve işgücüne katılım için ne kadar hazır oldukları ile ilgili bilgi sağladığı için ülkeler arası başarı farkları politika yapıcılar için büyük baskı oluşturmaktadır. Bu baskı dolayısıyla, birçok ülke, başarı farklarının ulusal arka planına yeterince odaklanamadan eğitim sistemlerinde ciddi revizyona gitmektedir. Eğitim sistemlerinin bütününü izleyen ve değerlendiren ulusal izleme ve değerlendirme sistemlerinin olmaması da sorunların arka planını doğru tespit edememe riskini artırmaktadır. Bu çalışmada, özellikle PISA araştırmalarında ülkeler arası başarı farklarının arka planında işlev gören faktörler ele alınmakta ve ülkelerin kültürel ve sosyal bağlam farklarından bağımsız olarak öğrenci başarısında etkin olan en önemli faktörler belirlenmeye çalışılmaktadır. Bu bağlamda en önemli üç faktörün, öğretmen kalitesi, öğrencilerin okul ayrıştırmalarının geciktirilmesi ve özellikle dezavantajlı okulları daha fazla göz önüne alacak şekilde okullara kaynak dağıtılması olduğu görülmektedir. Ayrıca, uluslararası öğrenci başarı araştırma sonuçlarını sağlıklı değerlendirebilmek ve daha gerçekçi politikalar geliştirebilmek için eğitim sisteminin bütününe bakan bir ulusal izleme ve değerlendirme sisteminin kurulması önerilmektedir.

***Corresponding Author:** mahmutozer2002@yahoo.com
[a] Prof. Dr., Ministry of National Education, Ankara/TURKEY, https://orcid.org/0000-0001-8722-8670

Introduction

The achievement levels of the countries in international student achievement researches are interpreted as the achievement indicators of the education systems of the countries and bring intense discussions. In particular, the PISA study puts pressure on governments and policymakers to make changes to their country's education systems based on performance, as it is assumed that it measures the students' ability to solve problems associated with daily life rather than knowledge, in other words, it provides important information about how well students are ready for their community's expectations (Gür, Çelik and Özoğlu, 2012).

On the other hand, foreign investors also consider the results of international student achievement researches in the labour market evaluation of the country they will invest (NESC, 2012). It is now attempted to establish a relationship between educational outputs and economic outputs of countries based on PISA results, and even how much increase in certain PISA scores can lead to a certain amount of increase in national gross national product (GDP) is discussed (Hanushek and Woessmann, 2012; Woessmann, 2014). Therefore, when a country's position in the ranking is low in PISA research results, the pressure to revise or reform the education system of that country increases (Araujo, Saltelli and Schnepf, 2017).

Criticisms towards PISA have also increased over time. Since PISA deeply affected education systems, 100 academicians from different countries pointed out the negative effects of PISA rankings on education systems and stated that many companies, especially for profit, were involved in PISA test development processes (Meyer et al., 2014). This strengthens the views towards the commercialization of PISA research. Therefore, the linear relationships between PISA results and economic growth degrade PISA study to a commercial enterprise, which may lead to misinterpretation of the purpose of education (Araujo, Saltelli and Schnepf, 2017). On the other hand, the effects of social, economic and cultural contexts on student achievement can be neglected in this type of international achievement research and interpretation of the results, and therefore a uniform education approach is emphasized (Trohler, 2013).

After announcing the results of the PISA, which such great meanings are attributed, the countries are comparing their situation with other countries on one hand and, intense discussions and researches are made especially on the reasons of decrease in ranking or points on the other hand. However, uncertainty as to whether the relationship between achievement and factors associated with achievement is a correlation or a causal relationship also involves the risk of shifting debates from a healthy background. For example, although a correlation appears to be exist between PISA scores and GDP, the improvement in PISA scores will not necessarily lead to growth in GDP (Araujo, Saltelli and Schnepf, 2017).

Considering all these criticisms, when international student achievement researches are evaluated within its context, it also provides important information about the education systems of countries. It is assumed that the differences in countries' international student achievement research studies are systematically related to the organization and management of education systems (Woessmann, 2016). Educational production function approach is generally used to determine the weight of factors affecting education (Ammermüller, 2004). With this approach, the effects of various inputs affecting student achievement can be determined. On the other hand, as a common approach to understand what is behind the background of achievement, common patterns in education systems of high performing countries are tried to be identified and their relationship with achievement is investigated. However, other factors and cultural differences outside the education system can play an important role in achievement. Therefore, it is very difficult to determine the factors that affect achievement or the causes of low performance according to international achievement research results as a short cut, and requires a holistic approach that takes into account all parameters and dimensions.

In this study, the background of the differences between countries in international student achievement researches is reviewed and discussed on the basis of PISA studies and the main factors that countries should focus on in order to improve their education systems are tried to be determined.

What Do the International Student Achievement Researches Say?

Since international achievement researches give ranking information about the results, the discussions within the countries also revolve around the rankings, especially since the attention of the media focuses on rankings. However, focusing on scores rather than rankings in international studies provides healthier information about

countries' performance changes. Countries with statistically insignificant score differences in rankings, especially in PISA studies, can be placed above or below each other (Woessman, 2016) and it can lead to inaccurate comfort or anxiety only by focusing on rankings. Educational policy makers can turn to policies that they think will change in the PISA rankings in the short term and the long-term effects of these policy changes cannot be adequately evaluated (Gür, Çelik and Özoğlu, 2012; Takayama, 2015).

On the other hand, the mean scores alone are insufficient for a healthy evaluation. Beyond the scores, student ratios at the proficiency levels determined in each research area and the relationship between these ratio and the OECD average can provide much more meaningful information and contribute to developing the right policy. In all research areas, distribution of students in countries with approximately the same mean scores in these proficiency levels may differ. In other words, achievement differences of students with low and high performance provide more detailed information about those countries in the context of equality of education and equal opportunities in education. Grouping by OECD average, country mean scores and country rankings alone do not provide sufficient information. In order to evaluate this information in detail, the student ratios at proficiency levels must be taken into consideration. On the other hand, comparing these differences with other countries can provide an additional picture of the competitiveness of those countries. For example, although the country mean scores are above the OECD average in some areas, the student ratios at the baseline and upper qualification levels may be below the OECD average at those qualification levels (Hanushek, Peterson and Woessmann, 2013). On the other hand, in the USA, white and Asian students perform above OECD average in PISA researches while African-American and Latin students perform below average (Darling-Hammond, 2014).

Similar findings in different social and cultural contexts apply to different countries (NESC, 2012). For example, according to PISA 2018 results, the performance difference between the socioeconomic level and gender groups in B-S-J-Z (China), Singapore and Macao (China), which rank in the top three in the list of reading literacy are given in Figure 1 (OECD, 2019).

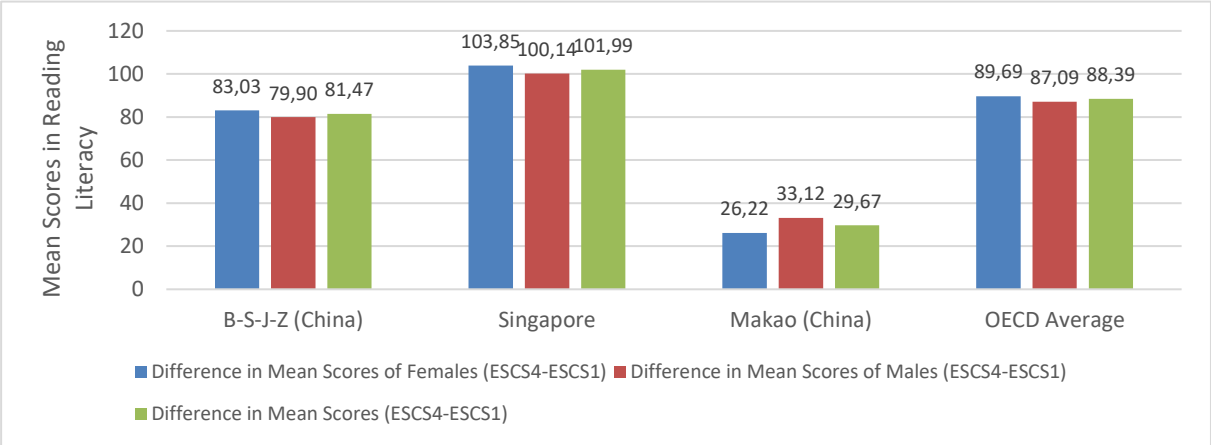


Figure 1. Change of PISA 2018 Reading Literacy Performance in Socioeconomic and Gender Groups of B-S-J-Z (China), Singapore and Macau (China)

As seen in Figure 1, the distribution of the performances of the top three countries in reading skills by gender and socioeconomic level is quite different. The difference between the mean scores of the students in terms of socioeconomic level at the highest level and the students at the lowest level is calculated as 81.47 in B-S-J-Z (China) and is close to the OECD average (88.39). In Singapore, where there is no significant difference between B-S-J-Z (China), this average is quite high (101.99). Macau (China), which ranks third in terms of performance, is one of the countries where socioeconomic level has the lowest impact on student performance with 2% comparing the OECD Average of 12%. The average score difference between the two groups in this region is quite low (29.67). The distribution of the proficiency levels in reading literacy is given in Figure 2 for these countries (OECD, 2019).

As seen in Figure 2, there are also significant differences in the distribution of students in the proficiency levels of the three countries that are in the top rank in the reading literacy. The ratio of students at the 6th level, which is the highest level of proficiency, is quite higher in Singapore than in other countries. Despite this, it is seen that student ratios at 1st, 3rd and 4th levels are low compared to B-S-J-Z (China). Among the countries with the same performance levels, B-S-J-Z (China) stands out with lesser ratio of students at lower levels while Singapore stands out with the higher ratio of students at the higher levels of qualification (level 5 and 6).

Therefore, in PISA studies, interpretations based on country rankings or mean scores should be made restrainedly and detailed analyses should be conducted from macro to micro levels.

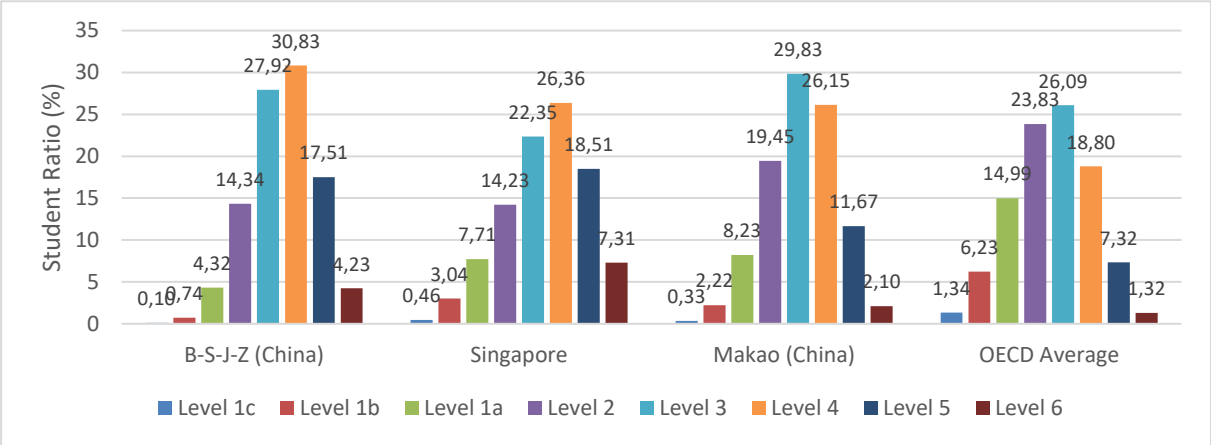


Figure 2. Distribution of PISA 2018 Reading Literacy Performances into Proficiency Levels in B-S-J-Z (China), Singapore and Macao (China)

The Relationship between International Student Achievement Research and Quality of Educational Systems

A good educational system must also meet important criteria outside the areas that international student achievement researches focus on (Sahlberg, 2011). If international student achievement research is the only indicator of whether education is successful or not, concerns are expressed that the focus will be only on these tests in education systems, education will weaken over time in other courses and ultimately the curriculum will narrow (Adams, 2003; Darling-Hammond, 2014; Goldstein, 2004; NESC, 2012; Prais, 2003). In particular, the linear relationships between PISA results and economic growth degrade PISA study to a commercial enterprise and thus may misinterpret the purpose of education (Araujo, Saltelli and Schnepf, 2017).

One of the most frequently expressed criticisms against PISA is to ignore the impact of historical, social, economic and cultural contexts on student achievement in the research and highlight a uniform educational approach (Trohler, 2013). It is stated that PISA does not provide sufficient evidence about causal relationships and that the policy recommendations presented in the result reports should be carefully evaluated before these relationships are established (Harris and Zhao; 2015). In this context, it is of great importance for the healthy development of education systems, to reduce the pressure to consider the results of international research as a sole indicator for the performance of educational systems and the risks of developing inaccurate policies, whose validity is discussed in terms of scale, sample, cultural differences and inclusiveness,. Consequently, the construction of national evaluation mechanisms that take into account the entire education system will provide an opportunity to use international achievement researches as secondary instruments, not the main ones, for the evaluation of education systems. National monitoring studies will also provide additional findings in terms of explaining and interpreting the results of international researches.

International studies carry out student achievement monitoring researches in different fields and at different periods and on different groups of students. For example, TIMSS focuses on curriculum-oriented student achievement research at 4th and 8th grade levels in four-year periods, while PISA focuses on the ability to solve

problems related to daily life based on the information learned by 15-year-old students in three-year periods. Correlation between different international studies can provide an opportunity to increase the number of options in instruments that countries can use to evaluate the outputs of education systems and to monitor educational outcomes and student achievement in different areas. In this manner, Hanushek and Woessmann (2015) found quite high correlations of 0.944 in mathematics and 0.930 in science, in the study in which they analysed the relationship between PISA 2012 and TIMSS 2011 results. This result shows that although the context and aim are different in international comparisons, test designs and item contents are of secondary importance (Woessmann, 2016). The fact that the high school types which have higher base scores in high school entrance exam including only multiple-choice items in Turkey, have also higher mean scores in PISA also confirms the aforementioned facts (MoNE, 2019). On the other hand, national monitoring studies provide richer feedback on curriculum-based deficiencies and improvements as countries use their curricula as resources. It is also possible to evaluate the criteria used by countries in educational quality assurance systems for national monitoring studies (DFID, 2011). These features show the importance of the national monitoring studies as the main instrument in the policies to be developed to improve educational processes.

The Relationship between International Student Achievement Research and Sociocultural Context

Researches on the background of achievement differences in international studies, cultural differences of countries require attention in evaluating the results. Research results do not mean that schools or education systems in countries with higher rankings are more effective than those in other countries (NESC, 2012). In researches, detailed outputs are presented according to the academic achievement or literacy levels of the target student group in the countries and the countries are ranked based on these outputs. However, the studies do not provide casual conclusions about why the countries are in their order because of the fact that the descriptive design of the researches prevent it (Takayama, 2015). However, correlational relations presented by the research might be interpreted as causal relations. While a parameter that positively affects the outcome in one country does not have an effect in another country, it may even have a negative effect on student achievement in another country.

Therefore, reforms that lead to success in one country may not lead to the same result in countries with different cultural or social contexts (Sahlberg, 2011). For example, although school autonomy has a significant effect on student achievement, this effect varies between countries; while this positive effect is quite high in developed and higher performing countries in PISA, it has a negative effect in developing and low performing countries in PISA (Woessmann, 2016). On the other hand, it is expressed that the cultural and social structure, in which students' hard work, determination and perseverance and family involvement to education coexist greatly explain the high performance of Asian countries such as South Korea (Araujo, Saltelli and Schnepf, 2017). On the other hand, it is not possible to state that these features explain achievement in Scandinavian countries such as Finland.

In a comparative study of the PISA results for Germany and Finland, it has been shown that the same characteristics may have different effects in the educational production function (Ammermüller, 2004). In other words, while mechanisms that activate cultural codes affect the results positively, conflicting mechanisms can also affect negatively. Therefore, it should not be ignored that multiple factors are effective in the results and that each of these factors can be affected by culture. Consequently, it is necessary to avoid inferences that the parameters that are effective in the results of high performing countries should lead to achievement in other countries. To avoid such risky implications, national monitoring research programs are very important, as we will see later.

Effects of Socioeconomic Background and School Tracking on the Achievement Differences

The impact of the socioeconomic background on the student achievement is generally addressed in the context of school tracking in the education system (Ozer and Perc, 2020). Since there are different types of schools in school systems in countries, students are tracked into different school types. The school tracking usually takes place at the beginning of upper secondary school level. The student age at which the tracking is made, the number of schools tracked and the scale of the curriculum differentiation in the tracked schools are examined in terms of their effects on student achievement (Reichelt, Collischon and Eberl, 2019). These studies focus on whether school tracking enhances the impact of out-of-school factors such as the socioeconomic status and educational levels of families on the student achievement (Bol and Van de Werfhorst, 2013; Brunello, 2004; Hanushek and Woessmann, 2006; Marks, 2006; Ozer and Perc, 2020; Pekkarinen, Uusitalo and Pekkala, 2006; Reichelt, Collischon and Eberl, 2019; Roemer, 1998; Woessmann, 2009; Zimmer, 2003).

The socioeconomic status of the family has a strong impact on the student's academic achievement especially at early ages (Horn, 2009; Marks, 2005; Ozer and Perc, 2020; Reichelt, Collischon and Eberl, 2019). With the school tracking at early ages, children from disadvantaged backgrounds are differentiated into different school types without having the chance to compensate for this situation, which further deepens the achievement difference in the country (Ammermüller, 2004). Therefore, disadvantaged students cannot adequately get involved in the high performing student community (Burroughs and Plucker, 2014; Jacobs and Wolbers, 2018).

Schütz, Ursprung and Woessmann (2008) showed that family background effects on student achievement are systematically larger in countries where the school tracking is made at an early age and pre-school education is less common. Access to preschool education is also related with the socioeconomic status of families. For example, in the United States, %30-%40 of children lack the skills required to be successful initially in primary school, as children of low-income families are much less likely to have access to pre-school education than their peers from wealthy families (Darling-Hammond, 2014). Similarly, early tracking and the increase in the number of tracked schools increase the impact of family education on the student achievement (Ammermueller, 2013). Although tracking of students according to their abilities in school types does not have the same level of positive contribution to the achievement of students in upper achievement groups, it has a rather negative effect on students in lower achievement groups (NESC, 2012). Therefore, early tracking significantly increases inequality in countries' achievement outcomes (Hanushek and Woessmann, 2006; Ozer and Perc, 2020).

Effects of Teacher Quality on the Achievement Differences

The main actors of education are teachers and their quality directly affects student achievement (Rivkin, Hanushek and Kain, 2005). In PISA studies, teacher quality is considered as the main explanatory factor of high performance (Takayama, Waldow and Sung, 2013). Employment of quality teachers is considered as a common point of the most successful education systems in the world (Barber and Mourshed, 2007). In countries with higher performance in the international student achievement researches, access to qualified teachers is higher (Akiba, LeTendre and Scribner, 2007).

The most important issue in reducing the achievement difference between schools is the quality of teachers. The importance of accessing a qualified teacher increases more, especially if children with a low socioeconomic background do not have a strong chance of early childhood education. For example, in the USA, students with high and low socioeconomic status have very high inequality of opportunity in accessing quality teachers (Darling-Hammond, 2014). In New Zealand, less than %40 of students have access to qualified teachers, while students with low socioeconomic status (SES) have higher access to qualified teachers than students with higher SES (Akiba, LeTendre and Scribner, 2007). In the disadvantaged areas where students with low SES are clustered, especially inadequate teachers are employed at a higher ratio due to the difficulty of working conditions (Darling-Hammond and Sykes, 2003), which leads to a further deepening of the initial disadvantage. Since more qualified and more experienced teachers are found less frequently in disadvantaged schools in most countries, the performance gap is growing even more according to socioeconomic status (OECD, 2018).

It is suggested that inequalities in accessing qualified teachers play an important role in long-standing achievement differences in the USA (Darling-Hammond, 2006). For this reason, in order to reduce the difference in student achievement in America, it is recommended to appoint qualified teachers especially in schools where minority students are present (Darling-Hammond, 2014). In Japan and South Korea, teachers change schools periodically, so that all schools' access to effective and experienced teachers is tried to be increased, while on the other hand, continuous professional development of teachers and flowing of experiences throughout the system are assured (OECD, 2018). In other words, the most common policy used to reduce the negative impact of SES on student achievement is practices that will increase the access of disadvantaged students to more qualified teachers.

Since the teacher was determined as the main actor in the transformation in education in Finland, both the selection of the candidates to be trained and their education have been strengthened, and as a result, the efficiency of the investments made in education with the strong teacher has been increased, thus high performance in international student achievement researches was achieved and the difference in achievement between schools has been minimized (Sahlberg, 2011). As a result, not only the difference between the ratio of the quality of teachers in a country compared to the international average, but also the ratio of access to qualified teachers of students with different socioeconomic backgrounds is an important parameter.

Effect of School-Related Other Factors on the Achievement Differences

Many studies have been carried out on the relationship of many factors such as the amount of expenditure per student in schools, accountability mechanisms in schools, number of students in classes, weekly course hours and teacher training with the student achievements.

In a study examining student achievement and expenditures per student over a 25-year period in OECD countries, it was shown that the large increases in student expenditures did not reflect the student achievement at the same ratio (Gundlach, Woessmann and Gmelin, 2001). Woessmann (2016) also showed that the effect of school expenditure on student achievement is relatively small. However, it is pointed out that when the resources are allocated correctly to prioritize the places where they are needed the most, they cause a significant difference in educational outcomes (Darling-Hammond, 2014). It has also been shown that there is a strong relationship between the national achievement level of a country and the level of allocating more resources to schools serving socioeconomically disadvantaged students (OECD, 2013). These results indicate the importance of how efficiently they are used rather than the amount of resources. Here, the interaction between the factors affecting the outcome comes to the fore. For example, resources are used more efficiently in Finland, where the selection and training of teachers is based on a very strong system (Ammermüller, 2004).

School autonomy is also one of the topics examined in terms of its effects on student achievement. In school systems, exit exams are associated with accountability, as well as school management capacities. In this context, significant positive interaction was found between changes in school autonomy and exit exams (Hanushek, Link and Woessmann, 2013). In addition, it has been shown that higher student achievement can be achieved as the quality of management in schools increases (Bloom et al., 2015).

Although countries prefer to reduce the number of students in the classroom in order to improve the quality of education in the classroom and to better meet the needs of the students, PISA findings indicate that the smaller class size is not associated with higher achievement (Ehrenberg et al., 2001). Conversely, as the number of students in the class increases, student achievement has been shown to increase (Woessmann, 2016). In a study conducted by Altinok and Kingdom (2012) over 47 countries, only 14 countries have shown that class size has an effect, but this effect is mostly small. It has been shown that low class size can only be beneficial in countries with relatively low teacher quality (Woessmann, 2005).

Weekly instruction hours and teacher education indicators have been shown to be positively associated with student achievement (Woessmann, 2016). Lavy (2015) showed that the instruction time has a significant positive effect on student achievement. In a study carried out by Andrietti (2015) for the 8th and 9th grades specific to Germany, an hourly increase in the weekly instruction hour led to a significant improvement in student achievement. Course duration has also been shown to be positively associated with the integration of immigrant students (Schneeweis, 2011). Although the number of books at home is positively associated with student achievement, the difference in achievement is shown to be lower among students who have different numbers of books in their homes when the class duration is increased (Ammermueller, 2013). Similarly, participation in early childhood education has been shown to be associated with lower socioeconomic gradients and better integration of immigrant students (Schneeweis, 2011; Schütz, Ursprung and Woessmann, 2008). Therefore, the weekly instruction hour has a positive effect on the achievement of students who come from disadvantaged backgrounds and on the integration of immigrant students, which stand out in international achievement differences.

Discussion and Policy Suggestions

Education is an area where there is intense debate all around the world and where satisfaction is relatively low. Countries are working hard to improve the quality of their education systems and meet their societies' expectations. While countries make their own monitoring and evaluation to measure the performance of their education systems, they also participate in international student achievement monitoring studies. In this context, PISA researches, conducted in three-year cycles and evaluating how ready students aged 15 are in the expectations of the modern society, have been one of the most important indicators of the educational performance of the countries. When PISA results are announced, intense discussions about education systems continue in countries, and pressure on policy makers is increasing. Despite discussions about the limitations of the context of PISA research, its validity and the impact of cultural differences on the results, revisions are made in education systems to succeed in PISA research in most countries.

It is seen that many factors are effective in student achievement of countries. While some of these factors are effective in one country, they may not have a significant impact on the outcome in another country. They may even have a negative effect. This indicates that both the interactions between the factors affecting the educational output and their impacts on the output have a nonlinear relationship. However, there are also main factors affecting the performance of the education systems regardless of the cultural differences of the countries. These factors stand out as teacher quality, delaying school tracking and providing a longer comprehensive schooling, and allocating resources according to the needs of schools to provide equal learning environments in schools. All of these three factors are the internal parameters of the education system and they are also the most effective factors in reducing the negative effects of external factors. While other factors may have positive effects in education systems where all three factors are strong, they cannot make a significant contribution to student achievement in systems where these three factors are weak.

Teacher quality is the most important factor that determines the performance of education systems. Carefully selected and well-trained teachers are critical to the success of schools. In education systems where teacher selection is weak and quality lacks a minimum level, it is quite difficult for investments made in education to give the expected output or for improvements made in different areas to become widespread in the system. Qualified teachers directly affect the efficiency of the investments in schools (Sahlberg, 2011; Darling-Hammond, 2014; Darling-Hammond et al., 2017). On the other hand, access of students with low socioeconomic background to quality teachers is of great importance in reducing student achievement differences in countries. Access to quality teachers has a much more critical function, especially in countries where pre-school education is not strong or access is limited, or in countries where other mechanisms to reduce social inequality are not implemented (Akiba, LeTendre and Scribner, 2007). Therefore, building some strong mechanisms that will ensure continuity in the professional development of teachers as lifelong learners, and on the other hand, increasing the mobility of teachers between schools in certain periods will provide a relatively fair distribution of experienced and qualified teachers among schools (OECD, 2018). This will also increase the professional development and experience of teachers in the country, as well as increase the flow of knowledge and experience sharing across the education system through teachers.

Considering the augmenting negative impact of socioeconomic status of families on student achievement by an early school tracking, both factors serve as the main factors in the growth of student achievement differences in countries (Ozer and Perc, 2020). This finding is also reflected in the PISA results. It is seen that countries adopt the comprehensive school approach, delay the tracking age and give all students the opportunity to receive education in the same curriculum until the tracking in order to reduce this out-of-school effects and increase the chance of compensating them. In PISA studies, it is seen that one of the main factors behind the success of Finland, which stands out in terms of both its place in the ranking and the difference in achievement and therefore equal opportunities in education, was the comprehensive school reform in 1970s (Pekkarinen, Uusitalo and Pekkala, 2006). With this reform, the school tracking age was increased from 11 to 16 and all students up to the age of 16 are provided with the same curriculum. In Finland, comprehensive schools supported by strong teachers have been able to minimize the impact of family socioeconomic status or background on student achievement (Sahlberg, 2011). In addition to Finland, most of high performing countries in PISA offer education opportunities to students with the same curriculum until upper secondary school level (Darling-Hammond, 2014).

The performance of education systems is evaluated in the context of equality in education and opportunity. Not only factors related to school and education system but also external factors affect student achievement. In all countries, the socioeconomic status and education levels of families differ. It is known that the socioeconomic status and education level of families are determining factors in the academic achievement of students, especially in the first stages of education. Therefore, it is seen that for the school tracking according to academic achievement, delaying tracking age and the implementation of a common curriculum in all schools until this age are a common approach adopted by countries to mitigate the effects of non-school factors (Ozer and Perc, 2020). This approach also reduces the differences in achievement between schools.

Similarly, although the resources allocated per student in education have been shown to have a small impact on international student achievement, it is known that especially investments in disadvantaged and needy schools have an important effect on student achievement and have an important function in reducing the achievement differences between schools. However, in this study, the transfer of resources to disadvantaged schools is not intended just the financial resources allocated per student to improve the learning environment. In addition to this,

positive discrimination in the appointment of more qualified and more experienced teachers and school administrators in disadvantaged schools are also meant.

The most important issue with the potential to reduce false inferences based on PISA is national monitoring researches. It enables countries to conduct their own national monitoring studies for student achievement, and to identify and compare their relationship with international research results. Thus, countries will be able to conduct their own student achievement research every year without waiting for three or four year cycles as in international research, take measures for improvement based on the findings obtained, and will soon be able to monitor their results.

Finally, while countries explore the background of their status in PISA research and their performance relative to different countries, the focus is often on how high performing countries achieve this. In this case, the effects of cultural differences on the outcome or the risk of a mechanism working in different cultures and social contexts does not perform the same in other countries may be neglected. On the other hand, situations where the characteristics of factors relate with student achievement are uncertain whether it is only correlation or causal lead to develop wrong policies. In this case, both the efficiency of the revisions and resources decrease and motivations of the main actors of the education systems, which are constantly revised, are negatively affected. Therefore, it is very important for countries to establish their own national evaluation systems in evaluating the performance of education systems and to look at education as a whole. Establishing national evaluation systems at international standards and evaluating international student achievement researches related to this system will contribute to more realistic policies and more efficient use of resources in the continuous improvement of countries' education systems.

References

Adams, R. J. (2003). Response to “Cautions on OECD’s recent educational survey (PISA)”. Oxford Review of Education, 29(3), 377-389.

Akiba, M., LeTendre, G.K., & Scribner, J.P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. Educational Researcher, 36(7), 369-387.

Altinok, A., & Kingdom, G. (2012). New evidence on class size effects: A pupil fixed effects approach. Oxford Bulletin of Economics and Statistics, 74(2), 203-234.

Ammermüller, A. (2004), PISA: What makes the Difference? Explaining the Gap in PISA Test Scores

between Finland and Germany. ZEW Discussion Paper No.04-44.

Ammermüller, A. (2013). Institutional features of schooling systems and educational inequality: Cross-country evidence from PIRLS and PISA. German Economic Review, 14(2), 190-213.

Andrietti, V. (2015). The causal effects of increased learning intensity on student achievement: Evidence from a natural experiment. Working Paper, Economic Series 15-06. Universidad Carlos III de Madrid.

Araujo, L., Saltelli, A., & Schnepf, S. (2017). Do PISA data justify PISA-based education policy? International Journal of Comparative Education and Development, 19(1), 1-17.

Barber, M., & Mourshed, M. (2007). How the world's best performing schools systems come out on top. McKinsey & Company.

Bloom, N., Lemos, R., Sadun, R., & Van Reenen, J. (2015). Does management matter in schools? Economic Journal, 125(584), 647-674.

Bol, T., & Van de Wefhorst, H.G. (2013a). The measurement of tracking, vocational orientation, and standardization of educational systems: A comparative approach. GINI Discussion Paper 81:1-42.

Brunello, G. (2004). Stratified or comprehensive? Some economic considerations on the design of secondary education. CESifo DICE Report 4:7-10.

Burroughs, N.A., & Plucker, J.A. (2014). Excellence gaps. In J.A. Plucker & C.M. Callahan (Eds.). Critical issues and practices in gifted education: What the research says (2nd ed., pp. 255-265). Waco, TX: Profrock Press.

Darling-Hammond, L., & Sykes, G. (2003). Wanted: A national teacher supply policy for education: The right way to meet the “highly qualified teacher” challenge. Education Policy Analysis Archives, 11(3), 1-53.

Darling-Hammond, L. (2006). Securing the right to learn: Policy and practice for powerful teaching and learning. Educational Researcher, 35(7), 13-24.

Darling-Hammond, L. (2014). What can PISA tell us about U.S. education policy? New England Journal of Public Policy, 26(1), 1-14.

Darling-Hammond, L., Burns, D., Campell, C. & et al. (2017). Empowered educators: How high-performing systems shape teaching quality around the World. San Francisco: Jossey-Bass.

DFID (2011). National and international assessments of student achievement. Guidance note: A DFID Practice Paper. Retrieved from https://www.gov.uk/government/publications/national-and-international-assessments-of-student-achievement-guidance-note-a-dfid-practice-paper

Ehrenberg, R., Brewer, D., Gamoran, A., & Willm, D. (2001). Class size and student achievement. Psychological Science in the Public Interest, 2(1), 1-30.

Goldstein, H. (2004). International comparisons of student attainment: Some issues arising from the PISA study. Assessment in Education, 11(3), 319-330.

Gundlach, E., Woessmann, L., & Gmelin, J. (2001). The decline of schooling productivity in OECD countries. Economic Journal, 111(471), C135-C47.

Gür, B.S., Çelik, Z., & Özoğlu, M. (2012). Policy option for Turkey: A critique of the interpretation and utilization of PISA results in Turkey. Journal of Education Policy, 27(1), 1-21.

Hanushek, E.A., & Woessmann, L. (2006). Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries. Economic Journal, 116(510), C63-C76.

Hanushek, E.A., & Woessmann, L. (2012). Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation. Journal of Economic Growth, 17, 267-321.

Hanushek, E.A., Link, S., & Woessmann, L. (2013). Does school autonomy make sense everywhere? Panel estimates from PISA. Journal of Development Economics, 104, 212-232.

Hanushek, E.A., Peterson, P.E., & Woessmann, L. (2013). Endangering prosperity: A global view of the American school. Washington DC: Brookings Institution Press.

Hanushek, E.A., & Woessmann, L. (2015). Universal basic skills: What countries stand to gain. Paris: OECD Publishing.

Harris, A., & Zhao, Y. (2015). Should the PISA be saved? The Washington Post. Retrieved from http://www.washingtonpost.com/blogs/answer- sheet/wp/2015/04/19/pisas-potentially-dangerous-problems-and-what-to-do- about-them.

Horn, D. (2009). Age of selection counts: A cross-country analysis of educational institutions. Educational Research and Evaluation, 15(4), 343-366.

Jacobs, B., & Wolbers, M. H. J. (2018). Inequality in top performance: An examination of cross-country variation in excellence gaps across different levels of parental socioeconomic status. Educational Research and Evaluation, 24(1-2), 68-87.

Lavy, V. (2015). Do differences in schools' instruction time explain international achievement gaps? Evidence from developed and developing countries. Economic Journal, 125(588), F397-F424.

Marks, G.N. (2005). Cross-national differences and accounting for social class inequalities in education. International Sociology, 20(4), 483-505.

Marks, G.N. (2006). Are between-and within-school differences in student performance largely due to socioeconomic background? Evidence from 30 countries. Educational Research, 48(1), 21-40.

Meyer, H., Lori, A., Ball, S. J., Barber, M., Beckett, L., Berardi, J., … Zhao, Y. (2014). OECD and PISA tests are damaging education worldwide – academics. The Guardian. Retrieved from http://www.theguardian.com/education/2014/may/06/oecd-pisa-tests- damaging-education-academics.

MoNE (2019). PISA 2018 Turkey report. Education Analysis and Evaluation Report Series No.10. Ankara: Ministry of National Education Publishing.

NESC (2012). Understanding PISA and what it tells us about educational standards in Ireland. National Economic & Social Council.

OECD (2013). PISA 2012 results in focus: What fifteen-year-olds know and what they can do with what they know. Paris: OECD Publishing.

OECD (2018). Effective teacher policies: Insights from PISA. Paris: OECD Publishing.

OECD (2019). PISA 2018 results (Volume I): What students know and can do. Paris: OECD Publishing.

Ozer, M., & Perc, M. (2020). Dreams and realities of school tracking and vocational education. Palgrave Communications, 6, 34.

Pekkarinen, T., Uusitalo, R., & Pekkala, S. (2006). Education policy and intergenerational income mobility: Evidence from the Finnish comprehensive school reform. IZA Discussion Paper 2204, Institute for the Study of Labor, Bonn.

Prais, S.J. (2003). Cautions on OECD's recent educational survey (PISA). Oxford Review of Education, 29(2), 139-163.

Rivkin, S., Hanushek, E., & Kain, J. (2005). Teachers, schools and academic achievement. Econometrics, 73(2), 417-458.

Reichelt, M., Collischon, M., & Eberl, A. (2019). School tracking and its role in social reproduction: Reinforcing educational inheritance and the direct effects of social origin. The British Journal of Sociology, 70(4), 1-26.

Roemer, J.E. (1998). Equality of opportunity. Cambridge: Harvard University Press.

Sahlberg, P. (2011). PISA in Finland: An education miracle or an obstacle to change? C.E.P.S Journal, 1(3), 119-140.

Schneeweis, N. (2011). Educational institutions and the integration of migrants. Journal of Population Economics, 24(4), 1281-1308.

Schütz, G., Ursprung, H.W., & Woessmann, L. (2008). Education policy and equality of opportunity. Kyklos, 61(2), 279-308.

Takayama, K., Waldow, F., & Sung, Y.K. (2013). Finland has it all? Examining the media accentuation of 'Finnish education' in Australia, Germany, and South Korea. Research in Comparative and International Education, 8, 307-325.

Takayama, K. (2015). Has PISA helped or hindered? Reflections on the ongoing PISA debate. THF Lecture Series. The HEAD Foundation.

Trohler, D. (2013). The OECD and Cold War culture: Thinking historically about PISA. In H. Meyer & A. Benavot (eds.) PISA, power, and policy: The emergence of global educational governance (pp. 141-161). Oxford, UK: Symposium Books.

Woessmann, L. (2005). Educational production in Europe. Economic Policy, 20(43), 446-504.

Woessmann, L. (2009). International evidence on school tracking: A review. CESifo DICE Report, 1, 26-34.

Woessmann, L. (2014). The economic case for education. EENEE Analytical Report 20, EENEE, Institute and University of Munich.

Woessmann, L. (2016). The importance of school systems: Evidence from international differences in student achievement. Journal of Economic Perspectives, 30(3), 3-32.

Zimmer, R. (2003) A new twist in the educational tracking debate. Economics of Education Review, 22(3), 307-315.

Bolatlı, Z. & Korucu, AG. (2020). Determining the academic achievement of students who use flipped classroom method supported by a mobile application and their views on collaborative learning. *Bartın University Journal of Faculty of Education*, 9(2), 229-251.

Bartın UniversityJournal of Faculty of Education, 9(2), 229-251

buefad.bartin.edu.tr

Determining the Academic Achievement of Students Who Use Flipped Classroom Method Supported by a Mobile Application and Their Views on Collaborative Learning

Zafer BOLATLI[*a], Agah Tuğrul KORUCU[b]

Article Info

DOI: 10.14686/buefad.631835

Article History:
Received: 10.10.2019
Accepted: 10.12.2019
Published: 05.06.2020

Keywords:
Mobile Learning,
Flipped Classroom,
Blended Learning,
Collaborative learning.

Article Type:
Research article

Abstract

In our study, a flipped classroom method supported by a mobile application was prepared, and students' opinions about collaborative learning were evaluated along with its effect on their academic achievement. In the quantitative research section of this research, a semi - experimental pattern model with pre-test and post-test control group was used for the academic success variable. The population of the study consisted of 48 randomly selected and 48 control group students from the Sancak Secondary School affiliated to the National Education Directorate in the Selcuklu district of Konya province. According to the results of the research, it is that the academic success of the students who utilized the flipped classroom method supported by the mobile application increased, compared with the students who took the traditional -learning method, and this was found statistically significant. In addition, it has been observed that the students' prejudice to mathematics has been removed; they had fun in the process; they liked the lesson and they took an active role thanks to the mobile-supported FCM (Flipped Classroom Method). It is also seen that blending FCM and Collaborative Learning method increased the students' interest, motivation, participation in the class and their sympathy.

Mobil Uygulama ile Desteklenmiş Ters-Yüz Öğretim Ortamını Kullanan Öğrencilerin Akademik Başarılarının ve İşbirlikli Öğrenmeye Yönelik Görüşlerinin İncelenmesi

Makale Bilgisi

DOI: 10.14686/buefad.631835

Makale Geçmişi:
Geliş: 10.10.2019
Kabul: 10.12.2019
Yayın: 05.06.2020

Anahtar Kelimeler:
Mobil Öğrenme,
Flipped Classroom,
İşbirlikli Öğrenme,
Harmanlanmış Öğrenme.

Makale Türü:
Araştırma Makalesi

Öz

Araştırmamızda mobil uygulama ile desteklenmiş ters-yüz öğrenme ortamı hazırlanmış ve öğrencilerin akademik başarısına etkisiyle birlikte işbirlikli öğrenmeye ilişkin görüşleri değerlendirilmiştir. Bu araştırmanın nicel araştırma bölümünde akademik başarı değişkeni için "Ön Test – Son Test Kontrol Gruplu Yarı Deneysel Desen Modeli" kullanılmıştır. Araştırmanın evrenini Konya ili Selçuklu ilçesindeki Milli Eğitim Müdürlüğüne bağlı Sancak Ortaokulu'ndan rastgele seçilmiş 48 deney ve 48 kontrol grubu öğrencileri oluşturmaktadır. Yapılan araştırma ve bulgulara göre, mobil uygulama ile desteklenmiş ters-yüz öğrenme ortamının işbirlikli öğrenmeyle yapan öğrencilerin, geleneksel öğretim ortamı ile ders gören öğrencilere oranla akademik başarısının arttığı görülmüş ve istatiksel olarak anlamlı bulunmuştur. Ayrıca, mobil destekli TYÖO (Ters-yüz Öğretim Ortamı) sayesinde öğrencilerin matematik dersine olan ön yargısının kalktığı, süreçte eğlendikleri, dersi sevdikleri ve aktif rol aldıkları gözlemlenmiştir. Bir başka bulguda ise, TYÖO ile İşbirlikli öğrenme ortamının harmanlanması öğrencilerin derse olan ilgisini, motivasyonunu, derse katılımını ve sevgisini arttırdığı tespit edilmiştir. Kullanılan yöntemin deney grubu öğrencilerinin akademik başarısına da pozitif yönde etki ettiği görülmüştür.

[*] **Corresponding Author:** zaferbolatli@gmail.com
[a] Graduate Student, Necmettin Erbakan University, Konya/Turkey, https://orcid.org/0000-0003-1259-6211
[b] Assoc. Prof. Dr., Necmettin Erbakan University, Konya/Turkey, https://orcid.org/0000-0002-8334-1526

Introduction

Developments in science and technology are forcing all areas from economy to health, from art to literature to go through important changes. They in turn lead to changes in the structure of societies and acceleration in other developments. Therefore, these changes reveal the necessity to change the education and training institutions (Kocabatmaz, 2016:14). In today's educational system, it is requested that students go to the centers or instituions rather than to teachers. The behaviorist approaches used in TLM (Traditional Learning Method) are gradually shifted to the constructivist approach (Yıldız, Sarsar & Çobanoğlu, 2016: 187). In addition, the use of many different models and methods to synthesize the information has become important. This has led to the idea that in order to better educate students, practical training should be carried out in a broader period of time (Kocabatmaz, 2016: 14; Yıldız et al., 2016: 187).

Communication has recently introduced the concept of smart mobile devices with the development of computer and telephone technologies. The literary meaning of the word mobile originating from *Mobile* in French is movable and portable (Çakır & Arslan, 2013: 25). With personal smart mobile devices, people have recognized the possibilities of managing audio files, images, information and storage. These tools allow people to share the data with others at any time (Sharples, Corlett & Westmancott, 2002: 220). With mobile devices dating back to the 1970s, learning was carried out in and out of classrooms in the school environment with portable light vehicles such as laptops, tablets, palmtop computers and smartphones (Gökçearslan, Solmaz & Kukul, 2017: 146). ML (Mobile Learning) is defined as a teaching model that enables mobile communication and e-learning areas to access the content in a mobile application as a result of blending together, to benefit from dynamically developed services and to make communication with other people in the learning environment as much as possible without being dependent on time and place (Özcan, 2008: 1).

Many applications have been developed to increase the availability of mobile devices and for commercial purposes. Thanks to these applications, access to information can be provided directly or via the Internet without being dependent on time or a learning method (Tanrıverdi, 2011: 1). Although the features of mobile smart phones such as their small screen size, lack of battery times, low data and memory capacity may limit the use of these devices in learning activities, mobile phones can help with learning through designs suitable for the learning method thanks to their features such as portability and fast communication. Student-centered mobile applications increase academic success (Tanrıverdi, 2011: 1).

Collaborative and communicative skills enabled individuals to develop media and technology literacy, to improve 21st century skills (problem solving, critical thinking, creativity, design, social-cultural skills), to learn how to learn and to make self-assessment (Yıldız et al., 2017: 77). In order for these skills to be developed by the learners, learning-based education is required by multiplying these activities in the classroom. For this reason, active participation of FCM students is necessary. FCM has been preferred in accordance with the constructivist teaching approach since 2000 (Yıldız et al., 2017: 77).

By completely reversing the TLM, FCM makes it possible for students to learn the course material presented during classes and then loaded into the electronic environment regardless of the setting (Moreno, 2004). In the course of the school hours, the course aims to deepen and strengthen the learning by discussing the subject and making reinforcement examples. In short, this method is the opposite of the TLM (Figure-1). As TLM is known, the teacher first lectures in the classroom, while the student is only seen as a passive listener. Homework is given to students to reinforce the subjects lectured. In this process, it is assumed that students will reach up to the first two steps of the Bloom taxonomy, which are recollection and comprehension (Figure 1) (Kara, 2016b: 13). After in-class teaching, students are asked to apply the applications of Bloom taxonomy to more complex and difficult upper steps as homework (Figure 2). FCM students are relatively easy to remember and understand the steps of listening to the course they do at home by themselves. Other difficult and complex upper-level activities are provided by teachers in a classroom setting through active learning methods (Figure 2) (Kara, 2016a: 13).

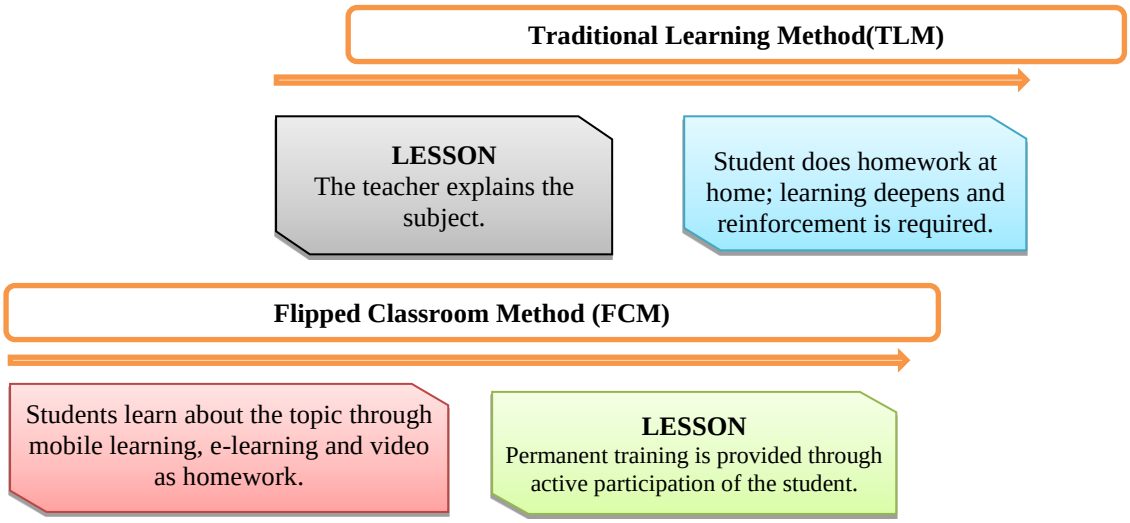


Figure 1. Temporary "TLM" vs. "FCM" (Kara, 2016a:13)

FCM has taken this name because it has displaced the stages of the course of TLM. In summary, this can be defined as completing the lesson at home and doing homework in school. If the definition of FCM is made in terms of education, it is the method in which classroom activities are applied outside the school and all activities in the classroom are applied in the active learning process (Kara, 2016a: 13).

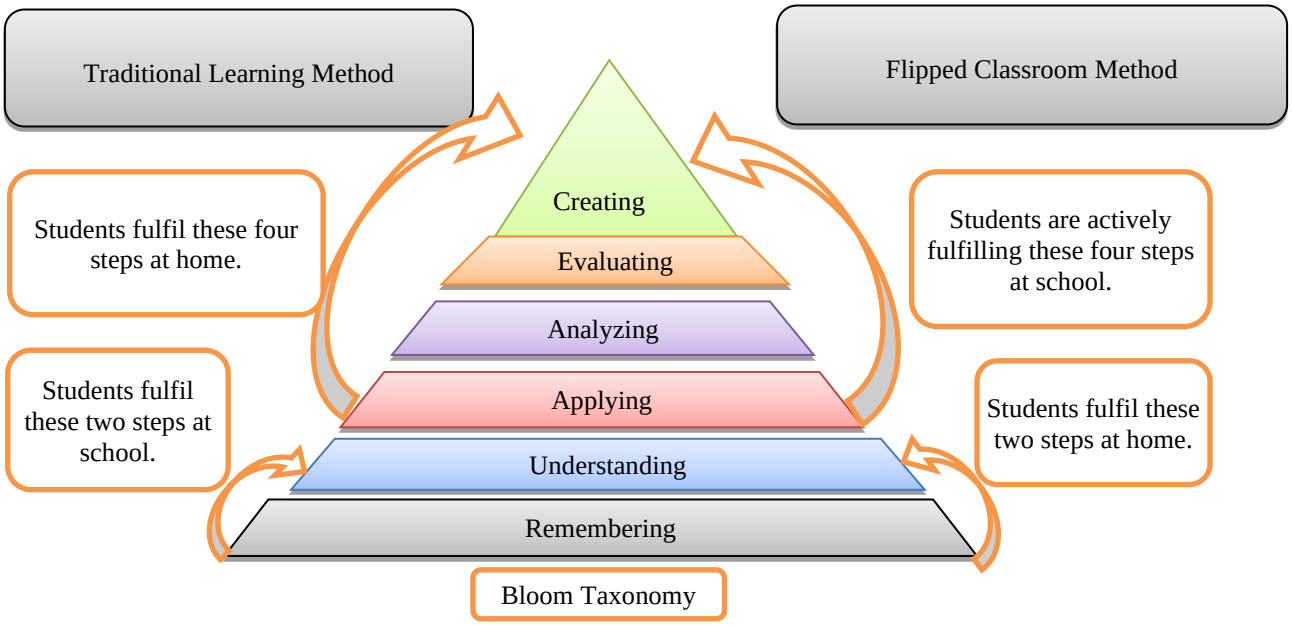


Figure 2. The demonstration of "FCM" vs. "TLM" in the Bloom taxonomy model.

The Flipped Classroom application does not have a uniform shape or model. FCM is a method of transition from teaching at a teacher-centered setting to an active and collaborative learning method centered on students and

learners. Therefore, FCM can be applied with different tools and materials in accordance with the need. (Kara, 2016a).

One of the most important advantages of flipped classroom application in this field is the tendency to interact between the teacher and the student (Artino, 2008). In FCM, students complete their teaching in the center and under the guidance of the teacher in the active learning environment. However, in a traditional setting, the teacher only plays the role of imparting the subject. In the FCM system, the student-teacher interaction is naturally increasing. This process also facilitates the feedback from the instructor (Figure 2) (Kara, 2016b: 13).

Some of the researchers found that students had a negative view of the FCM in their research, which compared the traditional teaching method with the FCM. Doğan (2015), who reported that participants had negative experiences regarding the flipped classroom approach, had positive experiences regarding a pilot study, suggesting that these participants may have prejudices against the flipped classroom approach (Doğan, 2015: 45; Turan & Yüksel 2015: 163). There are also opinions and bodies of research suggesting that the FCM system is positive. It is stated by Ekmekçi (2014) that the FCM yielded positive and positive results on students (Ekmekçi, 2014: 144).

Mobile applications play important roles in blended education model. In a study by Torun and Dargut (2015), it suggested that the learners are willing to use ML, and that the communication between the teacher and students, as well as the one between students, is strengthened. It is observed that ML contributes not only to the positive development of students' academic achievement but also to the development of knowledge and socio-cultural development (Torun & Dargut, 2015: 27).

The failure to design a good learning method leads to the failure to benefit from the FCM method. In our research, it is thought that a FCM learning method with a mobile application will be effective in line with field research. With this study, an example of the basic logic of FCM has been created to use ML environments in teaching mathematics, and students' opinions about this environment have been collected. In this context, the subject of the study was presented to the students in a blended format of the new learning methods, which are mobile learning and flipped classroom learning method. Students received theoretical information in their homes through the pre-prepared mobile application on video, flash card, pill information etc. In the school, the deficiencies were tried to be solved by individual and group studies under the guidance of teachers.

The aim of this study is to develop different learning methods in teaching mathematics because of the low academic achievement of students, their negative attitude towards the course, their low motivation and difficulty in mathematics. As all over the world, new developments have occurred in Turkey in the field of educational technology. These developments have created new teaching models in the field of teaching. The most important feature of the flipped classroom (Flipped, Homework at Home Course), which is named differently in the literature, is to enable the students to move away from the traditional learning method in which they are just listeners in a passive position. It is seen in field research that students have developed their problem-solving skills and collaborative learning skills significantly through this method.

The aim of the study is to examine the effects of flipped classroom method supported by a mobile application on students' achievement and their opinions on collaborative learning. In this context, the answers to the following research questions were sought;

1. Is there a significant difference between students' academic achievements when comparing the traditional learning method with the mobile application and the Flipped Classroom Method?
2. What do students think about the methods used in the flipped classroom method supported by a mobile application developed and the course applied?
   a. What are the views of students about mathematics lesson and what is the level of their interest in the course?
   b. What are the views of students about collaborative learning?
   c. What are the views of students about the use and applicability of the Flipped Classroom Method supported by a mobile application?

Method

Qualitative and quantitative data were used in the research. The effectiveness of qualitative data analysis in the process of describing and explaining the increasing reputation and social reality in the academic environment has led to a significant increase in the number of studies conducted in this area. It has not been possible to develop a common language in qualitative research which has been done in recent years in qualitative data analysis. Therefore, it is possible to see different analysis methods and techniques in data analysis (Dey, 1993; Özdemir, 2010).

The most appropriate method within the scope of our research subject is considered as the mixed research method. In the quantitative research section of this study, the semi-experimental pattern model with pre-test – post-test control groups was used for the academic achievement variable (Campbell & Stanley, 1966) (Table 1). Experimental patterns are research patterns that reveal the cause-effect relationships and differences between variables. The difference between the quasi-experimental design and the experimental design is the selection of the individuals in the quasi-experimental design, control and experimental groups, rather than randomization. In order for educational research to give accurate results, semi-experimental designs are widely used because it is very difficult to make neutral assignments (Büyüköztürk et al., 2014).

Table 1. Experimental pattern

Pretest-posttest control grouped pattern			
Group	**Pretest**	**Operation**	**Posttest**
Experimental Group	T1	Mobile-assisted Flipped Classroom Method	T1
Control Group	T1	Traditional Learning Method	T1

Working group

The universe of the study was composed of students studying at Sancak Secondary School affiliated with the National Education Directorate in Selçuklu district of Konya province. For random assignment of the experimental and control groups, improved learning model is applied to randomly chosen 48 experimental group students in 7th grade by considering 2016-2017 Academic Year Mathematics lesson 1st semester grade average ($\overline{X}$ = 73.76) and students' mobile application skills and pre-test results ($\overline{X}$ = 32.19). Similarly, traditional learning method is applied to randomly selected 48 control group students in 7th grade by considering mathematics course the first semester average grade ($\overline{X}$ =74.19) and pre-test average ($\overline{X}$ =32.86) (Table 3)(Table 4).

The blended learning model was started by the researcher with 48 students for 2 weeks. However, 42 Experiment Groups and 46 Control Groups were fully involved in the process due to absenteeism and because students did not want to complete the process (Table 2). In order for the research to be neutral, the experimental and control group students were trained by the same teacher.

Table 2. Working Group Gender Distribution

Gender	**Experimental Group**		**Control Group**		**Experiment and Control Group**	
	f	%	f	%	f	%
Male	23	54,76	20	43,48	43	48,86
Female	19	45,24	26	56,52	45	51,14
Total	42	100	46	100	88	100

A comparison of the results of the academic achievement test applied to the experimental and control groups (pre-tests) (independent t-test for unrelated samples) is given in Table 3.

Table 3. Pre-Test Comparison Results Between Groups

	Groups	N	$\overline{X}$	Ss	Sd	t	p
Pre test	**Experimental Group**	42	32,19	9,46	86	-,386	,700*
	Control Group	46	32,86	6,94			

Note. p<0.05

In the preliminary tests conducted in the experimental and control groups (experimental group pre-test average = 32.19; control group pre-test average = 32.86) * p <.05 is not significant because it is .05 <p for significance level (Table 3). Similarly, the grade point averages were similar in both groups (Table 4). In other words, it was determined that both groups were roughly equal before the research.

Table 4. Comparison Results of 1st Semester GPA between Groups

Groups	N	$\overline{X}$	Ss	Sd	t	p
Experimental group	42	73,76	11,30	86	-,188	,851*
Control group	46	74,19	10,32			

Note. p<0.05

Collection Tool and Data Collection

As the data gathering tool within the scope of the study, the *"Academic Achievement Test"* and *"Collaborative Learning and Questionnaire Form",* which were examined by 4 field experts and 2 linguists, were prepared by the researchers.

Before starting the research, pre-analysis of mobile application design was made with the learning method. The existing situation and the desired situation were determined. First, expert opinion and student interviews were analyzed for the development of data collection tools. According to the result of the prepared analysis report, the application process was designed and the instructional learning method design was developed with the tools to be used during the application. During the two-week implementation process, all the stages of the research were recorded in detail with the help of video footage and student views. A rich content was obtained through the collected data. The Academic Achievement Test, which was developed by researchers and experts at the beginning and end of the application, was conducted as pre and post-test.

After the application process, semi-structured Collaborative Learning and Interview Form were developed by the researcher. Qualitative data were collected to answer the second question of the study.

Flipped Classroom Method

The data were provided by the participants before and after the experimental procedure by completing the achievement test, collaborative learning and interview form. Video recordings were taken to examine the students' behaviors. Detailed implementation plan is presented below.

Activities before the Implementation Phase

The following processes were carried out before starting the planned training environment.

- Necessary permissions were obtained from the Konya Provincial Directorate of National Education and parents before 48 students were randomly assigned to the study and control groups.
- On April 16 2017, the students were pre-tested to see their current situation. For the pre-test, the students were asked to complete the "Academic Achievement Test" and "Collaborative Learning and Questionnaire Form."

Activities in the Implementation Phase

The following processes took place after the studies to be performed before the implementation;

- As of April 17 2017, the implementation of the mobile application and the course were applied to the students for 1 week at home and for 2 weeks in the classroom. Control and experimental groups were divided into two classes as 24 individuals.
- On April 17 2017, the mobile application was pre-installed on students' phones. Information about mobile application was delivered. The students were informed about the teaching model to be applied.
- Students were given 1 week (18-25.04.2017) to study mobile application. Students were told that they must observe every section of the mobile application at home and that they could watch the videos as much as they want. They were told that, during the first week, they would spend 30 minutes a day with mobile application and that they could take short notes if they wanted. They were told that they could ask the questions they wanted in the group communication department that was created with the teacher when they had a problem at home.
- In the 2nd and 3rd weeks, the classroom stage of the reverse facial model was carried out. In this process, it was stated that smart phones might be with them.
- On April 26 2017, the students were divided into 4 groups. A total of 12 groups were formed in two classes. The dates specified in the two classes were used. Only the hours were set differently.
- It was stated that each group should have a leader and a group name.
- In-class activities prepared by the teacher between April 26 and May 3, 2017 were grouped together. Examples were distributed to groups and had them made.
- The students were given the right to speak about the parts they did not understand. The teacher tried to correct the problems.
- On May 4, 2017, the teacher organized a 20-question quiz on the subject in the classroom. The next day, they were asked to take a last look at the mobile application and ask them in the group communication section if they wanted to ask any questions.
- The traditional teaching model was also exchanged between the teachers in the normal classes.

Activities Following the Implementation Phase

The following actions were realized after the completion of the teaching process;

- The students were appreciated for their participation in the learning program for two weeks, and a semi-structured interview form prepared to evaluate the process was applied to the students.
- "Flipped Classroom Method Participation Certificate" was prepared and distributed to the students after participation.
- After the completion of the process on May 5, 2017, the students were asked to do the final test in the same way as "the Academic Success Test" and "the Collaborative Learning and the Course Discussion Form", which were conducted as the pre-test.

Mobile Application Design

The mobile application was prepared and planned by the researcher in accordance with the design principles. The pictures and contents of the mobile application were prepared as described below.

Mobile application was prepared by researchers and field experts in the site **"mobiroller"** (make your own mobile application site). Mobile application content was prepared according to the opinions of 4 field experts. In line with the basic elements of visual design, line, color, shape, balance, value and texture characteristics were compiled by the researchers. At the same time, while designing mobile applications, integrity, difference, emphasis and balance were taken into consideration in visual design principles. After the design and content of the mobile application were prepared, 10 students and 4 field experts who were teaching to the 7th grade were shown the mobile application and their opinions were received. From the warnings taken, the final form of the mobile application was given, and the experimental group was made ready for installation (Figure 3-12).

Figure 3. Mobile Application Homepage

Figure 4. Mobile Application Videos

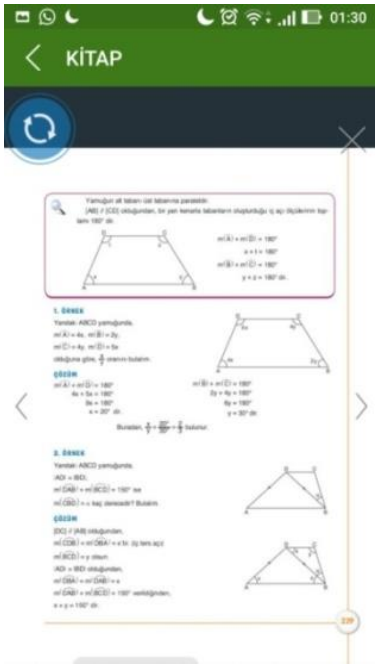


Figure 5. Mobile Application Textbook

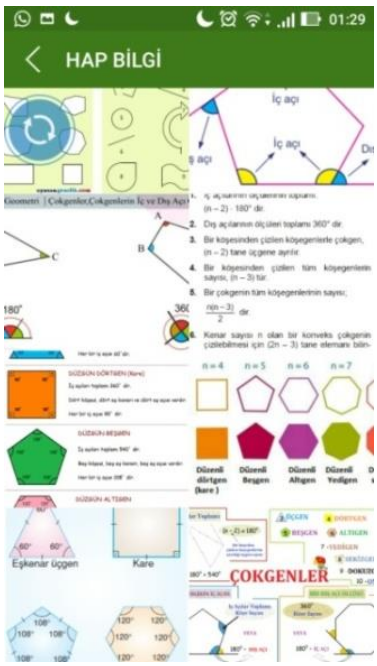


Figure 6. Information on Mobile Application Pills

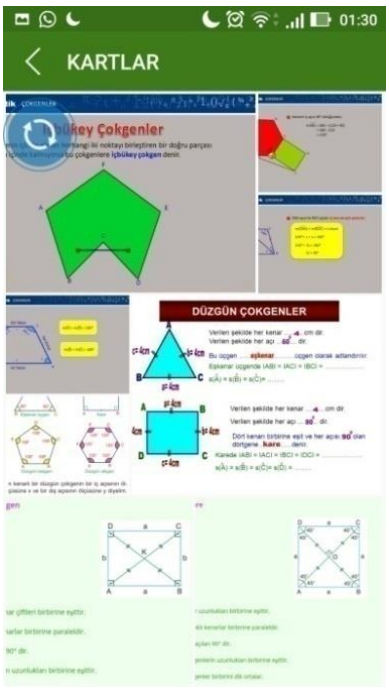


Figure 7. Mobile Application Cards

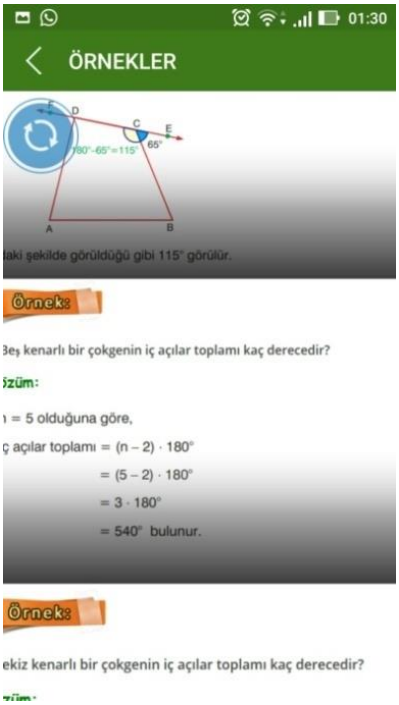


Figure 8. Mobile Application Examples

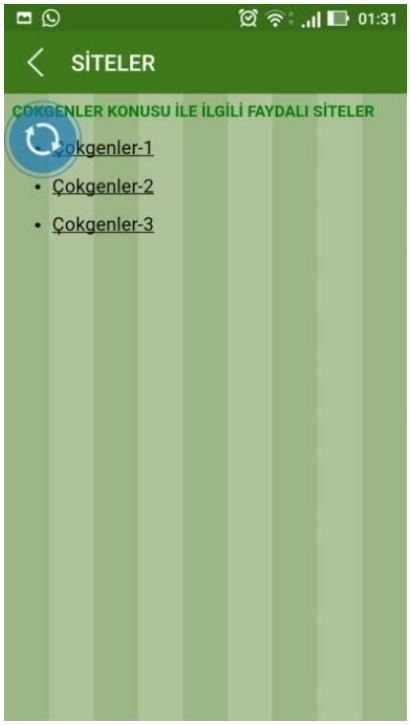


Figure 9. Mobile Application Sites

Figure 10. Mobile Application

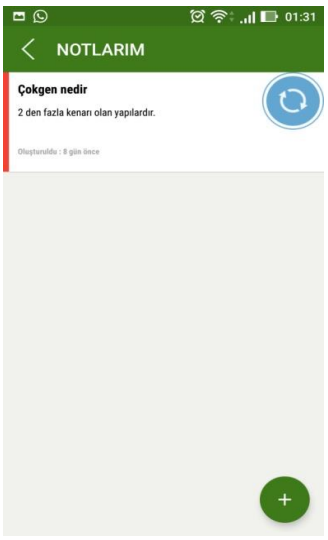


Figure 11. Mobile Application Notes

Figure 12. Mobile Application Communication

Findings

The In this part of the study, the research questions and the results of the statistical analyses performed according to the data collected from the research are presented in detail.

The experimental group students performed the tasks given in the developed classroom and so did the control group students in the traditional classroom environment. The students completed the content of the 2-week Math "Polygons" subject (4 + 4 lecture hours) within the given time period. FCM activities were conducted in an empty classroom suitable for the students to avoid problems during the learning method. Video recordings and pictures were taken to examine how the teaching process took place. In order to examine the problems and classroom behaviors of students, video recordings and "*Collaborative Learning and Questionnaire Form*" were used. After the completion of the FCM activities, students were asked to complete the semi-structured "*Collaborative Learning and Questionnaire Form."* Students were asked about their opinions regarding the process during video recording. General thoughts about the learning method developed during video recording were asked and recorded. As a result of the semi-structured interview form, academic achievement test and video recordings, the students were coded as follows when the findings were given.

EG: Experimental Group, **CG:** Control Group.

Is there a significant difference between the students' academic achievements when compared with the traditional learning method and the Flipped Classroom Method supported by the mobile application?

The level of significance between the students using the flipped classroom and the students' academic achievement was examined.

Experiment group pre-test - posttest comparison (Paired t test)

As a result of the application, the results of the comparison of the pre-test and post-test to determine the academic development status of the experimental group students are given in Table 5.

Table 5. Experimental Group Pre-Test-Final Test Comparison Results

	Test	N	$\overline{X}$	Ss	Sd	t	p
Experimental Group	Pre-test	42	32,19	9,46	41	22,049	**.000**
	Post-test	42	83,52	10,28			

* p<0.05

There was a statistically significant difference (p <0.05) between the pre-test and post-test scores (pre-test average $\overline{X}$ = 32.19; final test average $\overline{X}$ = 83.52). It was determined that the experimental group students increased their academic achievement as a result of the application they participated in with the flipped classroom method (Table 5).

Control group pre-test – post-test comparison (Paired t test)

As a result of the application, the results of the comparison of the pre-test and the post-tests to reveal the academic status of the control group students are given in Table 6.

Table 6. Control Group Pre-Test-Final Test Comparison Results

	Test	**N**	$\overline{X}$	**Ss**	**Sd**	**t**	**p**
Control Group	Pre-test	46	32,86	6,94	45	32,079	**.000**
	Post-test	46	55,91	14,71			

Note. p<0.05

There was a statistically significant difference between the control group pre-test post-test scores (pre-test average $\overline{X}$ = 32,86; final test $\overline{X}$ = 55,91) for the statistical significance * p <.05 (p <0.05). A significant difference was found in the academic achievement of the control group students (Table 6).

Experiment and control group posttest comparison (Independent t test)

The results obtained from the students using the inverted learning method (experimental group) and those who received traditional learning method (control group) compared to their "academic achievement" are given in Table 7.

Table 7. Between Groups (Experiment - Control Group) Final Test Comparison (T - Test) Results

Groups		**N**	$\overline{X}$	**S**	**Sd**	**t**	**p**
Post-test	Experimental Group	42	83,52	10,28	86	10,112	**.000**
	Control group	46	55,91	14,71			

Note. p<0.05

In post-treatment tests, there was a significant difference in favor of the experimental group, since * p <.05 was 0.00 <.05 for the final test. In the final tests (EG posttest average test $\overline{X}$ = 83,52; CG posttest average test $\overline{X}$ = 55,91), the posttest scores of the experimental group were found to be higher than the posttest scores of the control group (Table 7). This result shows that the application was in favor of the experimental group. The effect of the mean difference between the experimental group and the control group was examined for the neutrality of the results. In the calculations, Cohen's d value was 2,176. The effect size (r) was calculated as 0.736.

What did the students think about the methods used in the flipped classroom method supported by the mobile application developed and the course applied?

The methods used in the learning method and the views of the students about the teaching of the course were investigated. In this context, the answers to the three research questions were sought.

1. What are the views of students about mathematics lesson and their interest in the course?

The students were asked about the benefits of the learning method and the changes in their interest in the course. The students used the expressions that FCM and the mathematics courses were prevented from being boring. In addition, the students stated that their prejudices in the teaching of difficult mathematics lessons with FCM were removed and their interest in the lesson increased. Some of the students expressed that they liked mathematics lessons with this method.

In the research, students were asked about *"the benefits of the learning environment related to the mathematics course and the changes in their interest in the course".* Most of the experimental group students responded positively to this research question. The students stated that the flipped classroom method was fun for the math lesson. In addition, the students found this method very useful and expressed that they liked the mathematics lesson. The students stated that they had the opportunity to do a lot of repetition at home with the flipped classroom method. Thus, it is easy to learn mathematics. On the other hand, students expressing negative or abstentious stated that the new methods were good for students with a high success but not so good for students with a low success. Another negative statement was that individual study would be good rather than group work.

Table 8. Benefit rate for mathematics course

Favorable	Unfavorable	Neutral
39	1	2

According to **the video recordings,** it was observed that the students enjoyed themselves with the developed learning method. It was observed that the students were active participants throughout the course. In the course of teaching mathematics, it was found that they benefited greatly from pills and flash cards. The students stated that the prepared activities were suitable for the mathematics course. It was observed that students experiencing a negative or abstaining opinion about the method experienced unrest in the group. In the examinations, 39 students used the method; 1 student was useless and 2 students were found to have abstinence (Table 8). This situation shows that the most important factor in increasing the academic success of mathematics course with FCM is that it causes students to have fun during the course and hve a high interest in the course.

2. What are the views of students about collaborative learning?

The following findings were obtained in the experimental group students filling *"Collaborative Learning and Interview Form".*

42 students who completed the FCM process were asked through CL whether it had helped them learn the lessons better. According to Table 9 from EG, 38 students gave the answers "yes" and 4 students "no". The students who answered "Yes" were asked how it contributed to their learning. The reason for their negative answer was asked to students who gave the answer "No".

Table 9. Percentage of Students Considering Contribution to Collaborative Learning

Yes	No
38	4

The experimental group students' ideas about collaborative learning were found to be positive. The students specifically stated that they could express themselves in group work in this method. The students also stated that they were having fun in the class as they worked together with their friends. It is seen that the students benefit from this method in understanding the subject by doing activities together with their friends. Group mates correcting each other's errors have a positive effect on understanding the subject. The students who did not find cooperative learning useful were found not to be in good agreement with their friend and therefore they did not like collaborative learning.

In the research, it was determined that FCM had a significant learning effect on students through collaborative learning method and their active participation in the course.

The students were asked about the most pleasing aspects of this method in IO studies. The positive thoughts of the students were collected in 5 categories (Table 10). Some of the students liked the CL method in a few ways.

EG7 students did not make any comment. The conditions that students liked about the environment are listed in Table 11. According to the findings, 15 experimental students stated it as “asking their friends what they didn’t understand”, 11 experimental students stated as “activities and lessons at home”, 10 experimental students stated it as “Group work”, 8 experiment students stated it as “Help and Sharing” and 4 experimental students stated it as “using the phone”.

Table 10. The ratio of students' likes in collaborative learning

Group work	Activities and lessons at home	Help and sharing	Phone use	Asking friends what we don't understand
10	11	8	4	15

In the research, *what the aspects they didn’t like and the difficulties they encountered in the application of collaborative learning were* asked. In Table 11, the problems and difficulties experienced by the students are gathered in 5 categories. 26 students from the experimental group stated that they did not encounter any difficulties in the process and they easily performed the whole process. In CL with FCM, 5 of the students stated that they had problems with the negative behavior of their friends; 4 of the students replied that they disagreed with group friends. 3 students complained about “selfishness of group mates” and “Internet problems”, and 1 student stated his problem as “activities”.

Table 11. Problems experienced by students in CL

Not being able to agree with group friends	Negative behavior of our friends	Selfishness of group friends	Internet problems	Activity
4	5	3	3	1

As shown in Table 11, the individual errors made by the students during the CL process had a negative impact on the other students. However, in this study, it was determined that students did not prevent them from being successful in FCM environment. The academic success of the students who had problems in the examinations didn’t decrease.

Students were asked w*hat the changes that they see during group work were. The* general answers given by the students in Table 12 were collected in 5 categories. 6 of the experimental students stated that their participation in the class increased, 18 stated that they understood the subjects more comfortably. 5 remarked that they had increased motivation to the course. 7 stated that they had fun in group work. 3 stated that their interest in mathematics increased. Students EG7 and EG27 stated that they did not see any change in themselves.

Table 12. The Ratio of Changes That Students saw in Themselves Through CL

Active participation increase	Easy to understand topics	Motivation increase	Fun group work	Increased interest in mathematics
6	18	5	7	3

Students were asked h*ow they evaluated face-to-face communication with their group friends during the implementation of the method.* The answers of the students were collected in 3 categories (Table 13). Students are divided into three groups; those who saw the communication with their group friends as good, the ones who saw the communication with their group friends as bad, and the ones who generally saw the communication with their group friends as good although they had some problems.33 students stated that they had good communication with their friends. 4 students noted they didn’t get along well and 5 students stated that they had arguments but the communication was still alright. According to the findings of the research, it was determined that the blending of

CL with FCM increased the level of communication between students themselves and between teachers and students.

Table 13. The level of communication between group colleagues in CL

Students who describe their communication with their friends as good and fun.	Students who responded as not getting well with their group friends.	Students who state that they both went well and argued occassionally.
33	4	5

Students were asked *whether there were any characteristics of their group friends that they hadn't noticed before but did so during their group work.* Students' answers were collected in two main categories. Table 14 reveals the students who noticed the difference in their friends and those who didn't. 23 students noticed a change, but 19 students did not notice any changes in their friends. Some students' answers are as follows;

Experimental group students remarked that they had noticed some personality characteristics in their friends during cooperative learning noticed. The students in the experimental group stated that their friends were entertaining, helpful and mobile addicts.

Table 14. Change in group friends during CL

During CL, students noticed a change in their friends.	During CL, students didn't notice a change in their friends.
23	19

The students were asked h*ow they had solved this problem when there were missing places that they and their group friends didn't understand.* It is seen that students resorted to one or more of the three different solutions (Table 15). When the experimental group did not understand the subject, the majority of the students stated that they asked the teacher first. The students then stated that they benefited from the mobile application and their friends. These solutions involved friends, teachers and mobile applications. 22 of the students stated that they took advantage of their friends, 34 of their teachers and 31 of mobile applications.

Table 15. Methods of assistance in CL

Friend	Teacher	Mobile App
22	37	31

Many of the students repeatedly stated that they overcame their problems with the guidance of a teacher. As it can be seen in Table 15, it was determined that the teacher was the one that the students most frequently applied to. At the same time, it was determined that most of the students' cognitive load decreased through the teacher.

Students were asked *whether they would like collaborative learning method to be used in lessons and why.* Those who said yes and those who said no are collected in two categories (Table 16). While the number of students who wanted CL to be applied in lessons is 38, the number of those who didn't want is 4. It was determined that the combined use of FCM and CL environment increased the willingness of the students for CL method to be applied in the courses.

Table 16. Ratio of CL method to be applied in courses

willing	unwilling
38	4

The experimental group students stated that they had a good time thanks to the CL method; they benefited from their friends' knowledge and learned easily thanks to their group friends. On the other hand, students who thought negatively about CL stated that they could not get along well with their group friends.

The students were asked w*hat should be considered to ensure the efficiency of group work and what they recommended.* The experimental group students suggested that the choice of their group friends should be done

by the student himself, that each student should have a task within the group and that there should be silence in the group during the solution of the questions.

3. What are the views of students about the use and applicability of the Flipped Classroom Method supported by mobile application?

The students were asked about their positive and negative thoughts about the developed Flipped Classroom Method. The experimental group students said that the videos were simple to understand and easy to work at home. It was also very reasonable to do homework at school because the students stated that there were many people to ask for help about the points they didn't understand while at school. It was seen that the students had fun in the implementation of this method. It should be noted that the mobile application contains a lot of information about the subject and that students are efficiently learning the subject. On the other hand, the experimental group students who revealed negative opinions stated that they had problems with their group friends. These students said that the problem of internet shooting at home had a negative impact on the applicability of FCM.

Table 17. Reflections on improved teaching environment

Positive Feedback	Negative Feedback	Both positive and negative feedback
36	2	4

As examining the results, we collected the opinions of the students in three categories as indicated in Table 17. 36 of the students stated positive, 2 of them negative, and 4 of them both positive and negative opinions.

Students were asked w*hat you thought about the applicability of the applied learning method in schools.* The experimental group students stated that the developed teaching method can be easily applied in secondary schools. Students can learn difficult topics easily through the developed learning method. The students stated that they were learning at their own pace thanks to this method. The students also remarked that this method was applicable in all courses. On the other hand, students with negative opinions stated that they were not sure whether the students would comply with all the rules.

Table 18. Applicability of FCM

Applicable	Not applicable
41	1

In the examinations, 41 students commented on the applicability of FCM in schools as positive and 1 student as negative (Table 18).

Discussion

In a comparison between the traditional learning environment and FCM supported by mobile application, significant differences were observed among students' academic achievement. According to the results of the research conducted by Akgün and Atıcı (2017), Çalışkan (2016), Galway et al. (2014), Boyraz (2014), Ekmekçi (2014), Dill (2012), Roshan and Roshan (2012), Marcey et al. (2012) and Moravec et al. (2010), participants who study with FCM are more successful than the participants studying with traditional media. In addition, Pierce and Fox (2012), Tune et al. (2013), Wilson (2013), McGivney-Burelle and Xue (2013), McLaughlin et al. (2013), Baepler et al. (2014), Murphree (2014) and Hung (2015) made a study about FCM students stating that their academic success increased. Similarly, in the study, it was determined that the FCM group composed of the experimental group students was more successful than the TLM group made up by the control group students. At the same time, a statistically significant change was found in academic achievement. But Howell (2013), Davies et. Al. (2013), Clark (2013) and Marlowe (2012) stated otherwise in their research and that there were no significant changes in academic achievement.

The views of the students about the course and their interest in the course were also taken. Fulton (2012) stated in his research that FCM education has increased students' interest in mathematics education. For some subjects of mathematics 2 course, FCM was prepared and applied to 45 experimental group students in Albalawi (2018). He stated that there was a significant increase in the performances of the students in the activities he tried on 45 people but there was no statistical significance. In the research, the findings of the students' performance and

interest during the course process were determined. In addition, a significant result was obtained in the experimental group students' academic achievement in the subjects determined in the mathematics lesson.

Students' opinions were asked about collaborative learning. Herold et al. (2012) and Fulton (2012) stated in their research that the duration of the communication between the teacher and students and between students and students increased. They also stated that classroom discussion environments were more efficient. This situation coincides with the research done. This research has revealed that FCM's students' learning in a collaborative learning method is an important factor in students' interest in the course, their fun and active participation. It is seen that students can solve many problems through group interaction. In this way, it is thought to contribute to the success of the process and the academic success of students.

Turan and Göktaş (2016), Artino (2008) and Moreno (2004) stated in their research that students' cognitive burden decreased thanks to teacher guidance in FCM's classroom activities. In the research, it was found that the students' cognitive burden was mostly removed by teacher guidance and similar results with the literature were obtained.

Larsen (2009) stated in his research that the students who took courses with FCM were more willing for collaborative learning rather than individual learning. This situation coincides with the findings and it is seen that the students use these expressions to improve their skills. In another study, Frydenberg (2012) stated that those who were taught with CL were more motivated than those who received traditional education. Similarly, in the study, it was observed that collaborative learning method had a positive effect on students' interest and motivation.

Ekren and Akkul (2013) stated in their research that the videos used in education would be useful for the students in explaining the subject. In addition, they stated that the visual and audio video techniques that appeal to many sensory organs contributed to the students' motivation. Fulton (2012) revealed in his research that students did not like it when they had difficulty understanding while watching videos. This situation does not correspond with the research. On the contrary, they liked to watch the videos over and over again and to have their teachers available while doing homework at school. Deperlioğlu and Köse (2010) stated in their research that, thanks to video, audio, visual and presentations from multimedia technologies, the students displayed a positive effect in the success of the course and that these presentations provided students with a collaborative and constructivist education. Bergmann and Sams (2007), in their research, formed the basis of FCM with videos. They stated that the videos would be an advantage of learning technology by designing them according to the five senses. Bishop and Verleger (2013) stated that they rejected studies related to the FCM method which does not include video lessons. Similar results were obtained in the literature. In the answers given by the students, the importance of videos and visuals was repeatedly expressed. Especially through the use of mobile applications with smart phones and independent from place limitations, they stated that their interest in the lesson increased and they were prepared for the lesson. This finding is consistent with the high academic achievement.

Mason, Teodora and Kathleen, (2013), Herold et al. (2012), Lage et al. (2010) stated in their research that the participants in the classroom made better use of time by applying the environment of FCM. Similar results were obtained in the study. Students also stated that there were extra times for fun activities throughout the process.

Roach (2013) stated in his research that FCM made a significant contribution to the students' understanding of the subjects and initiated a period in which students were active in education through innovations. He also stated in his research that there were no definite beliefs about the applicability. In Francl's (2014) study, it is determined that FCM approach in this age of technology is a viable system. He stated that the lessons and homework done with traditional learning method were left behind. Now, smart phones and portable tablets should be used in the Internet era (Francl, 2014). In another study, the implementation of the FCM approach was examined. In their study, 450 students stated that their grades increased, general conditions improved and job satisfaction increased (Hamdan et al., 2013). Similar results were obtained in the study. The applicability of the developed FCM in the courses was favourably stated by the students.

Results

With the technological developments, the use of technological tools in education has increased. Many teaching models have been developed to achieve full learning in education. The use of technological tools in developed teaching models comes to the fore. In this study, a mobile application has been developed for the subject of 7th

grade polygons in mathematics course in order to integrate FCM with smart phones which are technological tools of new learning methods. With this mobile application, the aim is for students to follow the lessons easily without limitations of time and place and thus understand the subject with enriched visuals.

The academic achievement test was prepared after taking expert opinions to measure the students' success. Demographic characteristics, the level of motivation, pre-test results and general academic averages of the experimental and control group students were determined by random sampling method before the application. As a result of the statistical analysis of the pre-test results of the experimental and control group students, it was determined that they were similar groups and the application process was started.

Results of the First Research Question

According to the results obtained from the experimental group and the control group academic achievement scores;

- When the pre-test and post-test results of the experimental group were compared, it was found that the academic success of the students increased significantly after the application.
- When the pre-test and post-test results of the control group were compared, it was seen that the academic success of the students increased significantly after the application.
- The experimental group and the control group post-tests were compared and were found significant in favor of the experimental group. Accordingly, the post-test averages of the experimental group were found to be higher than those of the control group.

Regarding the first research question, it is observed that the students who used FCM supported by a mobile application with collaborative learning increased their academic achievement compared to the students who utilized traditional learning method. In other words, there was a significant difference in favor of the experimental group students who applied the two week quasi-experimental education process.

The main reason for the high academic achievement in favor of the experimental group is the interactive, collaborative and active participation of the students in the FCM process. In addition, it is observed that their interest in mathematics lesson increased with the mobile application and that the activities in which the students were in the center contributed to the meaningfulness of the experiment group.

Results of the Second Research Question

In the scope of the research, the changes in the teaching process and in the interest of the students in mathematics education are revealed in general terms as follows;

- The experimental group students stated that they participated actively through FCM.
- The students expressed that mathematics course was not a boring course in a FCM environment supported by a mobile application.
- The students stated that lessons such as mathematics became easier for them.
- The main reason for the success in the mathematics course was that FCM became fun and the students' prejudices against the mathematics lesson disappeared with this method.
- Some of the students stated that they liked mathematics thanks to FCM supported by a mobile application.
- Students also stated that FCM supported by a mobile application was beneficial in mathematics lesson.

Concerning the second research question in this research, thanks to the mobile-supported FCM, the bias against mathematics lesson was removed, students had fun in mathematics class which they had earlier seen as boring, and they liked mathematics lesson by taking an active role in the process.

Results of the Third Research Question

Within the scope of the research, students stated the following thoughts about collaborative learning in the FCM supported by mobile application.

- In FCM, it is determined that the students' course work with collaborative learning method has an important effect on students' interest in the course, their fun and active participation.
- It is determined that students can solve many problems with group interaction.
- Some of the students' individual errors and negative behaviors in the CL method were seen to have an impact on other students. However, there was no decrease in academic achievement.
- In FCM, the students stated that they enjoyed themselves during the group work, the participation in the class increased and they understood the subject more easily.
- The students stated that their communication with their friends increased positively during the group studies.
- It is seen that communication between teacher-student and student-student has increased in a positive way.
- The majority of the students stated that they saw features that they did not realize before because of group work.
- It was determined that the students solved their problems during the process with the teacher, the mobile application and the group friends respectively.
- Most of the students think that the CL method should be applied in the courses.
- The collaborative learning method mixed with the mobile application supported FCM increased the students' motivation to the course.
- The experimental group stated the elements that should be considered while preparing the CL method of the students.
    - The selection of the group friends by considering the demands of students can affect the process positively. However, it was determined that the students who were close friends before the research caused grouping and threw other members of the group out of the process. Therefore, it is thought that very close friends should not be in the same group.
    - Group members need to be understanding with each other.
    - Everyone in the group must have a role.
    - The members of the group should be ready for the learning method.
    - It was stated that students with low success should not be in the same group.
    - It is stated that the number of members of the group does not exceed 4.
    - It is emphasized that there should be a leader in the group work and he/she should prevent any confusion.

According to the results of the third research question; the experimental group stated that the students liked collaborative learning, enjoyed their group friends in the process, understood the lesson better than the traditional learning method and increased their interest in the mathematics lesson. The experimental group students who participated in the process stated that they had an active role in the developed learning method, thus increasing their academic success. It was observed that they developed positive communication with their friends throughout the whole implementation process. In addition, the first time students encountered in this learning method has been found to have little difficulty. However, students who use negative expressions have generally emphasized the individual errors and negative behaviors of their friends.

Research results show that; FCM and CL method increase the students' interest, motivation, attendance and sympathy to the course. This situation is thought to be realized by the mixture of FCM and CL method and it is seen that students' academic achievement is also a significant increase.

Results of the Fourth Research Question

Within the scope of the research, the students generally stated their comments about the FCM supported by a mobile application as follows;

- The importance of videos and visuals was repeatedly expressed by the students and it was remarked that they played an important role in learning the lesson.
- The experimental group stated that the students had the opportunity to watch videos through their smart phones whenever and wherever they wanted. In this way, they had the chance to repeat as much as they wanted according to their pace of learning.
- The interest of the students in the course increased thanks to their use of mobile application via smart phones in the developed learning method, and this application enabled them to prepare for the course.
- The students stated that they could solve a lot of examples on the subject and use their time better through FCM.
- The students noted that the developed learning method could be applied in schools. In addition, they stated that this teaching method should be applied to not only in mathematics course but also in all courses.
- It was stated that all the rules required by the students should be followed and the activities should be completed in order to achieve success in the developed learning method

As regards the fourth research question, it was observed that almost all of the students in the experimental group thought that the developed learning method could be easily implemented in schools. At the same time, it was seen that the students' interest in classes had increased thanks to the collaborative learning method through a mobile application-supported FCM. During the application process, the students learned the subject at the time and place of their own learning speed, and this increased their academic success.

Suggestions

Considering the data obtained from the research, the following suggestions can be made regarding the application and the research to be carried out.

Application recommendations

- The mobile application has been used by the students for homework during the implementation stage of FCM. In the mobile application used, attention should be paid to the design principles.
- The videos in the mobile application should be as simple, clear and concise as possible. Long videos may adversely affect the process.
- In-class activities take time to create. For this reason, it is important to get prepared in advance.
- During the application, there are some drawbacks in communication between the groups and within the groups. For this reason, while forming the groups, keeping students who are opposite together or having very close friends in the same group may adversely affect the process.
- The students stated that they liked the pills information with the colorful flash cards in the mobile application. In addition, they stated that it would be useful to have educational games on the subject in the mobile application. Therefore, designing and placing games related to the mobile application can make the home-learning process more entertaining and efficient.
- The interaction of students with students and teacher with students in the learning process is very important in order to ensure that the developed learning method is efficient. In this respect, the fact that there are many fun activities such as in-group studies and quizzes in this process can increase the academic success and interest of the students.
- Students need to be motivated to watch the course videos at home. If not motivated, they may be adversely affected by this process. For this reason, it is necessary to have entertaining activities associated with the video to enable students to watch videos.

Research recommendations

- In this research, the effect of a mobile application-supported FCM on students' academic success and collaborative study skills were examined. In future studies, different teaching outcomes such as creative thinking, problem solving and critical thinking can also be examined.
- Flash cards, pill information, sample solutions and videos are included in the developed mobile application. In the mobile application, missing games, chats and test sections can be added and their effect on the student can be evaluated.
- The study group of this study consists of 7th grade students. Differences can be made between them by applying the research sample to all levels of secondary and high school because the reactions of high school students and secondary school students to the method may be different.
- In the study, the effect of mathematics course on the academic achievement of students in polygons was surveyed. It is important to consider whether the applied process will have similar effects on other branches.
- The study was designed with the help of a mobile application. This design was determined in the investigations that attracted the attention of the students. It is important to compare FCM and the developed learning method which will be supported by augmented reality and virtual reality that will attract more attention of students.

Acknowledgments

This article was created from the master thesis. Selçuk University Institute of Educational Sciences, Department of Computer Education and Instructional Technology. Master thesis name: “Determining the academic achievement of students who use flipped classroom method supported by mobile application and their views on cooperative learning” in 2018.

References

Akgün, M. & Atıcı, B. (2017). The Effect of Flipped Classroom on Learners' Academic Achievements and Views. *Kastamonu Education Journal, 25(1), 329-344.*

Albalawi, Abdullah S. (2018). The Effect of Using Flipped Classroom in Teaching Calculus on Students' Achievements at University of Tabuk. *International Journal of Research in Education and Science, 4*, 1, 198-207.

Artino, R.Jr. Anthony (2008), Cognitive load theory and the role of learner experience: An abbreviated review for educational practitioners. *AACE Journal, 16*(4), 425–439.

Baepler, Paul, Walker, J. D., and Driessen, Michelle (2014), It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education, 78*, 227–236.

Bergmann, Jonathan, & Sams, Aaron (2012). *Flip Your Classroom: Reach Every Student in Every Class Everyday.* Publisher: ISTE & ASCD.

Bishop, Jacob L. & Matthew A. Verleger (2013). *The flipped classroom: A survey of the research. In ASEE National Conference Proceedings,* Atlanta, GA 30, 9, 1-18.

Boyraz, Serkan (2014). *Evaluating Flipped Classroom/Educatıon Method in English Teaching,* Master Thesis, Afyon Kocatepe University Social Sciences Institute: Afyonkarahisar.

Bergmann, Jonathan & Aaron, Sams (2012). *Flip your classroom: Reach every student in every class everyday*. International Society for Technology in Education (ISTE).

Büyüköztürk, Şener, Çakmak, Ebru Kılınç, Akgün, Özcan Erkan, Karadeniz, Şirin & Demirel, Funda (2014) *Bilimsel Araştırma Yöntemleri*, PEGEM Akademi: Ankara.

Campbell, Donald T. & Stanley Julian C. (1966). *Experimental and quasi-experimental designs for research* (6).

Clark, K. R. (2013). Examining the effects of the flipped model of instruction on student engagement and performance in the secondary mathematics classroom: An action research study(Doctoral dissertation, Capella University).

Çakır, Hüseyin, & Arslan, İsmail (2013). Development of Course Content Package for Mobile Devices. *International Journal Of Informatics Technologies*, *6*, 3, 24-33.

Çalışkan, Nazlı (2016). *Examining the influence of flipped classroom on students learning English as a foreign language.* Master Thesis. Çağ University Social Sciences Institute: Mersin.

Davies, Randall S., Dean, Douglas L., & Ball, Nick (2013). Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course. Educational Technology Research and Development, 61(4), 563-580.

Deperlioğlu, Ömer & Utku, Köse (2010). Effects of Web 2.0 Technologies on the Education and An Example Learning Experience. *XII. Academic Informatics Conference*, Muğla.

Dey, Ian (1993) *Qualitative Data Analysis: A User-Friendly Guide for Social Scientists.* London: Routledge Publications.

Dill, Ebony M. (2012). *The Impact of Flip Teaching on Student Homework Completion, Behavior, Engagement and Proficiency.* University Of New England Educators Conference. New Orleans: EDSIG. 1-11.

Doğan, T. G, (2015). Sosyal medyanın öğrenme süreçlerinde kullanımı: Ters-yüz edilmiş öğrenme yaklaşımına ilişkin öğrenen görüşleri. *Açıköğretim Uygulamaları ve Araştırmaları Dergisi,* 1, 2, 24-48.

Ekmekçi, E. (2014). *Flipped Writig Class Model With A Focus On Blended Learning.* PhD Thesis, Gazi Üniversity Institute of Educational Sciences: Ankara.

Ekren, Nazmi, & Nuriye, Akkul (2013). "Bilgisayar ve İnternet Destekli Uzaktan Eğitim Programlarının Değerlendirme Aşamaları (UZEM örneği). *8. National Education Management Congress,* İstanbul, 21-23.

Francl, Thomas J. (2014). "Is Flipped Learning Appropriate?." Publication of National University, 119-128.

Frydenberg, Mark (2012). Flipping Excel. 2012 Proceedings of the Information Systems Educators Conference (s. 1-11). New Orleans: EDSIG. ISSN. Vol. 2167.

Fulton, Kathleen (2012). Upside Down and Inside Out: Flip Your Classroom To Improve Student Learning. Learning & Leading with Technology, 12-17.

Galway, Lindsay, Corbett, Kitty.- Takaro, Timothy, Tairyan, Kate & Frank, Erica (2014), A novel integration of online and flipped classroom instructional models in public health higher education. https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-14-181, (Erişim Tarihi 20.04.2018).

Gökçearslan, Şahin, Solmaz, Ebru & Kukul, Volkan (2017). Mobile Learning Readiness Scale: An Adaptation Study. *Eğitim Teknolojisi Kuram ve Uygulama*, 7 (1), 143-157. DOI: 10.17943/etku.288492

Herold, Michael J., Lynch, Thomas D., Ramnath, Rajiv & Ramanathan, Jayashree (2012). October. Student and instructor experiences in the inverted classroom. *In Frontiers in Education Conference* (FIE), 2012 (pp. 1-6). IEEE.

Howell, Donna (2013). *Effects of an inverted instructional delivery model on achievement of ninth-grade physical science honors students* (Unpublished doctoral dissertation). GARDNER-WEBB UNIVERSITY, Boiling Springs, NC.

Hung, Hsiu-Ting (2015). Flipping the classroom for English language learners to foster active learning. *Computer Assisted Language Learning*, *28*(1), 81–96.

Kara, Cüneyt Orhan (2016a). Flipped Classroom. *Tıp Eğitim Dünyası, 45,* 12-26.

Kara, Cüneyit Orhan. (2016b). *Can flipped classroom model be used in clinical education program of medical faculty*, Master Thesis, Akdeniz Üniversity Health Sciences Institute, Antalya.

Kocabatmaz, Handan (2016). The Ideas Of Pre-Service Teachers Regarding The "Filipped Classroom Model". *Journal of Research in Education and Teaching, 5*, 4, 14-24.

Lage, Maureen, Platt, Glenn, & Treglia, Micheal (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *Journal of EconomicEducation, 31*, 1, 30-43.

Lage, Maureen J. & Glenn, Platt (2010). The internet and the inverted classroom. *The Journal of Economic Education, 31*(1), 11-11.

Larsen, Judy A. (2009). *Experiencing a Flipped Mathematics Class.* Doctoral dissertation, Education: Faculty of Education.

Marcey, David J. & Michael, E. Brint (2012). Transforming an undergraduate introductory biology course through cinematic lecture sand inverted classes: A preliminary assessment of theclic model of the flipped classroom. *In NABT Biology Education Research Symposium,* Dallas, Texas.

Marlowe, Cara A. (2012) "The effect of the flipped classroom on student achievement and stress." 1-40.

Mason, Gregory, Teodora, Rutar Shuman, & Kathleen E. (2013). Inverting (flipping) classrooms-Advantages and challenges. *20th ASEE Annual Conference & Exhibition. Atlanta:* ASEE.

McGivney-Burelle, J. & Xue, Feu (2013). Flipping calculus. PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies. *Primus, 23*, 5, 447–486.

McLaughlin, Jacqueline E., Griffin, LaToya M., Esserman, Denise A., Davidson, Christopher A., Glatt, Dylan M., Roth, Mary T., Gharkholonarehe, Nastaran & Mumper, Russell J. (2013). Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *American Journal of Pharmaceutical Education, 77(9),* 1–8.

Moravec, Marin, Williams, Adrienne, Aguilar-Roca, Nancy & O'Dowd, Diane K. (2010), Learn before lecture: A strategy that improves learning outcomes in a large introductory biology class. *CBE Life Sciences Education,* 9, 473–481.

Moreno, Roxana (2004). Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia. *Instructional Science, 32,* 99–113.

Murphree, Daniel S. (2014). "Writing wasn't really stressed, accurate historical analysis was stressed": Student perceptions of in-class writing in the inverted, general education, university history survey course. *History Teacher, 47(2),* 209–219.

Özcan, Ayhan (2008). *Design and application of a mobile learning environment for personal digital assistant (PDA)*, Master Thesis, Muğla University Institute of Science and Technology, Muğla.

Özdemir, Murat (2010). Qualitative Data Analysis: A Study on Methodology Problem in Social Sciences *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi, 11, 1,* 323-343.

Pierce, Richard & Jeremy Fox (2012), Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American Journal of Pharmaceutical Education, 76(10),* 1–5.

Roach, Travis (2013). "The friday flip: New methods to increase interaction and active learning in economics." Available at SSRN 2302898.

Roshan, Stacey & Wendy Roshan (2012). My View: It's never too late to begin flipping your classroom. http://schoolsofthought.blogs.cnn.com/2012/08/24/my-view-its-never-too-late-to-beginflipping-your-classroom/(Erişim Tarihi: 06.05.2017).

Sharples, Mike, Corlett, Dan & Westmancott, Oliver (2002). The design and implementation of a mobile learning resource. *Personal and Ubiquitous Computing, 6,* 3, 220-234.

Tanrıverdi, Mustafa (2011). *Development of a mobile learning application to support e-learning and analyze its effects*, Master Thesis, Gazi University Institute of Informatics, Ankara.

Tune, Johnathan D., Michael Sturek & David P. Basile (2013, December). Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology. *Advances in Physiology Education, 37*(4), 316–320.

Turan, Zeynep & Yüksel, Göktaş (2015). A New Approach in Higher Education: The Students' Views on Flipped Classroom Method. *Journal of Higher Education and Science,* 5, 2, 156-164.

Turan, Zeynep & Yuksel Göktas (2016). The Flipped Classroom: instructional efficency and impact of achievement and cognitive load levels. *Journal Of E-Learning and Knowledge Society, 12*(4).

Torun, Fulya & Tülay, Dargut (2015). Mobil öğrenme ortamlarında ters yüz sınıf modelinin gerçekleştirilebilirliği üzerine bir öneri. *Adnan Menderes Üniversitesi Eğitim Fakültesi Eğitim Bilimleri Dergisi, 6,* 2, 20-29.

Wilson, Stephanie Gray (2013). The flipped class: A method to address the challenges of an undergraduate statistics course. *Teaching of Psychology, 40,* 193–199.

Yıldız, D.G. & Kıyıcı, G. (2016). Effect of the Flipped Classroom on Prospective Teachers's Academic Achıevement, Metacognitive Awareness And Epistemological Beliefs. *Celal Bayar University Journal of Social Sciences, 14,* 3, 423-444. Doi: 10.18026/cbusos.70886

Yıldız, Ş.N., Sarsar, F. & Çobanoğlu, A.A. (2017). A Literature Review of Flipped Classroom Practices. *Electronic Journal of Social Sciences,* 16, 60, 76-86. DOI: 10.17755/esosder.289652

Mirici, I. H., & Şengül, F. (2020). Assessment in EFL classes based on CEFR principles. *Bartın University Journal of Faculty of Education*, 9(2), 252-263.

Bartın University Journal of Faculty of Education, 9(2), 252-263

buefad.bartin.edu.tr

Assessment in EFL Classes Based on The CEFR Principles

Ismail Hakkı MİRİCİ[a], Fatma ŞENGÜL[*b]

Article Info

DOI: 10.14686/buefad.655985

Article History:
Received: 06.10.2019
Accepted: 07.01.2020
Published: 05.06.2020

Keywords:
The Common European Framework of Reference for Languages,
English Language Assessment,
English as a Foreign Language.

Article Type:
Research article

Abstract

Just upon its publication, the Common European Framework of Reference for Languages: Teaching, Learning Assessment (CEFR) has become a frequently referred document in foreign language education practices globally, including teaching, testing and assessment. In order to find out information about the assessment procedures in the classes of English as a foreign language (EFL) based on the CEFR principles, this investigation purposed to examine the most common types of assessment and their effects on the academic achievement of the learners. In this study, a meta-analysis design was adopted comprising 75 articles published in the journal of Language Assessment Quarterly between the years of 2010-2019 on the fields of Language Education and Literature. The articles were searched in the electronic database, Taylor and Francis, using the keyword "The Common European Framework of References for Languages". The data were analysed quantitatively via the SPSS software version 20.0 with particular themes coded by the researcher. The findings revealed that the most common types of assessment based on the CEFR principles were the proficiency assessment followed by the performance assessment. It was also found out that there was a linear relationship between the academic achievement and the CEFR oriented assessment procedures.

Yabancı Dil Olarak İngilizce Sınıflarında Avrupa Dilleri Ortak Çerçeve Programı İlkelerine Dayalı Değerlendirme

Makale Bilgisi

DOI: 10.14686/buefad.655985

Makale Geçmişi:
Geliş: 06.10.2019
Kabul: 07.01.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Avrupa Dilleri Ortak Çerçeve Programı,
İngiliz Dili Değerlendirme,
Yabancı Dil Olarak İngilizce.

Makale Türü:
Araştırma makalesi

Öz

Avrupa Dilleri Ortak Çerçeve Programı: Öğretim, Öğrenim Değerlendirme (CEFR), yayınlandığı ilk günden beri öğretim, ölçme ve değerlendirme dahil olmak üzere yabancı dil eğitiminde dünya çapında adından sıklıkça söz edilen bir belge olmuştur. Yabancı dil olarak İngilizce öğrenen bireylerin bulunduğu sınıflarda Avrupa Dilleri Ortak Çerçeve Programı ilkelerine dayalı değerlendirme prosedürleri hakkında daha fazla bilgiye ulaşmak amacı ile bu araştırma, en yaygın kullanılan değerlendirme türlerini ve bunların öğrencilerin akademik başarısı üzerindeki etkilerini araştırmayı amaçlamıştır. Meta-analiz yönteminin benimsendiği bu çalışma, Language Assessment Quarterly dergisinde 2010-2019 yılları arasında dil eğitimi ve edebiyatı alanında yayınlanan 75 makalenin incelenmesini içermektedir. Makaleler, Taylor and Françis adlı elektronik veritabanından "Avrupa Dilleri Ortak Çerçeve Programı" anahtar kelimesi kullanılarak araştırılmıştır. Veri, nicel olarak SPSS 20.0 versiyonu ve araştırmacının belirli temaları kodlaması yolu ile analiz edilmiştir. Bulgular, Avrupa Dilleri Ortak Çerçeve Programı ilkelerine dayalı olarak en yaygın değerlendirme türlerinin yeterlilik değerlendirmesi ve ardından performans değerlendirmesi olduğu sonucunu ortaya koymuştur. Aynı zamanda bulgular, akademik başarı ve Avrupa Dilleri Ortak Çerçeve Programı arasında doğrusal bir ilişki olduğunu göstermiştir.

[*] **Corresponding Author:** fatmasengul3@gmail.com
[a] Prof. Dr., Near East University, Lefkoşe/Turkish Republic of Northern Cyprus, https://orcid.prg/0000-00020906-0259
[b] Prof. Dr., Near East University, Lefkoşe/Turkish Republic of Northern Cyprus, https://orcid.prg/0000-00020906-0259

Introduction

Human beings learn an additional language for numerous reasons such as, communicating with people who speak a dissimilar language and represent another cultural identity, in order to have better job opportunities and a better paid career, for staying in a different country, and so on (Vajjala & Löo, 2014). In majority of these situations, learners also enter into examination in order to receive qualification for their language level in a target language (Vajjala & Löo, 2014). This is for why majority of the learners are examined about their language proficiency levels in English as a Foreign Language (EFL) learning process (Gultom, 2016). In other words, language competency level of the EFL students are determined after the assessment process (Önalan & Karagül, 2018). Assessment is defined as any process that maintains knowledge about the reasoning, accomplishment or advancement of learners (Charvade, Jahandar & Khodabandehlou, 2012). Alias, this process aims to provide some information regarding the efficacy of the language learning process and consequences of language learning based on the average score of the learners (Gultom, 2016). Language level of the EFL students are generally examined through using several standardized assessment criteria such as, Common European Framework of Reference for Languages (CEFR) in European territories (Vajjala & Löo, 2014). At the beginning, the CEFR is believed to serve as a general foundation for the circumstances of language syllabuses, curriculum guidelines, assessments, materials and so on around Europe (Shaarawy & Lofty, 2013). Nowadays, the CEFR is rapidly being utilized as a tool for successful implementation and combination of language teaching, learning and assessment all around the world (Fulcher, 2010). The CEFR is known as a language learning and teaching framework which maintains clear principles for different levels of language learners (Wang, Kuo, Tsai & Liao, 2012). The main purpose of CEFR is to encourage the independent movement of human being and thoughts by boosting the accountability across instructional systems through the mutual usage of the similar proficiency levels (Deygers, Zeidler, Vilcu & Carlsen, 2018). The CEFR has subscribed to the improvement of language teaching and learning process in numerous important ways, such as introducing 34 scales for writing, speaking, reading and listening, that include both general and communicative language competences for a set of domains to describe six levels of language proficiency, in order to evaluate the various perspective of language proficiency (Lowiea, Hainesa & Jansmaa, 2010). Significantly, until the existence of the CEFR, no single document has been more effective on teaching, learning and assessment of languages (Deygers, Carlsen, Saville & Gorp, 2018). Similarly, according to the CEFR, assessment can be done in several ways and all types of assessment includes collecting information on account of making influential decisions particularly, all types of the assessment might not be convenient, applicable and suitable to the circumstances in that they are implementing (Piccardo, Berchoud, Cignatta, Mentz, & Pamula, 2011). This is forwhy, this study purposed to examine information about the assessment procedures in English as a foreign language learners (EFL) classes based on the CEFR principles. On account of these, this study objective to find out the most common types of assessment and the effects of the assessment based on the CEFR principles on the academic performance of the EFL learners.

Literature Review

Assessment and evaluation are the indispensable parts of the EFL teaching and learning process (Gultom, 2016). Recently, an innovation has occurred in the evaluation process and there is a sudden change from testing to assessment (Charvade, Jahandar & Khodabandehlou, 2012). As the evaluation is a general term, assessment is considered as the subset of the evaluation (Ouahiani, 2016). The evaluation of the standards of the instructional process can be conquered from the consequences of assessment, test, interview and observation in the classroom (Tavassoli & Farhady, 2018; Gultom, 2016). Furthermore, assessment process can be defined as the any methods such as test, interview, observation, and so on that is implemented into the learning and teaching process in order to better comprehend the recent information that a learner retains (Önalan & Karagül, 2018). The assessment process in the EFL learning and teaching process enables the instructors to decide about whether or not the instructional process and outcome of educational process is successful in line with the average grades of the learners (Putri, Pratolo & Setiani, 2019). After the assessment process, the EFL instructors can decide about the learners' language proficiency level, and after the language proficiency level of the learners is assigned, the English instructors can identify which learners have attained the language proficiency level of English and which ones have not (Gultom, 2016). As the assessment is substantial in instructional process, every instructor should assess their learners' learning progressively (Charvade, Jahandar & Khodabandehlou, 2012). Majority of the instructors implement a test or examination to assess the learners' success in EFL learning and teaching process (Gultom, 2016). In fact, instructors spend majority of the classroom hour engaged in a single type of assessment (Charvade, Jahandar & Khodabandehlou, 2012). Assessing is apparently not the last step of the instructional process (Piccardo,

2012). Assessment of the learners requires a well-planned system to make decisions about the learners' success (Charvade, Jahandar & Khodabandehlou, 2012). Significantly, this can be viewed as the impulsion of the whole process (Piccardo, 2012). It is a continuous process that covers a much comprehensive field (Gultom, 2016). In order to assess the learners, an instructor should take into consideration about numerous perspectives in assigning the last grades of the learners (Gultom, 2016). Assessment is the consequence of a well-designed process and it is directed in a clear way with a scientific manner including in gathering and evaluating data for measuring pre-determined and aimed instructional goals, and it is practical and able to supply useful feedback (Piccardo, 2012). During the assessment process, besides the mid-term and final exam grades, the instructor also pay attention to the learners' engagement, motivation, performance, assignment and so on (Gultom, 2016). In order to achieve the objectives, the assessment process requires to be as definite and as targeted as possible, in fact, numerous assessment materials and resources such as grids, tables, scales, descriptors and so on are require to be the authorities' responsibility (Piccardo, 2012; Tavassoli & Farhady, 2018).

For a long time, the CEFR has been implemented in the assessment procedures of the EFL instructional process (Lowiea, Hainesa & Jansmaa, 2010). The Council of Europe was developed the CEFR as a guideline and framework for EFL instructional process and assessment (Wang, Kuo, Tsai & Liao, 2012). The CEFR purposes to put emphasis on teaching, learning and assessment (Piccardo, 2012). The CEFR has subscribed to the innovation of EFL instructional process in numerous significant ways (Ngai & O'Dwyer, 2011). According to Piccardo (2012), CEFR is an indispensable part of the EFL instructional process as it purposes "to give reflection on assessment, the implications of assessment and above all its multidimensionality in the professional discourse" (p. 38). The CEFR was designed as a normative source and guiding principle to maintain language education, communication aspect, instructing materials development and language assessment (Wang, Kuo, Tsai & Liao, 2012). In universal educational atmospheres, it is widespread to have a diverse group of EFL instructors coming from different backgrounds, and assessment systems (J. Runnels & V. Runnels, 2018). The CEFR can be implemented to state instructional objectives and outcomes in a globally comparable way (Europe, 2019). Five main elements of the assessment procedures in the EFL language educational process based on the CEFR principles are known as "familiarization, specification, standardization training and benchmarking, standard setting procedures and validation" (Examinations, 2011, p. 19). As it is emphasized by Broek and Ende (2013) "general principles and measures to be implemented by authorities responsible for language education at national, regional and local level which includes creating conditions to provide an effective use of the CEFR" and also these circumstances should embolden collaboration among both instructional foundations and associate countries, as well as it should ensure common familiarization of language characteristics, guidance for language teaching and learning with the purpose to ensure and advance multilingualism between European inhabitants (p. 10). Accordingly, the particular measures put emphasis on the convenient and consistent usage of the framework "by taking the responsibility to facilitate and coordinate cooperation between all relevant stakeholders involved in language education" (Broek & Ende, 2013, p. 10). The CEFR is a complicated document which do not purpose to provide available global remedy to the problems associated with the assessment (Piccado, 2012). The CEFR involves the descriptions of steps to develop language proficiency and skills for influential communication in line with the cultural context (Afip, Hamid & Renshaw, 2019). The CEFR has become an influential tool for developing language teaching and learning policies as it is considered as a sequence of language adequacy levels adapted by various nations to ensure the uniformity of common certification among their education systems (Europe, 2019; Wang, Kuo, Tsai & Liao, 2012). By the same token, the CEFR was borrowed or adopted by numerous countries in the world on account of using it as a foundation for setting up to their EFL instructional standards (Afip, Hamid & Rensaw, 2019; Hai & Nhung, 2018). One of the primary motive for adopting or adapting the CEFR as a tool for language education policy development is the levels of language proficiency illustration (Afip, Hamid & Renshaw, 2019). The advanced adjustment of language proficiency exams around the world to CEFR levels yields it international validity (Afip, Hamid & Renshaw, 2019). The increasing admission and implementation of the CEFR of language qualification introduced in the CEFR has formed a condition in that, all around Europe, "public bodies, examination institutes, language schools and university departments concerned with the teaching and testing of languages seek to relate their curricula and examinations to the Common Reference Levels" (Europe, 2019, p. 1). Additionally, as it can be used as a framework for the characterization of the scope of quizzes and exams, and also on account of adjusting the principles for the acquisition of a instructional goals in line with the assessment of the language skills as well as, for identifying the degree of adequacy in present quizzes and examins, in this way allowing comparisons to be made along various methods of qualifications (Press, 2001). Noticeably, utilizing the CEFR appropriately necessitates the employers to comprehend that the CEFR is implied to help administers to

define and assign proficiency levels for languages to make sure that qualifications of associate nations are equivalent (Broek & Ende, 2013). The levels have been widely used by language testing organizations namely, Cambridge English Language Assessment, British Council and Educational Testing Service for international English language tests involving IELTS, Cambridge Exams and TOEFL, which provides a perfect advantage to assess the learners' skills and language proficiency levels through the use of CEFR (Lowiea, Hainesa & Jansmaa, 2010). Several years after its primary publication, the CEFR has substantially changed language testing in Europe and its' six levels have been commonly acknowledged by all stakeholders, ranging from policy makers to applicants (Deygers, Zeidler, Vilcu & Carlsen, 2018). To assess the various features of language adequacy, the CEFR introduces 34 scales for reading, listening, writing and speaking, that consists both general language competencies and communicative competencies for a variety of areas to characterize the six levels of language proficiency (Examinations, 2011; Lowiea, Hainesa & Jansmaa, 2010). The CEFR defines the EFL proficiency as the capacity to use the language through five tasks namely, reading, listening, writing, spoken production and spoken interaction at six levels: A1 and A2 for elementary users, B1 and B2 for intermediate users and C1 and C2 for advanced users, with identifiers that characterize what students can do in the EFL process at each language proficiency level (Araújo & Costa, 2013). The key scope of CEFR defines the "the background of language use, the level of language proficiency, learner acquisition, knowledge, and skills that the language user or learner need to develop" (Wang, Kuo, Tsai & Liao, 2012, p. 2). The reference scales characterizes the cultural context in which each language is based and describes various levels of the information and dominance of the language on account of deciding about the learners' progress (Baldwin & Apelgren, 2018). It supplies materials and a great deal of resources and also general samples (Piccardo, 2012). The principles of the CEFR can be ranged as follows: 1. The CEFR is completely expressive; neither authoritarian nor standard, 2. The CEFR is language impartial; it requires to be implemented and performed conveniently with respect to each particular language, 3. The CEFR is frame of reference impartial; it requires to be practical and performed with respect to each particular instructional circumstances in line with the requirements and primacies particular to that circumstances, 4. The CEFR aims to be receptive, therein no characteristics of language knowledge, abilities and usage are intentionally neglected, 5. The CEFR proposes a mutual language and provides source as a foundation for stakeholders to think over and critically examine their actual implementation and to enable them to preferable embed their attempts as mutually, 6. The usage of the CEFR should subscribe to advanced clearness of techniques and methods increased standard of circumstances and equivalence of outcomes, 7. The usage of the CEFR should subscribe to introduction of the fundamental instructional values for which the Council of Europe leans, like communal subsumption, intercommunal conversation, dynamic democratic national status, language heterogeneity, multilingualism, learner autonomy and constant learning (Broek & Ende, 2013). The purpose of the Committee of Ministers to define these criterias was to make sure that the CEFR was practiced in a logical, practical and dependable way (Broek & Ende, 2013). Numerous countries around the world have either adapted or adopted the CEFR as a foundation for forming English language teaching and learning standards (Afip, Hamid & Renshaw, 2019). The CEFR is commonly used in organizing language proficiency necessities, especially for international learners seeking attainment to university lectures taught in English (Green, 2018). Significantly, the CEFR has had a great influence on university entrance policies and tests across Europe (Deygers, Zeidler, Vilcu & Carlsen, 2018). Several researches agree that the well-known feature of CEFR is that CEFR has introduced positive effect on assessment, curriculum development and educational process (Wang, Kuo, Tsai & Liao, 2012). As it is referred by Lowiea, Hainesa and Jansmaa (2010) "the advantage in using the CEFR is that it provides a single common structure upon which we can base our interpretations of the linguistic performance of students" (p. 153).

Types of Assessment Mentioned in the CEFR

The CEFR (2001) reflects that, there are different types of assessment that could be administered in the EFL settings namely:

> "1. Achievement assessment/Proficiency assessment, 2. Norm-referencing (NR)/Criterion-referencing (CR), 3. Mastery learning criterion referencing/Continuum criterion referencing, 4. Continuous assessment/Fixed assessment points, 5. Formative assessment/Summative assessment, 6. Direct assessment/Indirect assessment, 7. Performance assessment/Knowledge assessment, 8. Subjective assessment/Objective assessment, 9. Checklist rating/Performance rating, 10. Impression/Guided judgement, 11. Holistic assessment/Analytic assessment, 12. Series assessment/Category assessment, and 13. Assessment by others/Self-assessment" (p. 183).

Initially, achievement assessment is a type of assessment that focuses on the particular goals, such as the assessment of the information that has been taught, while proficiency assessment focuses on the performance and knowledge of the learner in connection with the practice of the theme in the reality and it presents an exterior point of view (Teachers, 2013). Differing from these, norm-referencing is the alignment of learners in degree sequence and they are assessed and sequenced in comparison to their peers, while criterion-referencing is a response towards norm-referencing assessment in which the learner is assessed clearly in line with her/his competency in a particular subject regardless of the competency of her/his peers (Flucher & Davidson, 2012). Apart from these, mastery criterion referencing approach focuses on an individual minimum competence standard which purpose to categorize learners as masters and non-masters without any degree of proficiency in the accomplishment of the goal being identified, whereas continuum criterion-referencing approach put emphasis on an individual skill that is referenced to a represented continuum of the whole appropriate degrees of proficiency in the domain in question (Piccardo, Berchoud, Cignatta, Mentz & Pamula, 2011; CoE, 2001). Nonetheless, continuous assessment focuses on the assessment by the instructor and possibly by the student of lecture performances, parts of work and projects along the course that the final grade is given in order to reflect the entire course, year and/or semester, while fixed point assessment is used when points are given and judgements are made based on the exams or other assessment that happens on a specific day, generally at the end of the course or prior to a course and the thing that occurred previously is unrelated; the thing that an individual can perform now is determinative, as well and also the assessment is generally considered as something out of the course that occur at fixed points on account of making decisions (CoE, 2001). Thenceforward, formative assessment is a continuous process of collecting data on the extent of learning, on pros and cons, that the instructor can implement feedback into their course planning and the real feedback that they provide learners, whereas summative assessment is implemented to sum up acquired knowledge with a grade at the end of course (Learning, 2019). Furthermore, direct assessment is used in order to assess what the learner is essentially doing, such as using a criteria grid in order to match the learners' performances with the most convenient categories whereas, indirect assessment implements a test, generally on paper, in order to assess facilitated skills. More than these, performance assessment asks the learner to supply an evidence of language in speaking or writing in a direct test, while knowledge assessment asks the learners to provide answers to the questions that can be a series of several item types on account of providing evidence of the degree of their linguistic knowledge and ability (Europe, 2001). Subsequently, subjective assessment is explained as an evidence of the excellence of a performance that is done by an assessor, while objective assessment is defined as the process that subjectivity is eliminated from the assessment (Avcı, 2019). On the other hand, during the ranking on a scale assessment process, "judging that a person is at a particular level or band on a scale made up of a number of such levels or bands" while ranking on a checklist assessment process an individual is judged in line with "a list of points deemed to be relevant for a particular level or module" (CoE, 2001, p. 191). Particularly, impression is defined as totally subjective evaluation made on the foundation of practice of the learners' achievement in lecture, besides reference to particular criteria in line with a particular assessment, whereas guided judgement that personal rater subjectivity is decreased by fulfilling impact with responsive assessment in line with a particular criteria (Avcı, 2019). Thenceforward, holistic assessment is explained as making universal synthetic judgement, where the several features are examined intuitively by assessor, while analytic assessment examines several features individually in terms of what is searched for and how a band, grade or score is reached at (CoE, 2001, p. 191). Significantly, category assessment contains an individual assessment task in that achievement is judged in line with the grouping in an assessment grid, whereas series assessment includes a range of separated assessment tasks that are rated with a basic holistic grade on an assorted scale of 1-4 or so on (CoE, 2001). Lastly, assessment by others can be identified as the judgements that are done by the instructor or assessor, whereas self-assessment can be defined as the judgements about the learners' own achievement (Avcı, 2019).

To summarize, there are several types of assessment based on the CEFR principles (CoE, 2001). In the light of the reviewed literature, all types of assessment should be carefully examined and analysed in order to help instructors to figure out the particular or common, interior or exterior, personal or universal targets to be directed and in deciding which types are more convenient, applicable and suitable to the circumstances in that they are utilizing in fact, the assessors are requested to take into consideration the most common types of assessment and the effects of the assessment procedures based on the CEFR principles on the EFL learners' academic achievement (Agenziascuola, 2013). In fact, by the help of the findings of this research, the researcher purposes to find out the most common types of assessment and their effects on the academic achievement of the EFL learners based on the CEFR principles.

Statement of the Problem

English language education plays an important role all around the world as it is considered as the language of globalization (Afip, Hamid & Renshaw, 2019). This is for why, majority of the countries give priority to the EFL learning process (Naved, 2015). Further, assessment is considered as one of the most important pieces of the EFL educational process which has key challenges and roles in the field of education (Putri, Pratolo & Setiani, 2019). Generally, assessment should be implemented into the field of education by every EFL instructor (Gultom, 2016). As it is believed, assessment process shouldn't be considered only as a tool to provide learners a diploma, but it should also considered as a process that guides and helps the learner to boost their language learning performance, achievement and language proficiency level as well as, improved learning applications and conditions (Charvade, Jahandar & Khodabandehlou, 2012). Importantly, the CEFR provides a guideline with a good foundation for grouping and defining the procedures that should be taken into consideration for an effective assessment and instructional process (Piccardo, 2012). The CEFR has existed as a worldwide policy in language education that has been adopted or adapted by nations around the world (Afip, Hamid & Renshaw, 2019). Majority of the nations, started to follow CEFR guidelines in order to revise and develop their countries' educational and language policies as it provides scales and descriptors that enable the teachers to assess the language skills and performances of the learners (Fleckenstein, Leucht & Köller, 2018; Hai & Nhung, 2018). As it is agreed by the Fleckenstein, Leucht and Köller (2018), the CEFR enables the instructors to become "fair judges of students' EFL competence, tapping the full potential of criterion-referenced assessment" (p. 98). In line with these, although the language assessment literacy is an indispensable part of language teacher education, EFL teachers have difficulties as they are not trained about the assessment process based on the CEFR principles during their educational process (Babaii & Asadnia, 2019; Tavassoli & Farhady, 2018). In spite of, majority of the educators are not trained about the usage of CEFR for the assessment process, the CEFR has rapidly been implemented in instructor education, target language curriculum and instructional tools as the instructors are hoped to adapt and adopt CEFR for usage in curriculum development, pedagogy and assessment for the advancement of the target language performances and language proficiency level of the EFL learners (Fleckenstein, Leucht & Köller, 2018). As a consequence, there is a gap in the context of education about the administration of the assessment practices based on the CEFR principles in the teacher education process as well as, language education policies, curriculum, examination guidelines and also researches in the field of education (Araújo & Costa, 2013; Fleckenstein, Leucht & Köller, 2018; Babaii & Asadnia, 2019). Additionally, as the CEFR influences the lives of millions, and many studies highlights the significance of the CEFR principles on the EFL assessment process there is a need for the research that will examine the effects of assessment procedures based on the CEFR principles regarding the academic achievement of the EFL learners (Baldwin & Apelgren, 2018; Deygers, Zeidler, Vilcu & Carlsen, 2018). Moreover, the CEFR suggests that there are various assessment types that can be implemented into the assessment process and all types of assessment should be carefully examined and analysed in order to help instructors to figure out the particular or common, interior or exterior, personal or universal targets to be directed and in deciding which types are more convenient, applicable and suitable to the circumstances in that they are utilizing (Agenziascuola, 2013; Piccardo, Berchoud, Cignatta, Mentz, & Pamula, 2011). In other words, although there are some researches about the usage of the CEFR principles for the assessment of the EFL learners, there is a lack of studies that will provide information about the most common types of assessment in the EFL classes based on the CEFR principles (Baldwin & Apelgren, 2018). As a result, this research purposes to find out information about the assessment procedures in EFL classes based on the CEFR principles, on account of providing useful insights into the field of EFL education process. In particular, this study intended to find out the most common types of assessment based on the CEFR principles and the effects of the assessment procedures based on the CEFR principles on the academic achievement of the EFL learners.

Research Questions

By carrying out this research, the researchers aim to find out the most common types of assessment and the effects of the CEFR oriented assessment procedures on the academic achievement of the EFL learners.

On account of achieving the purpose of the study, the following questions comprise the research questions of this study:

1. What are the most common types of CEFR oriented assessment types in the EFL classes?
2. What are the effects of the CEFR oriented assessment practices on the EFL learners' academic achievement?

Method

Research Design

A meta-analysis design is employed as a design of the research. Haidich (2010) identifies the meta-analysis as a kind of design that "a quantitative, formal, epidemiological study design used to systematically assess previous research studies to derive conclusions about that body of research" (p. 29). In other words, the study used meta-analysis design through analysing the information from the previous literature through the use of a particular database namely, Taylor and Françis. In fact, the collected articles were the data collection tools of the study. By the analysis of the previous literature as its data collection tool, the researcher purposes to collect and analyse quantitative data which purposes to transform the data into numeric form. Further, as the research was based on the quantitative data collection, a quantitative data analysis was employed (Green, 2015).

Population and Sample/Study Group/Participants

This research was used convenience sampling technique, as the researcher purposed to collect the specific kind of data from the 75 articles that were published in the journal of Language Assessment Quarterly between the years of 2010-2019 on language education and literature and available in the Taylor and Françis database. Convenience sampling can be defined as "a type of nonprobability sampling, where the members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate" (Etikan, Musa & Alkassim, 2016, p. 2). The purpose of choosing convenience sampling technique for the sampling and sample was to collect the data that the particular type of non-probability sampling leans on the data acquiring from occupant representatives that are handily accessible to take part in the research (Saunders, Lewis & Thornhill, 2012). All of the selected articles were reviewed and analysed to find out the most common types of assessment and their effects on the academic achievement of the EFL learners. The data was collected during the 2019-2020 fall semester, from the journal of Language Assessment Quarterly in the electronic database, Taylor and Françis, using the keyword "The Common European Framework of Reference for Languages".

Data Collection Tools

This research adopted a quantitative data analysis as the data was collected only quantitatively. The quantitative data was collected through the meta-analysis of the previous literature through the use of an electronic academic database namely, Taylor and Françis where the articles were selected randomly by the researcher from the journal of Language Assessment Quarterly and in order to reach the content that the researcher was focused on following keyword was entered "Common European Framework of References for Languages". Significantly, the researcher was only collected the data from the studies that were done among the 2010-2019 years on language education and literature, on account of focusing on the related and up to date quantitative data.

Data Collection

Primarily, the study was focused on the meta-analysis where the analysis of the previous literature was done to identify the most widely used type of assessment in EFL classes based on the CEFR principles, and also their effects on the academic achievement of the EFL learners. In brief, 75 articles published in the journal of Language Assessment Quarterly between the years of 2010-2019 on language education and literature and searched in the electronic database, Taylor and Françis, using the keyword "Common European Framework of References for Languages" were reviewed as the data collection tools of the investigation.

Data Analysis

Data, regarding the meta-analysis of the previous literature were analysed through the following procedures. Initially, an electronic academic database was selected randomly by the researcher and then, the following keywords were entered on account of reaching to the content that the researcher was focused "Common European Framework of References for Languages". Importantly, the researcher was only focalized on the articles that were conducted among 2010-2019 years, on account of reaching the up to date data. Next, these articles were analysed and grouped in line with their themes by the researcher. Thenceforward, the Statistical Package for Social Sciences (SPSS) software version 20.0; descriptive statistics was used on account of finding out the most commonly used type of assessment and their effects on the academic achievement of the EFL learners based on the CEFR principles.

Findings

The Most Common CEFR oriented Assessment Types in EFL Classes

As it is illustrated in the Table 1, the results of the investigation about the most common types of assessment based on the CEFR principles indicated that the proficiency assessment (40%) is the most widely used assessment type based on the CEFR principles, while achievement assessment, norm referencing assessment, criterion referencing assessment, continuum criterion referencing assessment, continuous assessment, fixed point assessment, indirect assessment, objective assessment, checklist rating assessment, impression assessment, and also guided judgement assessment types are taken into consideration by none of the reviewed articles (0%). Following to these, performance assessment (15%) based on the CEFR principles is found to be second most common assessment type based on the CEFR principles, whereas equal number of articles (4%) namely, formative assessment, performance rating assessment, analytic assessment, series assessment, category assessment, and also assessment by others based on the CEFR principles are implemented into the EFL classes. Additionally, holistic assessment (9%) is found to be third most commonly used assessment type based on the CEFR principles, and also almost equal number of the reviewed articles (7%) are implemented direct assessment based on the CEFR principles into their academic studies. Lastly, mastery learning criterion referencing, summative assessment, knowledge assessment, subjective assessment, and self-assessment (1%) are considered as the least common types of assessment based on CEFR principles. Significantly, these results are in line with the findings of Lai (2011) who agreed that the proficiency assessment is the most common type of assessment based on the CEFR principles. Contrarily, dissimilar to the findings of the Fastre, Klink and Merrienboer (2010) who claimed that performance assessment is more widely used than the proficiency assessment, the proficiency assessment (40%) is found to be the most common types of assessment based on the CEFR principles, following to these, performance assessment (15%) is another most common types of assessment based on the CEFR principles and majority of the types of assessment based on the CEFR principles are not investigated and/or implemented into the field of education.

Table 1. The Most Common CEFR Oriented Assessment Types

Types of Assessment	**F**	**%**
Achievement Assessment	-	-
Proficiency Assessment	30	40
Norm Referencing Assessment	-	-
Criterion Referencing Assessment	-	-
Mastery Learning Criterion Referencing Assessment	1	1
Continuum Criterion Referencing Assessment	-	-
Formative Assessment	3	4
Summative Assessment	1	1
Continuous Assessment	-	-
Fixed Point Assessment	-	-
Direct Assessment	5	7
Indirect Assessment	-	-
Performance Assessment	11	15
Knowledge Assessment	1	1
Subjective Assessment	1	1
Objective Assessment	-	-
Checklist Rating Assessment	-	-
Performance Rating Assessment	3	4
Impression Assessment	-	-
Guided Judgement Assessment	-	-
Holistic Assessment	6	9
Analytic Assessment	3	4
Series Assessment	3	4
Category Assessment	3	4
Assessment by Others	3	4
Self-assessment	1	1
Total	75	100

Key: F- Frequency % - Percentage

Effects of the CEFR Oriented Assessment on the EFL Learners' Academic Achievement

As it is demonstrated in the Table 2, the effects of the CEFR oriented assessment on the academic achievement seem to be highly positive. Majority of the studies (75%) reported strong relationship among the academic achievement and assessment procedures based on the CEFR principles, while minority of them (7%) revealed both positive effects and negative effects of the CEFR oriented assessment on the academic achievement of the EFL learners. Significantly, equal number of the articles (9%) indicated negative effects of the CEFR oriented assessment on academic achievement and no relationship among the assessment and academic achievement. In contrast to the findings of Uri and Aziz (2018) who agreed that assessment based on the CEFR principles might affect the academic achievement of the learners in a negative way as there were some challenges and difficulties regarding the implementation of it, this research indicated a positive relationship between the EFL learners' academic achievement and assessment procedures based on the CEFR principles. These findings were in line with the Afip, Hamid and Renshaw's (2019) research findings, who agreed that the CEFR based assessment procedures created opportunities for best practices in line with the higher-level English proficiency and language learning achievement.

Table 2. Effects of the CEFR Oriented Assessment Practices on Academic Achievement

Effects of the Assessment Procedures	**F**	**%**
Positive	56	75
Negative	7	9
Both Positive and Negative	5	7
Neither Positive nor Negative	7	9
Total	75	100

Key: F- Frequency % - Percentage

Discussion and Conclusion

The results regarding the first research question about the most common types of assessment in EFL classes based on the CEFR principles, illustrate that the proficiency assessment the most common and it is followed by the performance assessment and the holistic assessment. Following to these, the data related to the second question about the effects of the assessment practices based on the CEFR principles on the EFL learners' academic achievement shows a positive effect of the CEFR oriented assessment on the EFL learners' academic achievement. In fact, results of the study should be taken into consideration especially for the syllabus design and educational policy development as there is a positive relationship among the academic achievement and assessment procedures, and these findings has potential to embolden the policy makers' educational organizations to plan their assessment practices based on the CEFR principles. Significantly, this research is limited with the 75 articles that are published in the journal of Language Assessment Quarterly between the years of 2010-2019 on language education and literature. As a matter of the fact that the study is reviewed the previous literature conducted in a limited time and via limited electronic database namely, Taylor and Françis. Once the year of publication date of the reviewed articles extended and the data sources are varied and increased in number, it may be possible to obtain a different and deeper results. Moreover, using the keyword "The Common European Framework of Reference for Languages" cannot be enough to universalize the results of the study to the whole literature. Further studies are strongly recommended to investigate the effectiveness of different types of assessment based on the CEFR principles.

References

Afip, L. A., Hamid, M. O., & Renshaw, P. (2019). Common European framework of reference for languages (CEFR): insights into global policy borrowing in Malaysian higher education. *Globalisation, Societies and Education, 17*(3), 378-393.

Agenziascuola. (2013). *Evaluation and self-assessment: key concepts, descriptors and examples from the European language portfolio*. Retrieved from Forum Indire: http://forum.indire.it/repository_cms/working/export/attachments/5507/textual/5507_ver_1.pdf

Araújo, L., & Costa, P. D. (2013). *The European survey on language competences: School-internal and external factors in language learning.* Luxembourg: European Comission Joint Research Center Scientific and Policy Reports.

Araújo, L., & Costa, P. D. (2013). *The European Survey on Language Competences: School-internal and External Factors in Language Learning.* Luxembourg: Publications Office of the European Union.

Avcı, H. (2019). *Assessing writing in accordance with the descriptors of the common European framework of reference for languages.* Ankara: Hacettepe University Institute of Educational Sciences.

Babaii, E., & Asadnia, F. (2019). A long walk to language assessment literacy: EFL teachers' reflection on language assessment research and practice. *Reflective Practice International and Multidisciplinary Perspectives,* 1-16.

Baldwin, R., & Apelgren, B. M. (2018). Can do and cannot do: CEFR inspired examination and assessment in a Swedish higher education context. *Apples – Journal of Applied Language Studies, 12*(2), 19-35.

Bohn, H., & Hansen, T. (2017). Assessing pronunciation in an EFL context: Teachers' orientations towards nativeness and intelligibility. *Language Assessment Quarterly, 14*(1), 54-68.

Broek, S., & Ende, I. (2013). *The Implementation of the Common European Framework for Languages in European Education Systems.* Strasbourg: European Parliment.

Charvade, M. R., Jahandar, S., & Khodabandehlou, M. (2012). The impact of portfolio assessment on EFL learners' reading comprehension ability. *Canadian Center of Science and Education, 5*(7), 129-139.

CoE. (2001). *Common European Framework of Reference for Languages: Learning, Teaching and Assessment.* Strasbourg: Cambridge University Press.

CoE. (2019). *Principles, guidelines and the CEFR*. Retrieved from Council of Europe Portal: https://www.coe.int/en/web/portfolio/principles-and-guidelines-and-cefr

CoE. (2019, October 11). *Relating language curricula, tests and examinations to the common European framework of reference*. Retrieved from RELANG: https://www.ecml.at/TrainingConsultancy/RelatingLanguageExaminationstotheCEFR/tabid/1726/language/en-GB/Default.aspx

Deygers, B., Carlsen, C. H., Saville, N., & Gorp, K. V. (2018). The use of the CEFR in higher education: A brief introduction to this special issue. *Language Assessment Quarterly, 1*, 1-2.

Deygers, B., Zeidler, B., Vilcu, D., & Carlsen, C. H. (2018). One framework to unite them all? Use of the CEFR in European university entrance policies. *Language Assessment Quarterly, 15*(1), 3-15.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1-4.

Examinations, U. o. (2011, October). *Using the CEFR: Principles of good practice*. Retrieved from Cambridge English: https://www.cambridgeenglish.org/Images/126011-using-cefr-principles-of-good-practice.pdf

Fastré, G. M., Klink, M. R., & Mer, J. J. (2010). The effects of performance-based assessment criteria on student performance and self-assessment skills. *Advances in Health Sciences Education Theory Practice, 15*(4), 517-532.

Fleckenstein, J., Leucht, M., & Köller, O. (2018). Teachers' judgement accuracy concerning CEFR levels of prospective university students. *Language Assessment Quarterly, 15*(1), 90-101.

Fulcher, G. (2010). The reification of the common European framework of reference and effect driven testing. *Advances in Research on Language Acquisition and Teaching*, 15-26.

Fulcher, G., & Davidson, F. (2012). *The Routledge Handbook of Language Testing.* New York: Routledge.

Genç, Z. S. (2011). EFL in higher education: Designing a flexible content based curriculum at university level. *Asian EFL Journal*, 85-114.

Green, A. (2018). Linking tests of English for academic purposes to the CEFR: The score user's perspective. *Language Assessment Quarterly, 15*(1), 59-74.

Green, A. C. (2015). Approaches to mixed methods dissemination and implementation research: Methods, strengths, caveats, and opportunities. *Adm Policy Ment Health, 42*(5), 508-523.

Gultom, E. (2016). Assessment and Evaluation in EFL Teaching and Learning. *ISELT-4* (pp. 190-198). Pekanbaru: Proceedings of the Fourth International Seminar onEnglish Language and Teaching.

Hai, L. T., & Nhung, P. T. (2018). Implementing the CEFR at a Vietnamese university: General English language teachers' perceptions. *CEFR Journal: Research and Practice*, 41-55.

Haidich, A. B. (2010). Meta-analysis in medical research. *Hippokratia, 4*(1), 29-37.

Lai, E. R. (2011). Performance-based assessment: Some new thoughts on an old idea. *Pearson Education*(20), 1-4.

Learning, W. (2019, August 13). *Formative vs summative assessment: Which is better?* Retrieved from Wabisabi Learning: https://www.wabisabilearning.com/blog/formative-vs-summative-assessment

Lowiea, W. M., Haines, K. B., & Jansma, P. N. (2010). Embedding the CEFR in the academic domain: Assessment of language tasks. *Procedia Social and Behavioral Sciences, 3*, 152-161.

Nagai, N., & O'Dwyer, F. (2011). The actual and potential impacts of the CEFR on language education in Japan. *Synergies Europe*(6), 141-155.

Nakatani, Y. (2012). Exploring the implementation of the CEFR in Asian contexts: Focus on communication strategies. *Procedia - Social and Behavioral Sciences , 46*, 771-775.

Naved, Z. (2015, July 12). *The importance of the English language in todays' world*. Retrieved from Owlcation: https://owlcation.com/humanities/importanceofenglishlanguages

Ouahiani, A. B. (2016). Assessment in the EFL university classroom: between tradition and innovation. *Revue des Etudes Humaines et Sociales*(15), 3-10.

Önalan, O., & Karagül, A. E. (2018). A study on Turkish EFL teachers' beliefs about assessment and its different uses in teaching English. *Journal of Language and Linguistic Studies, 14*(3), 190-201.

Piccardo, E. (2012). Multidimensionality of assessment in the common European framework of reference for languages. *Cahiers deL'Ilob , 4*, 37-54.

Piccardo, E., Berchoud, M., Cignatta, T., Mentz, O., & Pamula, M. (2011). *Pathways through assessing, learning and teaching in the CEFR.* Austria: Council of Europe.

Press, C. U. (2001). *Common European Framework of Reference for Languages: Learning, Teaching and Assessment.* Strasbourg: Cambridge University Press.

Putri, N. S., Pratolo, B. W., & Setiani, F. (2019). The alternative assessment of EFL students' oral competence: Practices and constraints. *Ethical Lingua Journal of Language Teaching and Literature, 6*(2), 72-75.

Runnels, J., & Runnels, V. (2018). Impact of the common European framework of reference—A bibliometric analysis of research from 1990-2017. *CEFR Journal Research and Practice*, 18-32.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (6th ed.). Harlow: Pearson Education.

Shaarawy, H. Y., & Lotfy, N. E. (2013). Teaching writing within the common European framework of reference (CEFR): A supplement asynchronous blended learning approach in an EFL undergraduate course in Egypt. *Canadian Center of Science and Education, 3*(1), 123-135.

Tavassoli, K., & Farhady, H. (2018). Assessment knowledge needs of EFL teachers. *Teaching English Language, 12*(2), 44-65.

Teachers, C. A. (2013). *Assessment, the CEFR and the role of international exams*. Retrieved from CASLT: https://www.caslt.org/files/pedagogical-resources/cefr/cefr-elp-assessment-cefr-en-2013.pdf

Uri, N. F., & Aziz, M. S. (n.d.). Implementation of CEFR in Malaysia: Teachers' awareness and the challenges. *The Southeast Asian Journal of English Language Studies, 24*(3), 168-183.

Vajjala, S., & Löo, K. (2014). Automatic CEFR level prediction for Estonian learner text. *Proceedings of the third workshop on NLP for computer-assisted language learning* (pp. 113-127). NEALT Proceedings Series 22 Linköping Electronic Conference Proceedings.

Wang, H. P., Kuo, B. C., Tsai, Y. H., & Liao, C. H. (2012). A CEFR based computerized adaptive testing system for Chinese proficiency. *The Turkish Online Journal of Educational Technology, 11*(4), 1-12.

Yaşar, M. D., & Sadi Yılmaz, S. (2020). Analysis, evaluation, and comparison of the 2007, 2013 and 2018 chemistry curriculum learning outcomes based on the revised Bloom's taxonomy. *Bartın University Journal of Faculty of Education*, 9(2), 264-278.

Bartın University Journal of Faculty of Education, 9(2), 264-278

buefad.bartin.edu.tr

Analysis, Evaluation, and Comparison of the 2007, 2013 and 2018 Chemistry Curriculum Learning Outcomes Based on the Revised Bloom's Taxonomy

Mehmet Diyaddin YAŞAR*[a], Sibel SADİ YILMAZ[b]

Article Info

DOI: 10.14686/buefad.590764

Article History:
Received: 11.07.2019
Accepted: 05.05.2020
Published: 05.06.2020

Keywords:
High School Chemistry Curriculum,
Learning Outcomes,
Revised Bloom Taxonomy.

Article Type:
Research article

Abstract

The taxonomy approach in education provides teachers with an insight into learning outcomes in curricula and assessment of students. This study examines the chemistry curricula published by the Ministry of National Education of Turkey in the years 2007, 2013, and 2018 based on the knowledge and cognitive process dimensions of the Revised Bloom's Taxonomy (RBT). In the study, document analysis which is one of the qualitative research designs was used. Reliability analysis was made through examination of two researchers' agreements and disagreements. The reliability coefficient of the study was calculated to be 90.57%. Examining the chemistry curricula based on year and grade, the study found that learning outcomes associated with conceptual knowledge were a lot in the knowledge dimension while learning outcomes associated with understanding were many in the cognitive process dimension. The study is significant as it shows how learning outcomes changed in chemistry curricula in terms of RBT from 2007 to 2018. This study may be supported by research that determines students' RBT levels at the end of assessment in chemistry courses or the RBT levels of questions asked to students.

2007, 2013 ve 2018 Yılları Kimya Dersi Öğretim Programları Kazanımlarının Yenilenmiş Bloom Taksonomisi'ne Göre Analiz Edilmesi, Değerlendirilmesi ve Karşılaştırılması

Makale Bilgisi

DOI: 10.14686/buefad.590764

Makale Geçmişi:
Geliş: 11.07.2019
Kabul: 05.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Lise Kimya öğretim programı,
Kazanımlar,
Yenilenmiş Bloom Taksonomisi.

Makale Türü:
Araştırma makalesi

Öz

Eğitimde taksonomi yaklaşımı öğretmenlere, öğretim programlarındaki kazanımlar ve öğrencilerin değerlendirilmeleri hakkında fikir vermektedir. Bu çalışmada Milli Eğitim Bakanlığı tarafından 2007, 2013 ve 2018 yılları arasında yayınlanan Kimya Öğretim Programları, Yenilenmiş Bloom Taksonomisi'ndeki (YBT) bilgi ve bilişsel süreç boyutlarına göre incelenmiştir. Araştırmada, nitel araştırma desenlerinden biri olan doküman analizi kullanılmıştır. Çalışmada iki araştırmacının görüş birliği ve görüş ayrılıkları incelenerek güvenirlik analizi yapılmıştır. Çalışmanın güvenirlik katsayısı %.90.57 olarak hesaplanmıştır. Çalışma sonunda kimya dersi öğretim programı yıllara ve sınıf düzeylerine göre incelendiğinde bilgi boyutunda kavramsal bilgi basamağındaki kazanımların fazla olduğu, bilişsel süreç boyutunda ise anlama düzeyindeki kazanımların fazla olduğu tespit edilmiştir. Çalışma kimya öğretim programındaki kazanımların YBT'ye göre 2007 yılından 2018 yılına kadar nasıl bir değişim gösterdiğini ortaya koyması açısından önem arz etmektedir. Mevcut çalışma, öğrencilerin kimya derslerinde yapılan ölçme değerlendirme sonucunda YBT'ye göre hangi basamakta olduklarının tespit edilmesiyle veya öğrencilere sorulan soruların YBT'ye göre hangi basamakta olduğunun tespit edilmesiyle desteklenebilir.

***Corresponding Author:** mdiyaddinyasar@harran.edu.tr
[a] Assoc. Prof. Dr., Harran University, Şanlıurfa/Turkey, https://orcid.org/0000-0001-7512-580X
[b]Assist. Prof. Dr., Kafkas University, Kars/Turkey, http://orcid.org/0000-0001-7034-4472

Introduction

"*Is mathematics, for example, a discrete body of knowledge to be memorized or an organized, coherent, conceptual system to be understood? Does reading consist of remembering a set of sound-symbol relationships or gaining meaning from the words on a printed page?*" (Anderson, et al., 2010).

Objectives guide individuals' efforts in life. They show what an individual wants to achieve. Today, objectives are addressed as content or curriculum standards. These standards may be illuminating and beneficial on one hand but confusing on the other hand (Anderson et al., 2010).

Qualifications to be gained by people through education have a long list (Doğanay & Sarı, 2008, p.44). A curriculum is a process involving methods, techniques, and assessment activities for providing relevant contents through activities inside and outside the classroom conducted for attaining the objectives of national education and of educational institutions in any educational stage. It is a guide for courses in different grades in terms of subjects to be covered, goal to be achieved, duration, method, and techniques (Büyükkaragöz & Çivi, 1999, p.190). Teachers may encounter problems in terms of course content and time limitation problems unless serious and difficult decisions are made on what to teach and at which level to teach (Anderson et al., 2010). Educationists have proposed certain taxonomies by considering the common aspects of the above-mentioned qualifications. Taxonomy in education involves organizing or arranging behaviors that are intended for individuals to attain from simple to complex, from easy to difficult, and from concrete to abstract in such a way that they are prerequisites for one another (Sönmez, 2010).

The taxonomy approach gives teachers an idea about what they are trying to achieve as well as the understandability and observability of the learning outcomes in curricula and can be used for the analysis of student work. It guides teachers especially when they are preparing questions for assessing students. It helps teachers make out objectives (Anderson et al., 2001; Zorluoğlu, Kızılaslan & Sözbilir, 2016; Cangüven, Öz, Binzet & Avcı, 2017; Beyreli & Sönmez, 2017). It covers categories and groups about a single being, event, or situation. For example, there are birds, reptiles, mammals, etc. in the living beings group. When a species is called reptile, we understand that it bears the characteristics of reptile (Anderson et al., 2010)

Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook 1: Cognitive Domain, written by Bloom, Engelhart, Furst, Hill and Krathwohl, edited by Bloom, and published in 1956 lighted the way for a lot of educational research. The affective domain was added in 1964, and studies on psychomotor domain were included in 1966 and 1972. The taxonomy was updated with the novelties in 1999 as a result of the studies conducted between 1994 and 1999 (Anderson et al., 2010).

The most used model of educational objectives is based on Ralph Tyler's study (1949, quoted in Anderson et al., 2010). Tyler stated: "The most useful form for stating objectives is to express them in terms which identify both the kind of behavior to be developed in the student and the content or area of life in which this behavior is to operate." In Bloom's updated taxonomy (Revised Bloom's Taxonomy [RBT]), "behavior" is replaced by "cognitive process", and "content" is replaced by "knowledge type" (Anderson et al., 2010).

While the first version of the taxonomy had a single dimension, the revised taxonomy consists of two dimensions. In the updated taxonomy, objectives are listed, and a verb and a noun are incorporated in "objective". While the verb part covers the cognitive process, the noun part is about the knowledge to be learned by students. The table showing the relationship between cognitive process and knowledge is called taxonomy table. The knowledge dimension has four categories: factual, conceptual, procedural, and metacognitive. As some of procedural knowledge is more concrete than conceptual knowledge, which consists of the most abstract knowledge, conceptual and procedural knowledge categories in this dimension may overlap in terms of abstractness. The cognitive process of the table has six categories: remembering, understanding, applying, analyzing, evaluating, and creating (Anderson et al., 2010; Krathwohl, 2002).

Knowledge Dimension

The *Knowledge Dimension* has the following categories and sub-categories as summarized by Anderson et al. (2010):

A. Factual Knowledge: The elements students must know to solve a problem they encounter in a subject area.

B. Conceptual Knowledge: Knowledge in which different pieces of knowledge and parts of pieces of knowledge are connected and integrated in a more systematic way.

C. Procedural Knowledge: Knowledge about "how to do" something. It may often appear as procedures to be followed and steps to be taken in order, but it may also include procedures, skills, algorithms, techniques, and methods that are known together.

While factual knowledge and conceptual knowledge are about answers to "what" questions, procedural knowledge is about answers to "how" question. Differently from metacognitive knowledge, procedural knowledge is limited to skills, algorithms, techniques, and methods specific to a subject or discipline. It represents knowledge or ways of thinking specific to a discipline such as designing and doing experiments in sciences, solving equations of the second degree in mathematics, and historical data collection methods (Anderson et al., 2010).

D. Metacognitive Knowledge: Knowledge of cognition and awareness and knowledge of one's own cognition.

The Cognitive Process Dimension

The permanence of what is learned and increasing its transfer are very important among educational goals. Permanence involves keeping the knowledge in mind and recalling it while transfer requires making out and using what is learned. Permanence puts an emphasis on the past, whereas transfer stresses the future. Constructive learning (learning by understanding) is treated as an important educational objective. At this point, student assessment covers much beyond student's capability to present factual knowledge alone. The cognitive process dimension helps to show the ways in which students can actively engage in learning while trying to construct meaning. The verb part of "objective" is about the cognitive process dimension (Anderson et al. 2010, Krathwohl, 2002). Anderson et al. (2010) summarize the cognitive process dimension as follows:

1. Remembering: Recognizing and recalling.
2. Understanding: Interpreting (clarifying, translating), Exemplifying (illustrating a concept), Classifying (dividing, putting into groups), Summarizing (abstracting, generalizing), Inferring (concluding, extrapolating, predicting, generalizing), Comparing (comparing and contrasting), Explaining (constructing a model representing the cause and effect relationship).
3. Applying: Executing (applying) and Implementing (using).
4. Analyzing (determining the relationship between the part and the whole): Differentiating (distinguishing), Organizing (outlining, structuring), Attributing (ascribing and crediting).
5. Evaluating (making judgments based on criteria and standards): Checking (monitoring, testing), Critiquing (judging).
6. Creating (putting forward a functional whole): Generating (hypothesizing), Planning (designing), Producing (constructing).

Significance of the Study

The study is significant as it provides individuals working in the field of education with an insight into how learning outcomes changed in chemistry curricula in terms of RBT from 2007 to 2018. This study may be supported by research that determines the RBT levels of students at the end of assessment in chemistry courses or the examination of exam questions prepared by teachers for chemistry assessment of students based on RBT.

Taxonomy provides convenience to the practitioner on how the learning outcomes of the curriculum can be gained to pupils and the evaluation of learning outcomes. In the present study, from 2007 to 2018, the leaning outcomes of chemistry curriculum have been handled according to the RBT. This study may give researchers an idea of the changes in learning outcomes in the secondary school chemistry curriculum. It can also help teachers conduct their lessons and prepare exam questions.

Method

The type of the study, target group, data collection tools, validity and reliability, data collection methods, data analysis, limitations should be included in this section. If needed, subheadings can be used in this section.

Research Design

This research was carried out with document analysis which is one of the qualitative research designs. Document analysis involves the analysis of written materials containing information about the phenomenon or phenomena intended to be examined (Yıldırım & Şimşek, 2011). This study examines the chemistry curricula published by the Ministry of National Education of Turkey in 2007, 2013 and 2018 based on the knowledge and cognitive process dimensions of the Revised Bloom's Taxonomy (RBT). In this regard, chemistry curriculum

learning outcomes were subjected to content analysis based on the knowledge and cognitive process dimensions of RBT.

Population and Sample/Study Group/Participants

This study examines the chemistry curricula published by the Ministry of National Education of Turkey in 2007, 2013 and 2018 based on the knowledge and cognitive process dimensions of the Revised Bloom's Taxonomy (RBT).

Data Collection Tools

The data collection tool of this study; It consists of a written form in which researchers can be classified the learning outcomes of the 2007, 2013 and 2018 chemistry curricula published by the Ministry of Education in terms of knowledge dimension and cognitive process dimension according to the Revised Bloom Taxonomy (RBT). In the written form, the subtitles of the knowledge dimension and the cognitive process dimension of the RBT have preference boxes. Thus, the researchers had the opportunity to choose the appropriate box. The analysis of the data was done by two researchers who hold the title of Dr. in chemistry education.

Data Collection

The data of the study consisted of the learning outcomes of chemistry curricula published in 2007 2013 and 2018 by the Ministry of Education.

Data Analysis

The RBT dimensions in which chemistry curriculum learning outcomes would be included were determined by both authors separately. In the analysis process, both authors continuously had an exchange of ideas to locate the learning outcomes in the taxonomy and check them. The reliability of results was ensured by detecting agreements and disagreements between the authors through the reliability coefficient formula (Agreements/Agreements+ Disagreements). A reliability coefficient that is not less than 80% is accepted suitable (Miles & Huberman, 1994). In the present study, reliability coefficient was calculated to be 90.57%, which confirmed the reliability of the results.

Table 1 presents examples of chemistry curriculum learning outcomes for the RBT knowledge dimension. The analyses in the knowledge dimension were made considering the examples given in Table 1.

Table 1. Examples from the 2018 Chemistry Curriculum Representing the Knowledge Dimensions

Knowledge Dimension	Examples from the chemistry curriculum
A. Factual Knowledge	S/he *recognizes* basic warning signs used in chemistry for safety purposes.
B. Conceptual Knowledge	S/he *explains* the formation of coal and the types of coal.
C. Procedural Knowledge	S/he *uses* gas laws and kinetic theory to explain the behaviors of gases.
D. Metacognitive Knowledge	S/he *gains awareness of* the limitedness of available water sources in the world.

Table 2 presents examples of chemistry curriculum learning outcomes for the RBT cognitive process dimension. The analyses in the cognitive process dimension were made considering the examples given in Table 2.

Table 2. Examples from the 2018 Chemistry Curriculum Representing the Cognitive Process Dimensions

Cognitive Process Dimension	Examples from the chemistry curriculum
1. Remembering	S/he *matches* the names of elements s/he frequently interacts with in daily life with their symbols**.**
2. Understanding	S/he *explains* the properties of solutions with examples from daily life**.**
3. Applying	She *makes calculations* by connecting the concepts of mass, the number of moles, the number of molecules, the number of atoms, and volume of gases under normal conditions with one another**.**

4. Analyzing	S/he *explains* the importance of sustainable life and sustainable development for society by *establishing a connection* with the science of chemistry**.**
5. Evaluating	S/he *evaluates* the developments in the field of nanotechnology in terms of their effects on science, society, technology, environment, and economy**.**
6. Creating	S/he *puts forward solution suggestions* to decrease the harmful effects of fossil fuels on environment**.**

Research Ethics

We declare that the research has no unethical problem and we observe research and publication ethics.

Findings

This section analyzes 636 learning outcomes of the 2007, 2013, and 2018 chemistry curricula based on the knowledge and cognitive process skills dimensions of RBT and locates them in the taxonomy.

Figure 1 presents the distribution of learning outcomes by year. As showed in Figure 1, 56% (f=354) of the learning outcomes are in the 2007 Chemistry Curriculum, 24% (f=155) in the 2013 Chemistry Curriculum, and 20% (f=127) in the 2018 Chemistry Curriculum.

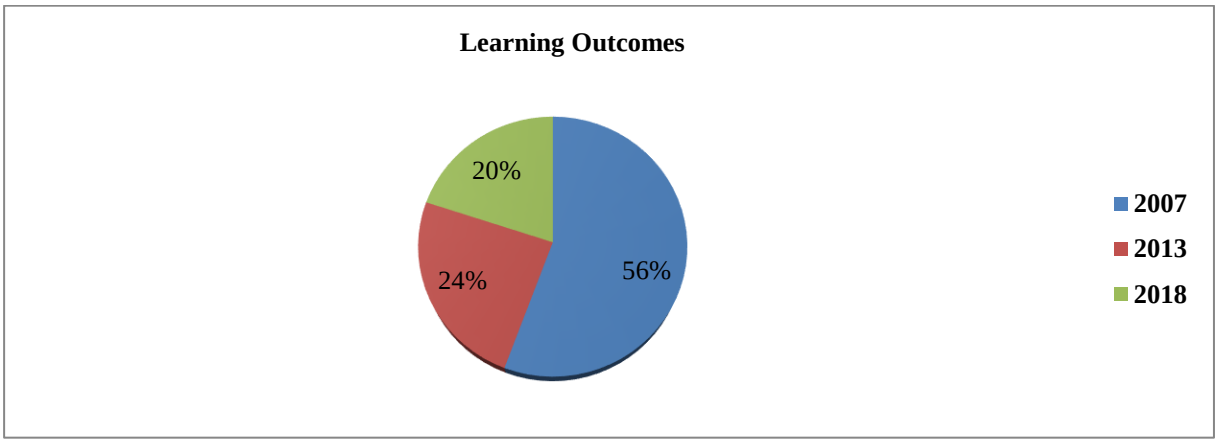


Figure 1. The Distribution of Learning Outcomes in Secondary Education Chemistry Curricula

The distribution of learning outcomes in the knowledge dimension

Table 3 shows the distribution of learning outcomes in the knowledge dimension. As showed in Table 3, 11% (f=70) of knowledge consists of factual knowledge, 70% (f=448) conceptual knowledge, 17% (f=114) procedural knowledge, and 0.48% (f=4) metacognitive knowledge. The table clearly shows that majority (70%) of the learning outcomes are associated with conceptual knowledge.

Table 3. The Distribution of Learning Outcomes in the Knowledge Dimension in Secondary Education Chemistry Curricula

KD	FK	CK	PK	MCK	f	%
2007	45	232	77	0	354	55.66
2013	16	113	22	4	155	24.37
2018	9	103	15	0	127	19.97
f	70	448	114	4	636	
Total Percentage	11.00	70.44	17.93	0.63		100

KD: Knowledge Dimension. FK: Factual Knowledge. CK: Conceptual Knowledge. PK: Procedural Knowledge. MCK: Metacognitive Knowledge.

Figure 2 presents the distribution of learning outcomes in the knowledge dimension based on year. As showed in Figure 2, 12.71% (f=45) of the 2017 learning outcomes, 10.32% (f=16) of the 2013 learning outcomes, and 7.03% (f=9) of the 2018 learning outcomes are in the factual knowledge category, and there is a decrease trend in

this category of learning outcomes. 65.54% (f=232) of the 2007 learning outcomes, 72.90% (f=113) of the 2013 learning outcomes, and 81.10% (f=103) of the 2018 learning outcomes are in the conceptual knowledge category, and there is an increase trend in this category of learning outcomes. 21.75% (f=77) of the 2007 learning outcomes, 14.20% (f=22) of the 2013 learning outcomes, and 11.81% (f=15) of the 2018 learning outcomes are in the procedural knowledge category, and there is a decrease trend in this category of learning outcomes. The metacognitive knowledge category is not covered in the 2007 and 2018 chemistry curricula, but 2.58% (f=4) of the 2013 learning outcomes are in the metacognitive knowledge category. There seems to be no considerable change in the metacognitive category of learning outcomes, and almost no coverage is given to this category in the chemistry curricula.

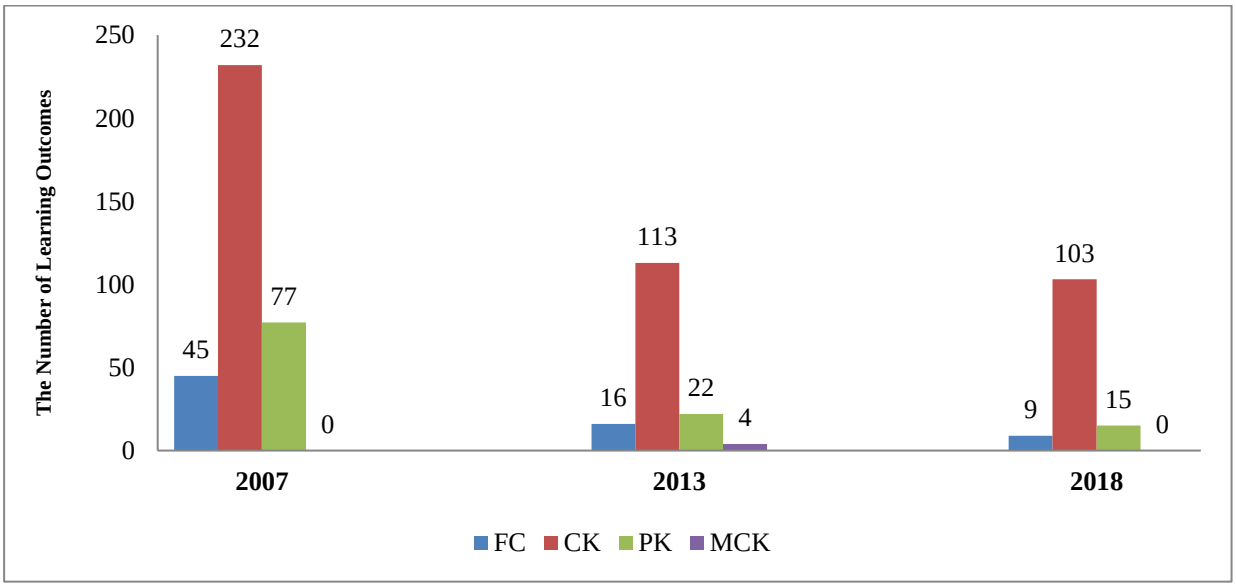


Figure 2. The Distribution of Learning Outcomes in the Knowledge Dimension by Year

Figure 3 presents the distribution of chemistry curriculum learning outcomes in the knowledge dimension by grade. As showed in Figure 3, 12.22% (f=11) of the 2007 ninth-grade learning outcomes, 24.24% (f=8) of the 2013 ninth-grade learning outcomes, and 7.89% (f=3) of the 2018 ninth-grade learning outcomes are in the factual knowledge category; 13.92% (f=11) of the 2007 tenth-grade learning outcomes, 7.69% (f=3) of the 2013 tenth-grade learning outcomes, and 2.57% (f=1) of the 2018 tenth-grade learning outcomes are in the factual knowledge category; 5.33% (f=4) of the 2007 eleventh-grade learning outcomes, 4.35% (f=2) of the 2013 eleventh-grade learning outcomes, and 0% (f=0) of the 2018 eleventh-grade learning outcomes are in the factual knowledge category; and 12.27% (f=9) of the 2007 twelfth-grade learning outcomes, 8.11% (f=3) of the 2013 twelfth-grade learning outcomes, and 16.13% (f=5) of the 2018 twelfth-grade learning outcomes are in the factual knowledge category. 67.78% (f=61) of the 2007 ninth-grade learning outcomes, 57.57% (f=19) of the 2013 ninth-grade learning outcomes, and 91.30% (f=21) of the 2018 ninth-grade learning outcomes are in the conceptual knowledge category; 70.89% (f=56) of the 2007 tenth-grade learning outcomes, 82.05% (f=32) of the 2013 tenth-grade learning outcomes, and 91.30% (f=21) of the 2018 tenth-grade learning outcomes are in the conceptual knowledge category; 74.67% (f=56) of the 2007 eleventh-grade learning outcomes, 76.09% (f=35) of the 2013 eleventh-grade learning outcomes, and 85.71% (f=30) of the 2018 eleventh-grade learning outcomes are in the conceptual knowledge category; and 53.64% (f=59) of the 2007 twelfth-grade learning outcomes, 72.97% (f=27) of the 2013 twelfth-grade learning outcomes, and 70.97% (f=22) of the 2018 twelfth-grade learning outcomes are in the conceptual knowledge category. 20.00% (f=18) of the 2007 ninth-grade learning outcomes, 12.12% (f=4) of the 2013 ninth-grade learning outcomes, and 13.16% (f=5) of the 2018 ninth-grade learning outcomes are in the procedural knowledge category; 15.19% (f=12) of the 2007 tenth-grade learning outcomes, 7.69% (f=3) of the 2013 tenth-grade learning outcomes, and 4.35% (f=1) of the 2018 tenth-grade learning outcomes are in the procedural knowledge category; 20.00% (f=15) of the 2007 eleventh-grade learning outcomes, 19.56% (f=9) of the 2013 eleventh-grade learning outcomes, and 14.29% (f=5) (f=30) of the 2018 eleventh-grade learning outcomes are in the procedural knowledge category; and 29.09% (f=32) of the 2007 twelfth-grade learning

outcomes, 16.22% (f=6) of the 2013 twelfth-grade learning outcomes, and 12.90% (f=4) of the 2018 twelfth-grade learning outcomes are in the procedural knowledge category.

As showed in Figure 3, none of the learning outcomes in the 2007 and 2018 chemistry curricula are in the metacognitive category. In 2013, on the other hand, coverage, though little, was given to the metacognitive category in the ninth (f=2; 6.07%), tenth (f=1; 2.57%), and eleventh (f=1; 2.70%) grades.

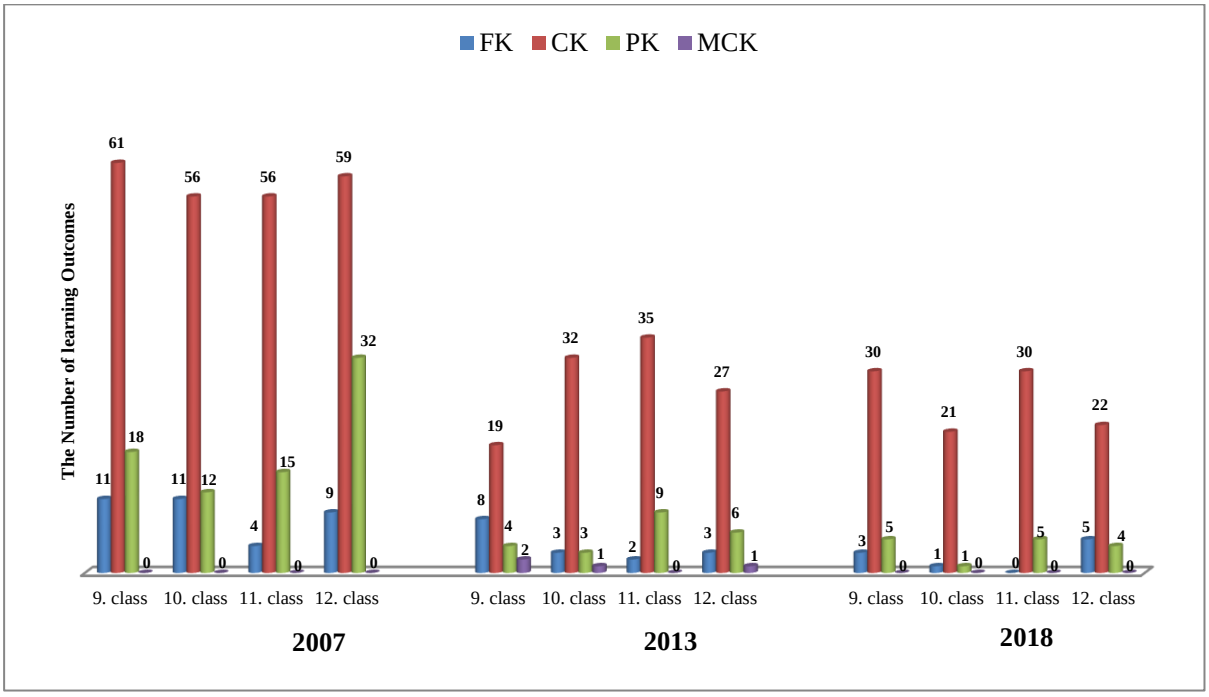


Figure 3. The Distribution of Chemistry Curriculum Learning Outcomes in the Knowledge Dimension by Grade

The distribution of learning outcomes in the cognitive process dimension

Table 4 shows the distribution of learning outcomes in the cognitive process dimension. As showed in Table 4, 7.86% (f=50) of learning outcomes consist of remembering, 60.53% (f=385) understanding, 12.58% (f=80) applying, 16.98% (f=16.98) analyzing, 0.64% (f=4) evaluating, and 1.41% (f=9) creating. The table clearly shows that majority (70 %) of the learning outcomes are in understanding cognitive process category.

Table 4. The Distribution of Learning Outcomes in the Cognitive Process Dimension in Secondary Education Chemistry Curricula

CPD	2007	2013	2018	f	%
R	33	10	7	50	7.86
U	226	67	92	385	60.53
AP	60	10	10	80	12.58
AN	35	60	13	108	16.98
E	0	2	2	4	0.64
C	0	6	3	9	1.41
f	354	155	127	636	
Total Percentage	55.66	24.37	19.97		100

CPD: Cognitive Process Dimension. R: Remembering, U: Understanding, AP: Applying, AN: Analyzing, E: Evaluating, C: Creating.

Figure 4 presents the distribution of learning outcomes in the cognitive process dimension by year. As showed in Figure 4, 9.32% (f=33) of the 2007 learning outcomes, 6.45% (f=10) of the 2013 learning outcomes, and 5.51% (f=7) of the 2018 learning outcomes are in the remembering category. 63.84% (f=226) of the 2007 learning

outcomes, 43.33% (f=67) of the 2013 learning outcomes, and 72.44% (f=92) of the 2013 learning outcomes are in the understanding category. 16.95% (f=60) of the 2007 learning outcomes, 6.45% (f=10) of the 2013 learning outcomes, and 7.87% (f=10) of the 2018 learning outcomes are in the applying category. 9.89% (f= 35) of the 2007 learning outcomes, 38.71% (f=60) of the 2013 learning outcomes, and 10.24% (f=13) of the 2013 learning outcomes are in the analyzing category. None of the 2007 learning outcomes are in the evaluating category while 1.29% (f= 2) of the 2013 learning outcomes and 1.57% (f=2) of the 2018 learning outcomes are in the evaluating category. Also, none of the 2007 learning outcomes are in the creating category while 3.87 % (f=6) of the 2013 learning outcomes and 2.36 (f=3) of the 2018 learning outcomes are in the creating category. Figure 4 clearly shows that the understanding category dominates the 2007, 2013, and 2018 chemistry curricula, whereas there are serious lacks in high-level cognitive process dimensions such as evaluating and creating.

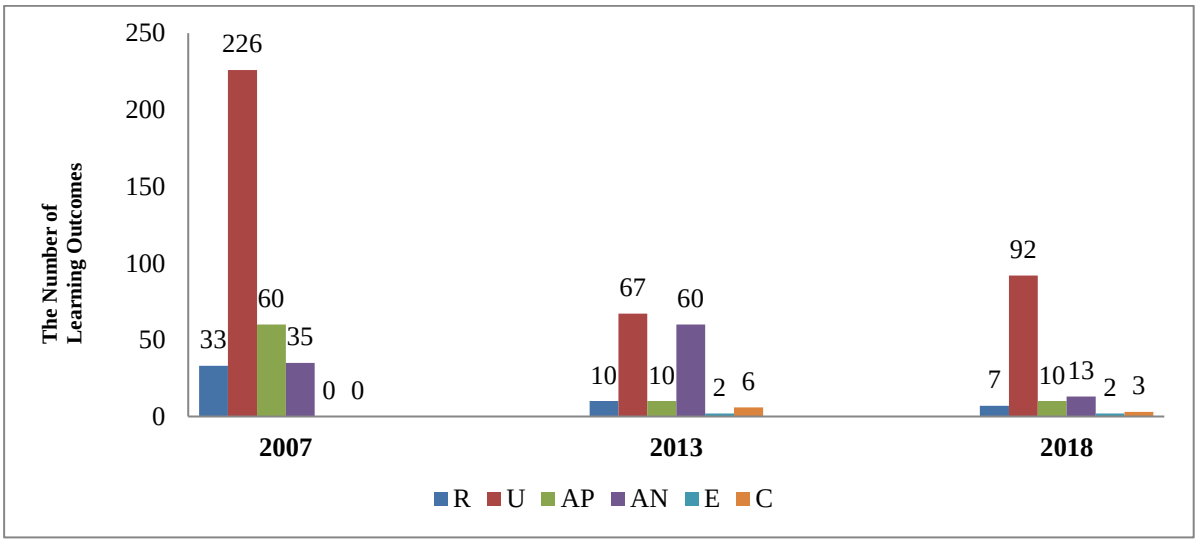


Figure 4. The Distribution of Learning Outcomes in the Cognitive Process Dimension by Year

Figure 5 presents the distribution of chemistry curriculum learning outcomes in the cognitive process dimension by grade. As showed in Figure 5, 6.67% (f=6) of the 2007 ninth-grade learning outcomes, 9.09% (f=3) of the 2013 ninth-grade learning outcomes, and 7.89% (f=3) of the 2013 ninth-grade learning outcomes are in the remembering category. 12.66% (f=10) of the 2007 tenth-grade learning outcomes and 7.69% (f=3) of the 2013 tenth-grade learning outcomes are in the remembering category, but none of the 2018 tenth-grade learning outcomes are in this category. 4.00% (f=3) of the 2007 eleventh-grade learning outcomes and 4.35% (f=2) of the 2013 eleventh-grade learning outcomes are in the remembering category, but none of the of the 2018 eleventh-grade learning outcomes are in this category. 3.64% (f=4) of the 2007 twelfth-grade learning outcomes, 5.41% (f=2) of the 2013 twelfth-grade learning outcomes, and 12.90% (f=4) of the 2018 twelfth-grade learning outcomes are in the remembering category. 66.67% (f=60) of the 2007 ninth-grade learning outcomes, 60.61% (f=20) of the 2013 ninth-grade learning outcomes, and 70.05% (f=27) of the 2013 ninth-grade learning outcomes are in the understanding category. 64.56% (f=51) of the 2007 tenth-grade learning outcomes, 47.72% (f=19) of the 2013 tenth-grade learning outcomes, and 95.65% (f=22) of the 2018 learning outcomes are in the understanding category. 66.67% (f=50) of the 2007 eleventh-grade learning outcomes, 30.96% (f=17) of the 2013 eleventh-grade learning outcomes, and 74.29% (f=26) of the 2018 eleventh-grade learning outcomes are in the understanding category. 59.09% (f=65) of the 2007 twelfth-grade learning outcomes, 29.73% (f=11) of the 2013 twelfth-grade learning outcomes, and 54.84% (f=17) of the 2018 twelfth-grade learning outcomes are in the understanding category. 18.89% (f=17) of the 2007 ninth-grade learning outcomes, 3.03% (f=1) of the 2013 ninth-grade learning outcomes, and 7.89% (f=3) of the 2013 ninth-grade learning outcomes are in the applying category. 12.69% (f=10) of the 2007 tenth-grade learning outcomes and 5.13% (f=2) of the 2013 tenth-grade learning outcomes are in the applying category, but none of the 2018 learning outcomes (f=0) are in this category. 20.00% (f=15) of the 2007 eleventh-grade learning outcomes, 10.20% (f=5) of the 2013 eleventh-grade learning outcomes, and 11.43% (f=4) of the 2018 eleventh-grade learning outcomes are in the applying category. 16.36% (f=18) of the 2007 twelfth-

grade learning outcomes, 5.41% (f=2) of the 2013 twelfth-grade learning outcomes, and 9.68% (f=3) of the 2018 twelfth-grade learning outcomes are in the applying category. 7.78% (f=7) of the 2007 ninth-grade learning outcomes, 24.24% (f=8) of the 2013 ninth-grade learning outcomes, and 7.89% (f=3) of the 2013 ninth-grade learning outcomes are in the analyzing category. 10.13% (f=8) of the 2007 tenth-grade learning outcomes, 28.20% (f=11) of the 2013 tenth-grade learning outcomes, and 4.35% (f=1) of the 2018 tenth-grade learning outcomes are in the analyzing category. 9.33% (f=7) of the 2007 eleventh-grade learning outcomes, 43.48% (f=20) of the 2013 eleventh-grade learning outcomes, and 14.29% (f=5) of the 2018 eleventh-grade learning outcomes are in the analyzing category. 11.81% (f=13) of the 2007 twelfth-grade learning outcomes, 57.76% (f=21) of the 2013 twelfth-grade learning outcomes, and 12.90% (f=4) of the 2018 twelfth-grade learning outcomes are in the analyzing category. None of the 2007 learning outcomes are in the evaluating category, and very few of the 2013 ninth-grade (3.03%, f=1) and tenth-grade (2.56%, f=1) learning outcomes and the 2018 twelfth-grade (6.45%, f=2) learning outcomes are in the evaluating category. Also, none of the 2007 learning outcomes are in the creating category, and very few of the 2013 tenth-grade (7.69%, f=3), eleventh-grade 4.36%, f=2), and twelfth-grade 2.70%, f=1) and the 2018 ninth-grade (5.26%, f=2) and twelfth-grade (3.23%, f=1) learning outcomes are in the creating category.

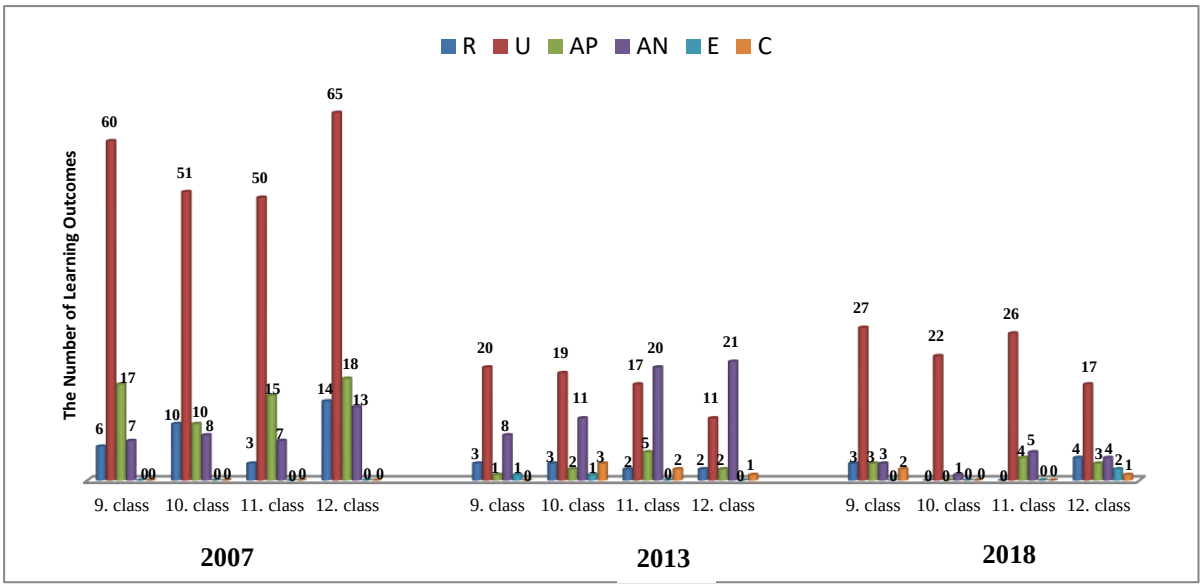


Figure 5. The Distribution of Learning Outcomes in the Cognitive Process Dimension by Year and Grade

Discussion and Conclusion

The study showed that chemistry curriculum learning outcomes had a considerable decrease from 2007 to 2018 (Figure 1). They were considerably simplified. This is in line with 'keeping short provides the essence' principle. It is possible to say that the aim is to provide meaningful learning by introducing basic concepts instead of overloading students with much information (Çepni & Çil, 2016). Moreover, the decrease in the number of learning outcomes given in the curriculum provides convenience for teachers as the number of class hours per learning outcome will increase, and it will be easier to transform learning outcomes into behaviors (Karatay, Timur & Timur, 2013).

The main aim of building up a taxonomy of educational objectives is to facilitate communication (Bloom, et al., 1956). The findings of the study indicate that chemistry curriculum learning outcomes in the knowledge dimension are rather about conceptual knowledge (Table 3). The distribution of learning outcomes in the knowledge dimension over years shows that the coverage of factual knowledge and procedural knowledge decreased from 2007 to 2018 while that of conceptual knowledge increased. It was also seen that the metacognitive knowledge category was not covered in 2007 and in 2018 whereas it is possible to trace metacognitive knowledge in 2013, though at a very low level (Figure 2). It is clear that there has not been a significant change in the metacognitive knowledge category. The distribution of factual knowledge outcomes by grade shows that factual

knowledge outcomes in the ninth grade increased from 2007 to 2013 while there was a decrease from 2013 to 2018. For the tenth and eleventh grades, factual knowledge decreased from 2007 to 2018. Finally, for the twelfth grade, there was a decrease from 2007 to 2013, while there was an increase from 2013 to 2018. The distribution of conceptual knowledge outcomes by grade shows that there was a decrease from 2007 to 2013 for the ninth grade, while there was an increase from 2013 to 2018. However, this does not mean that there was a significant decrease in the conceptual knowledge category. Instead, it means that there was a decrease in the increase of the coverage of conceptual knowledge. Conceptual learning outcomes increased for the tenth and eleventh grades from 2007 to 2018. For the twelfth grade, there was an increase from 2007 to 2013, while there was a decrease from 2013 to 2018, though slightly. However, this does not mean that there was a decrease in the coverage of conceptual knowledge, rather there was a decrease in the amount of the increase. It is possible to say that there is an overall increase in conceptual learning outcomes by grade. The distribution of procedural dimension learning outcomes by grade shows that there was a decrease from 2007 to 2018 for the ninth, tenth, eleventh, and twelfth grades. However, there was not a significant change in the coverage of metacognitive knowledge by grade, and this is an important lack (Figure 3).

Considering the chemistry curriculum as a whole and the cognitive process dimension, it can be concluded that the majority of learning outcomes are in the understanding category (Table 4). From 2007 to 2018, chemistry curriculum learning outcomes in the cognitive process dimension experienced a decrease in the remembering and applying categories, whereas there was an increase in the understanding category. The analyzing category seems fluctuating as there was a significant increase in 2013 compared to 2007; however, there was a significant decrease in 2018 compared to 2013. The evaluating and creating categories were not covered in 2007 though they were included in learning outcomes in 2013 and 2018, though at a low level, which was not sufficient (Figure 4). The distribution of chemistry curriculum learning outcomes in the cognitive process dimension by grade shows that there was not a significant increase or decrease in the remembering category for the ninth grade in 2007, 2013, and 2018. For the tenth and eleventh grades, there was a slight decrease in the remembering category from 2007 to 2018. As for the twelfth grade, there was a slight increase in the coverage of the remembering category from 2007 to 2018. There was a decrease in that of the understanding category from 2007 to 2013 for all grades, whereas there was an increase from 2013 to 2018. However, majority of the learning outcomes were in the understanding category for all grades. In the applying category, there was a decrease from 2007 to 2013 and an increase from 2013 to 2018 for the ninth, eleventh, and twelfth grades. However, for the tenth grade, there was a decrease from 2007 to 2013, and the applying category was not covered in 2018. There was a significant increase from 2007 to 2013 in the analyzing category for the ninth, tenth, eleventh, and twelfth grades while there was a significant decrease from 2013 to 2018. The evaluating category was not covered in 2007, while only a few learning outcomes were about the evaluating category in 2013 for the ninth grade (3.03%, f=1) and the tenth grade (2.56%, f=1), and a few were about this category in 2018 for the twelfth grade (6.45%, f=2), all indicating very low levels. Moreover, none of the learning outcomes in 2007 were about the creating category, and only a few were about this category in 2013 for the tenth grade (7.69%, f=3), eleventh grade (4.36%, f=2), twelfth grade (2.70%, f=1) and in 2018 for the ninth grade (5.26%, f=2) and the eleventh grade (3.23%, f=1), indicating also very low levels (Figure 5).

To conclude, the distribution of chemistry curriculum learning outcomes by year and grade shows that the knowledge dimension mostly covers the conceptual category, and the cognitive process dimension mostly covers the understanding category. Moreover, learning outcomes covering procedural and metacognitive categories of the knowledge dimension and learning outcomes covering the evaluating and creating categories of the cognitive process dimension are either very few or non-existent. This is a very important lack. These results are in line with the results of Zorluoğlu, Kızılaslan and Sözbilir (2016), Yaz and Kurnaz (2017), Zorluoğlu, Şahintürk and Bağrıyanık (2017), Cangüven, Öz, Binzet and Avcı (2017), Zorluoğlu, Güven and Korkmaz (2017), and Eke (2018). Zorluoğlu, Kızılaslan and Sözbilir (2016) analyzed the learning outcomes of the chemistry curriculum for 2013 while Zorluoğlu, Güven and Korkmaz (2017) analyzed the learning outcomes in the 2017 curriculum based on RBT. These studies report that most of learning outcomes in 2013 and 2017 curricula are about conceptual knowledge in the knowledge dimension and that learning outcomes are low-level in the cognitive process dimension, with the outcomes mostly focusing on remembering, understanding, and applying. They state that very little coverage is given to learning outcomes covering high-level cognitive processes such as evaluating and creating. Zorluoğlu, Şahintürk and Bağrıyanık (2017) and Yaz and Kurnaz (2017) studied draft 2013 science curriculum outcomes while Cangüven, Öz, Binzet and Avcı (2017) studied draft 2017 science curriculum outcomes based on RBT. These studies also yielded similar results. The 2013 science curriculum learning outcomes mostly concentrated on conceptual knowledge in the knowledge dimension while fewest learning

outcomes were about metacognitive knowledge. In the cognitive process dimension, learning outcomes were mostly about the understanding category while fewest learning outcomes covered high-level cognitive processes such as evaluating and creating. Similarly, draft 2017 science curriculum learning outcomes were mostly about understanding, which is a low-level cognitive process. Eke (2018) analyzed the 2018 physics curriculum learning outcomes based on RBT. That study also revealed that most of the learning outcomes were about conceptual knowledge in the knowledge dimension and about understanding in the cognitive process dimension. These results indicate that learning outcomes for the science, physics, and chemistry courses are mostly low-level, concentrating on conceptual knowledge and understanding.

The taxonomy approach not only helps teachers understand and observe the learning outcomes of curricula but also guides them through their efforts to prepare questions that will assess students (Anderson et al., 2010). Learning becomes more effective and meaningful when students seek answers to the questions they face (Koray, Altunçekiç & Yaman, 2005). The quality of questions that will assess students is of importance. In this sense, teachers' question preparing skills are important as well. The results obtained from certain previous studies in the literature dwelling on Bloom's Taxonomy, Revised Bloom's Taxonomy, and assessment in the teaching process are given below. Similar results were also obtained with these studies. Koray, Altunçekiç and Yaman (2005) studied preservice science teachers' question-asking skills. They reported that preservice science teachers' skills of asking knowledge and comprehension questions are better than their skills of asking questions in other areas. Dindar and Demir (2006) analyzed fifth grade teachers' science exam questions based on Bloom's Taxonomy. They ascertained that 65% of the questions were at the knowledge level. Ayvacı and Türkdoğan (2010) studied science and technology teachers' written exam questions based on RBT. They revealed that 38.8% of the questions covered factual knowledge in the knowledge dimension and 38% were in the conceptual knowledge dimension, whereas 38.4% were associated with remembering, 16.3% understanding, 8.5% analyzing, 23.1% evaluating, and 0.5% creating in the cognitive process dimension. Özcan and Oluk (2007) dealt with the sixth, seventh, and eighth grade science teachers' written exam questions based on Bloom's Taxonomy. They determined that 39% of the questions were at the knowledge level, 25% at the comprehension level, 32% at the application level, and 4% at the analysis and synthesis stages. Gündüz (2009) scrutinized the sixth, seventh, and eight grade science and technology teachers' written exam questions and detected that 64.65% of the questions were at the knowledge level, 9.68% at the comprehension level, 17.86% at the application level, 4.51% at the analysis level, 0.94% at the synthesis level, and 2.34% at the evaluation level.

Previous studies show that science teachers' exam questions are rather low-level based on Bloom's Taxonomy or Revised Bloom's Taxonomy. The analysis on the learning outcomes of curricula as well as the questions asked by teachers show that the outcomes and the questions are rather low-level based on Bloom's Taxonomy or Revised Bloom's Taxonomy. The Revised Bloom's Taxonomy guides academics and teachers through preparation of curricula and teaching and assessment of courses. In-service trainings may be provided for teachers to better understand the curricula prepared based on Bloom's Taxonomy and to use the taxonomy more consciously in their courses. In addition, preservice teachers studying in faculties of education may be equipped with elaborated awareness on various course contents (curriculum development, assessment and evaluation, teaching practice, etc.).

Acknowledgments

This research was presented at the 6. Congress of Chemistry Education, Ankara, Turkey 2-4 May 2019.

Statement of Publication Ethics

We (The authors) declare that the research has no unethical problems and we observe research and publication ethics.

Conflict of Interest

The study has no conflict of interest.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Mehmet DiyaddinYaşar	☒	☒	☒	☒	☒	☒
Sibel Sadi Yılmaz	☒	☒	☒	☒	☒	☒

References

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R, Raths, J., & Wittrock, M. C. (2010). *Öğrenme öğretim ve değerlendirme ile ilgili bir sınıflama: Bloom'un eğitim hedefleri ile ilgili sınıflamasının güncelleştirilmiş biçimi [A taxonomy for learning teaching and assessing: A revision of Bloom's taxonomy of educational objectives]* (Çev. D. A. Özçelik). Ankara: Pegem Publishing. (Orijinal yayın tarihi, 2001)

Ayvacı, H. Ş., & Türkdoğan, A. (2010). Yeniden yapılandırılan Bloom taksonomisine göre fen ve teknoloji dersi yazılı sorularının incelenmesi [Analysing "science and technology course exam questions" according to revised Bloom taxonomy]. *Türk Fen Eğitimi Dergisi*, *7*(1), 13-25.

Beyreli, L., & Sönmez, H., (2017). Bloom Taksonomisi ve Yenilenmiş Bloom Taksonomisi ile ilgili Türkiye'de yapılan çalışmaların odaklandığı araştırma konuları [Research issues focused on studies concerning Bloom taxonomy and the revised Bloom taxonomy in Turkey]. *International Journal of Languages' Education and Teaching, 5*(2), 213-229.

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals.* B. S. Bloom (Edt.). USA: Longmans.

Büyükkaragöz, S., & Çivi, C. (1999). *Genel öğretim metotları: öğretimde planlama uygulama [General teaching methods: planning, practice in teaching]*. İstanbul: Beta Publishing.

Cangüven, H. D., Öz, O., Binzet, G., & Avcı, G. (2017). Milli Eğitim Bakanlığı 2017 Fen Bilimleri Taslak Programı'nın Yenilenmiş Bloom Taksonomisine göre incelenmesi [Examination of ministry of national education 2017 draft science program according to revised Bloom taxonomy]. *International Journal of Eurasian Education and Culture*, *2*(2), 62-80.

Çepni, S., & Çil, E. (2016). *Fen bilimleri dersi öğretim programı (tanıma planlama uygulama ve TEOG ile ilişkilendirme): İlkokul ve ortaokul öğretmen el kitabı* (6. Baskı) *[Science course curriculum (recognition, planning, application and correlation with TEOG): Primary and secondary school teacher handbook]*. Ankara: Pegem Publishing.

Dindar, H., & Demir, M. (2006). Beşinci sınıf öğretmenlerinin fen bilgisi dersi sınav sorularının Bloom taksonomisine göre değerlendirilmesi [Evaluation of fifth grade primary teachers' questions in science exams according to Bloom taxonomy]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *26*(3), 87-96.

Doğanay, A., & Sarı, M. (2008). *Öğretim amaçlarının belirlenmesi ifade edilmesi ve uygun içeriğin seçimi [Determination, expression of teaching objectives and selection of appropriate content].* A. Doğanay (Edt., 2. Baskı). Öğretim ilke ve yöntemleri [Teaching principles and methods]. Pegem Akademi Yayıncılık, Ankara.

Eke, C. (2018). Ortaöğretim fizik dersi öğretim programındaki kazanımların Yenilenmiş Bloom Taksonomisi'ne göre analizi [Analysis of objectives of high school physics curriculum According to the Revised Bloom's Taxonomy]. *Sosyal Araştırmalar ve Davranış Bilimleri Dergisi*, *4*(6), 69-84.

Gündüz, Y. (2009). İlköğretim 6, 7 ve 8. sınıf fen ve teknoloji sorularının ölçme araçlarına ve Bloom'un Bilişsel Alan Taksonomisine göre analizi [Analysis of primary school 6,7, and 8 grades science and technology questions according to measurement scales and Bloom's taxonomy of the cognitive domain]. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi*, *6*(2), 150-165.

Karatay, Timur & Timur, (2013). 2005 ve 2013 yılı fen dersi öğretim programlarının karşılaştırılması [Comparison of 2005 and 2013 science course curricula]. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 6*(15), 233-264.

Koray, Ö., Altunçekiç, A., & Yaman, S. (2005). Fen bilgisi öğretmen adaylarının soru sorma becerilerinin Bloom Taksonomisine göre değerlendirilmesi [Evaluation of science teacher candidates' questioning skills according to Bloom Taxonomy.]. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, *17*(17), 33-39.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212-218.

Miles, M. B., & Huberman, A. M. (1994). Q*ualitative data analysis: An expanded sourcebook* (2nd Edition). California: Sage Publications.

Özcan, S., & Oluk, S. (2007). İlköğretim fen bilgisi derslerinde kullanılan soruların Piaget ve Bloom taksonomisine göre analizi [Analysis of questions used in science lessons at primary school according to Piaget and Bloom taxonomy]. *DÜ Ziya Gökalp Eğitim Fakültesi Dergisi 8,* 61-68.

Sönmez, V. (2010). *Program geliştirmede öğretmen el kitabı [Teacher handbook in curriculum development]* (16. Baskı). Ankara: Anı Publishing.

Yaz, Ö. V., & Kurnaz, M. A. (2017). 2013 fen bilimleri öğretim programının incelenmesi [The examination of 2013 science curricula]. *Uluslararası Türk Eğitim Bilimleri Dergisi, 8*, 173-184.

Yıldırım, A., & Şimşek, H. (2011). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences]* (6. Baskı). Ankara: Seçkin Publishing.

Zorluoğlu, S. L., Kızılaslan, A., & Sözbilir, M. (2016). Ortaöğretim kimya dersi öğretim programı kazanımlarının yapılandırılmış Bloom taksonomisine göre analizi ve değerlendirilmesi [Analysis and evaluation of learning outcomes in high school chemistry curriculum according to revised Bloom taxonomy]. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi,* 10(1), 260-279.

Zorluoğlu, S. L., Şahintürk, A., & Bağrıyanık, K. E. (2017). 2013 yılı fen bilimleri öğretim programı kazanımlarının yenilenmiş Bloom taksonomisine göre analizi ve değerlendirilmesi [Analysis and evaluation of science course curriculum learning outcomes of the year 2013 according to the revised Bloom taxonomy]. *Bartın Üniversitesi Eğitim Fakültesi Dergisi, 6*(1), 1-15.

Zorluoğlu, S. L., Güven, Ç., & Korkmaz, Z. S. (2017). Yenilenmiş Bloom taksonomisine göre analiz örneği: 2017 taslak ortaöğretim kimya dersi öğretim programı [Analysis of a sample according to the revised Bloom taxonomy: The draft line curriculum of secondary school chemistry 2017]. *Mediterranean Journal of Humanities, 7*(2), 467-479.

Appendix 1:

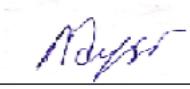
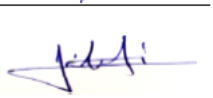
Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Analysis, Evaluation and Comparison of the 2007, 2013 and 2018 Chemistry Curriculum Learning Outcomes Based on the Revised Bloom's Taxonomy
Discipline	Chemistry education
Type of Article	Research article
Year of Data Collection	2019

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that the data collected through document analysis in 2019.

Date 08/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Harran University	Assoc. Prof.	Mehmet Diyaddin YAŞAR	
2.	Kafkas University	Assist. Prof.	Sibel SADİ YILMAZ	
3.	-	-	-	-
-	-	-	-	-

Correspondent Author's Info

Institute	Harran University
Postal address	Harran Üniversitesi Eğitim Fakültesi E Blok - Osmanbey Yerleşkesi 63190 Şanlıurfa / TÜRKİYE
E-mail	mdiyaddinyasar@harran.edu.tr
Phone	0544 503 6783

Topuz, F., & Cantürk Günhan, B. (2020). Content analysis of research on processes of constructing knowledge in mathematics education in Turkey. *Bartın University Journal of Faculty of Education*, 9(2), 279-300.

Bartın University Journal of Faculty of Education, 9(2), 279-300

buefad.bartin.edu.tr

Content Analysis of Research on Processes of Constructing Knowledge in Mathematics Education in Turkey

Faden TOPUZ *[a], Berna CANTÜRK GÜNHAN[b]

Article Info

DOI:10.14686/buefad.578076

Article History:
Received: 19.06.2019
Accepted: 29.04.2020
Published: 05.06.2020

Keywords:
processes of constructing knowledge,
mathematics,
content analysis

Article Type:
Research Article

Abstract

APOS, RBC, procept and abstraction theory with the students' knowledge creation processes on researches, are examined in order to scan in National Thesis Center, ULAKBİM, Google Scholar and papers in the symposium. A total of 27 postgraduate thesis, 15 articles and 8 papers were included in the study. By using descriptive content analysis method; the research was conducted by taking into consideration the year-type-publication language, sample-number and sampling type, the preferred topic and information creation theory in the research, the model-pattern and validity-reliability used, data collection tools and data analysis methods. It was determined that the most studies were conducted in 2018, and in the field of algebra learning with numbers. Most of the studies were conducted at middle school level. Studies were conducted with a small number of students in terms of sample numbers. In most of the researches, qualitative models were preferred and mostly open-ended questions, achievement tests, video and audio recordings as well as data diversity were used for data collection. There were some deficiencies in the researches about the validation and reliability of the studies with sampling methods. In order to overcome these deficiencies, research methods courses given to the researches can be made more effective.

Türkiye'de Matematik Eğitiminde Bilgiyi Oluşturma Süreçleri İle İlgili Araştırmaların İçerik Analizi

Makale Bilgisi

DOI:

Makale Geçmişi:
Geliş: 19.06.2019
Kabul: 29.04.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Bilgi oluşturma süreçleri,
matematik,
içerik analizi

Makale Türü:
Araştırma Makalesi

Öz

Türkiye'de APOS, RBC, procept ve soyutlama teorileriyle öğrencilerin bilgi oluşturma süreçleri üzerine yapılan araştırmaları incelenmek amacıyla YÖK Ulusal Tez Merkez, ULAKBİM, Google Akademik ve sempozyumlardaki bildiriler kapsamında tarama yapılmıştır. Yapılan taramada toplam 27 lisansüstü tez, 15 makale ve 8 bildiri araştırmaya dâhil edilmiştir. Araştırmalar, betimsel içerik analizi yöntemi kullanılarak; araştırmanın yapıldığı yıl-türü-yayın dili, örneklem düzeyi-sayısı ve örnekleme çeşidi, araştırmada tercih edilen konu ve bilgi oluşturma teorisi, kullanılan model-desen ve geçerlik-güvenirlik sağlanması, veri toplama araçları ve veri analiz yöntemlerine göre sınıflandırılmıştır. En fazla çalışmanın 2018 yılında ve sayılar ile cebir öğrenme alanında çalışıldığı belirlenmiştir. Çalışmalar en fazla ortaokul düzeyinde yapılmıştır. Örneklem sayıları yönüyle genel olarak az sayıda öğrencilerle çalışmalar yürütülmüştür. Araştırmaların çoğunda nitel model tercih edilerek verilerin toplanmasında açık uçlu sorular, başarı testleri, video ve ses kayıtları ile veri çeşitlemesi kullanılmıştır. Örnekleme yöntemleri ile çalışmaların geçerlik ve güvenirlik süreçlerinin yansıtılması konusunda araştırmalarda bazı eksiklikler görülmüştür. Bu eksikliklerin giderilmesi amacıyla araştırmalara verilen araştırma yöntemleri dersleri daha etkili bir duruma getirilebilir.

***Corresponding Author:** fadentopuz@gmail.com
[a] PhD student, Dokuz Eylül Üniversity, Institute of Education Sciences, İzmir/Turkey. http://orcid.org/0000-0003-0642-734X
[b]Assoc. Prof., Dokuz Eylül University, Faculty of Buca Education, İzmir/Turkey. http://orcid.org/ 0000-0002-9585-0811

Introduction

In recent years, it is seen that the qualitative researches on which the factors affecting learning are examined, as well as how the students construct the knowledge, which stages they pass during the constructing knowledge, and at which levels of thinking they take place are among the important research subjects. It is known that the process of learning the concepts, the stages of structuring, the meaning of understanding, and the development of cognitive structures in the mind are important for learning and teaching of mathematics (Açan, 2015; Akkaya, 2010; Bahar, 2017; Bulut, 2018; Deniz,2014; Güler & Arslan, 2018; Öksüz, 2018). In this sense, it is necessary to employ the theories that will make it easier for students to determine their learning paths and levels according to their level. APOS and RBC theories appear in the literature about the process of constructing knowledge of students.

APOS theory, which shows the stages of cognitive development in the mind during the learning of concepts, is based on Piaget's theory of reflective abstraction (Dubinsky, 1991). APOS theory first appeared in the studies of RUMEC (Research Society of Mathematics Education Community) founded in 1995 by Dubinsky (Cottrill, Dubinsky, Nichols, Schwingendorf, Thomas and Vidakovic, 1996). Dubinsky (2000) has focused on five basic mental mechanisms for the development of advanced mathematical thinking, including internalization, encapsulation, reversal, coordination, generalization-thematization. According to APOS theory, it is necessary to cope with a mathematical situation and to create cognitive structures called action, process, object and schema by using these mental mechanisms (Dubinsky, Weller, McDonald & Brown, 2005).

The idea of abstraction from Aristotle to the present is presented with various definitions. Russell (1926) considered abstract thought as the highest level of human intelligence and as the most powerful tool in Sierpinska (1994, p. 61) defined the action of the separation of certain features from a concept as abstraction. Nowadays, it is seen that the abstraction is interpreted with two points of view as cognitive and sociocultural. Decontexualization the context with respect abstraction cognitive approaches using characteristics of the concept and Piagets (1985) indicating that occurs upon its relationship to other concepts is to speak of empirical and semi-empirical abstraction it noted that occur at similar process. According to Piaget, the subject in experimental abstraction observes a large number of objects and isolates their common characteristics while the process in semi-experimental abstraction proceeds in the same way as experimental abstraction, and in later stages, actions are applied on objects. Another idea that Piaget put forward about abstraction is reflective abstraction. It is thought that abstraction is a mechanism developed for the mental structures in the development of thought as well as the logical-mathematical structures in the mind of the individual (Arnon, Cottrill, Dubinsky, Oktaç, Fuentes, Trigueros & Weller, 2014). As a matter of fact, the idea of reflective abstraction is also the basis for further research on abstractions (Tall, 1991). Also, Dienes (1961: p. 281), used abstraction from a cognitive point of view, defines abstraction as a process of making a common feature from different situations; Skemp (1986) sees the similarities in a previously formed classification as a continuous change in recognition of new experiences. When abstraction is interpreted from a sociocultural perspective, it is thought that learning cannot be separated from the environment, social interaction and use of tools. Noss and Hoyles (1996), some of the researchers with a sociocultural perspective, produced the idea of situational abstraction, which supports students to understand how they create mathematical ideas by extracting results from the materials they use and the dispersed components in the environment.

Procept refers to a high level of reasoning that expresses both a process and a concept that is formed by the merging of process and concept words (Gray & Tall, 1991). While the theory of APOS theory examines the formation and the relationship between process and object thoughts, procept explains this situation with the symbols used in the representation of concepts (Bayazit, 2016). In this context, it can be said that the idea of procept is a learning theory which is considered in the understanding of the processes of constructing the knowledge of students.

The RBC abstraction model introduced by Hershkowitz, Schwarz and Dreyfus in 2001 and which became an RBC + C abstraction model by Dreyfus in 2007 is also based on Davydov's (1990) Knowledge Creation Philosophy and Leontev's (1981) Theory of Activity. RBC defined abstraction as in vertically re-organization activity of pre-acquired mathematical knowledge to form a new mathematical structure (Dreyfus, 2007; Hershkowitz, Schwarz, & Dreyfus 2001). RBC + C based on the theory that abstraction can be observed by cognitive actions, it is stated

that four different cognitive actions enable the study of recognition, building with, consruction and consolidation processes of constructing the knowledge (Dreyfus, 2007).

First of all, the theory of reducing abstraction developed by Hazzan (1999) was used by abstraction levels to explain the perception of abstract algebra concepts of undergraduate students. These abstraction levels are:

- quality of the relationship between the thought object and the thinking person
- reflection of process-object duality
- the degree of complexity of the thought mathematical concept

In short, the idea of reducing abstraction is based on the tendency of students to work with abstraction at a level lower than the abstraction level in which the concepts are given (Şenay & Özdemir, 2014).

In the literature, it is seen that researches about the process of constructing knowledge and different mathematical concepts are studied within the framework of APOS and RBC + C theories and it is seen that efforts are made to contribute to the development of theories. In this study, it has been tried to contribute to the literature by content analysis of the researches. In this context, when the content analysis in the literature is examined, it is seen that the content analysis studies conducted in mathematics education are quite few. Descriptive content analysis of Albayrak's (2017) mathematical model and modeling studies, Aztekin and Taşpınar Şener's (2015) meta-synthesis study of mathematical modeling studies in the field of mathematics education, Gül and Sözbilir's (2015) thematic content analysis for scale development studies in science and mathematics education, Kutluca, Hacıömeroğlu and Gündüz's (2016) computer assisted mathematics teaching, Ulutaş and Ubuz's (2008) researches in mathematics education between 2000 and 2006 and content analysis of technology-assisted mathematics education research of Tatar, Kağızmanlı and Akkaya (2013), Çiltaş, Güler and Sözbilir (2012) mathematics education on research content analysis was found. However, no content analysis, meta-analysis, or meta-synthesis studies have been found for the process of constructing knowledge. However, increasing the number of content analysis, meta-analysis and meta-synthesis studies on various subjects is important for researchers to open new research areas. As a result; no relevant research has been found in the literature. What kind of results discussion has been obtained in this context made the content analysis of the prepared research with the process of creating knowledge in math in Turkey in existing research in the process of creating knowledge with the students intended this research by working on what topics, researchers and educators to new research aims also be given new ideas. The sub-problems of the research for these purposes are as follows:

In the process of generating information in mathematics;

- ✓ What is the distribution by type of research?
- ✓ What is the distribution by publication language?
- ✓ What is the distribution by years?
- ✓ What is the distribution of the subjects studied according to the learning areas?
- ✓ What is the preferred process of constructing knowledge theory?
- ✓ How is the model and pattern distribution used?
- ✓ How is the sample-size distribution and sampling type?
- ✓ Are validity and reliability criteria included? What criteria are reflected?
- ✓ What is the distribution according to the data collection tools used?
- ✓ What is the distribution according to the data analysis methods used?

Method

Research Model

In this study, prepared by research in mathematics process of constructing knowledge in Turkey were examined. In this context, document analysis method was used. Document analysis involves the analysis of printed materials for the intended purpose in the study (Yıldırım & Şimşek, 2016). According to Yıldırım and Şimşek

(2016), in the document analysis method, firstly a framework for descriptive analysis is created, then the data is arranged according to the thematic framework, and finally the findings are presented and interpreted.

Sample

Freankel and Wallen (2006) stated that although all sampling methods can be preferred in content analysis, it is purposeful for sampling. For the purpose of this study, criterion sampling was used from purposive sampling methods. Criteria: i) the sample is Turkey ii) APOS, RBC, procept and abstractions theories are studied. In order to determine the studies included in the study, the Higher Education Council National Research Center / ULAKBIM / Google Scholar conducted an advanced screening. For the purposes of the research, "APOS", "RBC", "RBC + C", "processes of construction knowledge", "abstraction" and "mathematics", "procept", "object-process" keywords were used for the purposes of this study. Theses produced in theses and articles were included in the research. It was observed that the studies included in this study as a result of screening were between 2005-2019 and between. In the screening, 3 of the theses were closed to access but they were examined according to the information in the summary sections. A total of 27 postgraduate theses, 15 articles and 8 papers were included in the study (See Appendix 2).

Data Collection Tool

"*Research Classification Form"* (See Appendix 1), which was developed by the researchers and finalized in accordance with the opinions of an expert, was used as a data collection tool. Research classification form consists of thirteen chapters; general information about the research, year-type-publication language of the research, sample-size and sampling type, preferred topic in the research, construction knowledge theory, model-pattern and validity-reliability, data collection tools and data analysis methods.

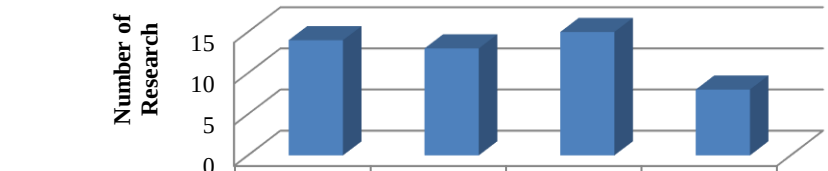
Data Analysis

Content analysis technique was used to evaluate the data obtained from the studies included in the study.When we look at the literature, we see that there are generally three types of content analysis with all advantages. Meta-synthesis, which is defined as a thorough synthesis and interpretation of research on a common subject in accordance with a specific theme (Au, 2007; Finfgeld, 2003; Walsh & Downe, 2005), is a quantitative study of research with the same subject or related purpose. meta-analysis of the findings by using appropriate statistical methods (Büyüköztürk, Kılıç, Çakmak, Akgün, Karadeniz & Demirel, 2016; Cooper, Hedges, & Valentine, 2009; Dinçer, 2014; Durlak, 1995; Wolf, 1986) and preferred for the purpose of this study. "Descriptive Content Analysis" is a systematic and renewable method for determining the tendencies and consequences of quantitative and qualitative research on a common subject (Çalık, Ünal, Coştu & Karataş, 2008; Göktaş, 2012; Jayarajah, Saat & Rauf, 2014; Lin, Lin & Tsai, 2014; Selçuk, Palancı, Kandemir & Dündar, 2014; Sözbilir, Kutu & Yaşar, 2012; Suri & Clarke, 2009; Umdu Topsakal, Çalık & Çavuş, 2012). In this context, it is thought that every research to be conducted with these kinds of analyzes can guide new researches, and this research, which examines the students' knowledge building processes in depth, will give a perspective on mathematics education. In this context, descriptive content analysis was preferred because it was appropriate for the purpose of this study. Researchers classified together twelve studies which were randomly selected among the studies. The remaining studies were classified independently by each researcher. The researches classified later were discussed in order to increase the reliability and disagreements on the classifications were eliminated. The data were presented in descriptive form as graph, frequency and percentage.

Results

In this section, the findings obtained from the descriptive content analysis in accordance with the various criteria mentioned below, including 27 theses, 15 articles and 8 papers are presented.

Findings of Distribution According to Research Types

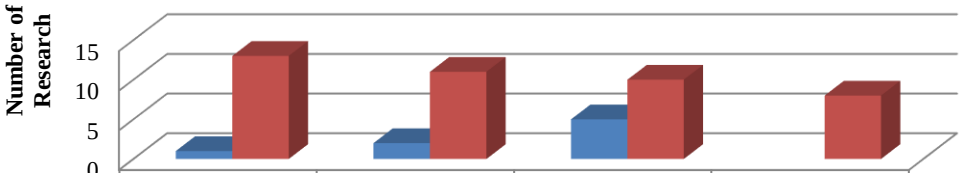


	Master's Thesis	Doctoral Thesis	Article	Paper
Number of Research	14	13	15	8

Figure 1. Distribution of Research by Type

When the distribution of the researches according to the types are examined, it is seen that there are 27 (54%) graduate thesis, 14 (28%) of them are master's thesis, 13 (26%) are doctoral thesis, 15 (30%) are articles and 8 (16%) are papers (Figure 1). It is determined that thesis are more than the articles in their distribution according to the types of research.

Findings of Distribution According to Publication Language



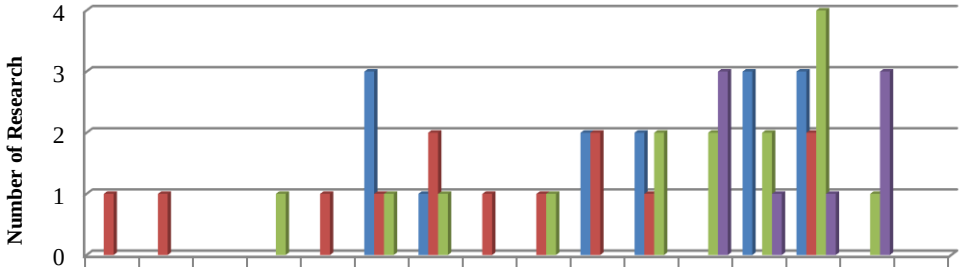
	Master's Thesis	Doctoral Thesis	Article	Paper
English	1	2	5	
Turkish	13	11	10	8

Figure 2. Publication Language of Studies

Eight of the studies (16%) reported that the language of publication was English and 42 (84%) of them were Turkish. 5 (10%) of the articles were English.

Findings of Distribution by Years

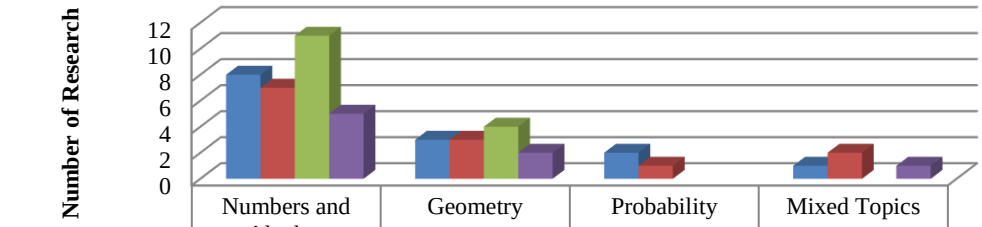
When the related researches are in the years 2005-2019 and the research types in all years are examined, it is seen that the research numbers are close to each other (Figure 3). In addition, it has been determined that the research has increased since 2014.



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Master's Thesis						3	1			2	2		3	3	
Doctoral Thesis	1	1			1	1	2	1	1	2	1			2	
Article				1		1	1		1		2	2	2	4	1
Paper												3	1	1	3

Figure 3. Distribution of Researches by Years

Findings Related to the Distribution of Subjects by Learning Areas



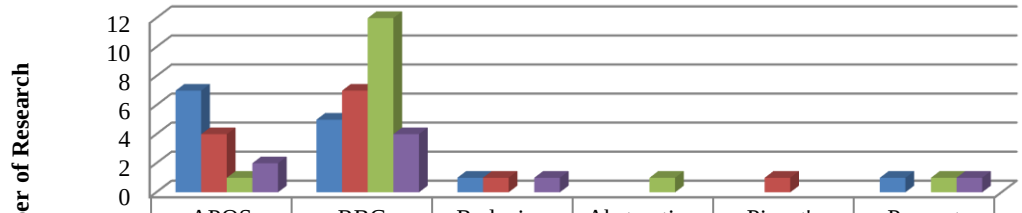
	Numbers and Algebra	Geometry	Probability	Mixed Topics
Master's Thesis	8	3	2	1
Doctoral Thesis	7	3	1	2
Article	11	4		
Paper	5	2		1

Figure 4. Subject Areas of Research

As seen in Figure 4, content analysis includes mathematics subjects from primary, secondary, high school and undergraduate. It is seen that these researches at different levels of education are subject to different learning areas in mathematics curriculum. Research subjects have been identified as “numbers and algebra” (62%) , “geometry” (24%), “probability” (6%) and “mixed topics” (8%). It was determined that the most “numbers and algebra” (62%) and least “probability” (6%) were studied in the learning area. Researches on the process of construction knowledge on more than one subject has been included in the mixed topics.

When we examine the researches at the level of the subjects studied, in *elementary school;* fraction, inequality, symmetry and geometry. *At secondary* level; coordinate system, linear relationship information, slope, identity, patterns, proportion-ratio, integers, exponential numbers, irrational numbers, polygons, triangular inequality, Pythagorean theory, transformation geometry, symmetry, rectangular prism and volume, surface area of vertical cylinder, geometry. It is seen that the most studied subjects are equations and probability. *At high school* level; the concept of irrational numbers and general algebra issues were studied in one study and the others were studied. In the studies conducted at the *undergraduate* level, probability, combination, limit, derivative, parabola, number theory, spherical geometry, analytical geometry, as well as functions in three studies have been studied. Generally speaking, it can be said that the most studied subjects are equations and functions.

Findings of Preferred Construction Knowledge Theory

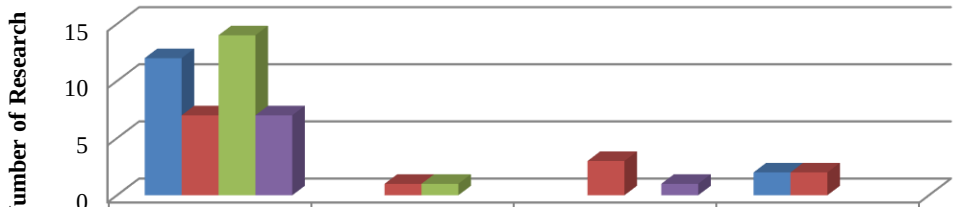


	APOS	RBC	Reducing Abstraction	Abstraction ve Generalization	Piaget's Abstraction Theory	Procept
Master's Thesis	7	5	1			1
Doctoral Thesis	4	7	1		1	
Article	1	12		1		1
Paper	2	4	1			1

Figure 5. Processes of Knowledge Creation Processes

The RBC and RBC + C studies were evaluated as RBC. Most of the researches was conducted with APOS (28%) and RBC (56%) theories. Out of these two theories, it is observed that reducing abstraction (6%), abstraction-generalization (2%), Piaget's abstraction theory (2%) and procept theory (6%) are included in the studies. Although APOS and RBC theories form the main framework of the research in general, the procept theory in research, Piaget's abstraction processes, realistic mathematics education, predictive learning road map and mathematical habits approaches of the mind, from the ideas of Tall / Vinner and Gray / Tall, Bloom taxonomy, mathematical power, Van Hiele geometric thinking levels, visualization, dynamic geometry software support is also seen.

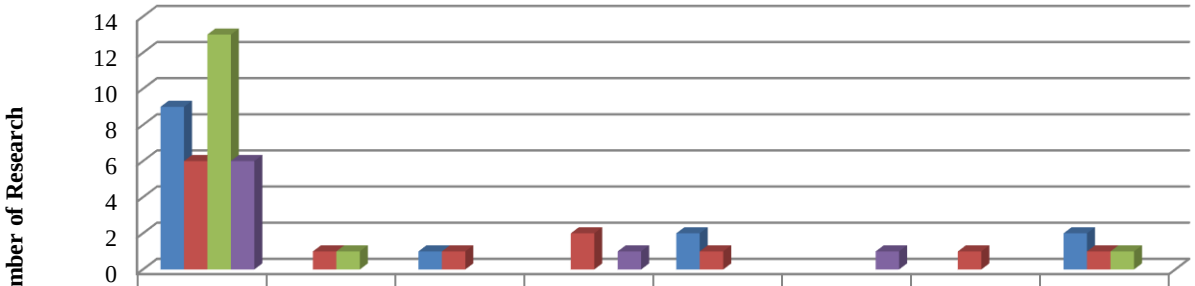
Findings of Model and Pattern Distribution Results



	Qualitative	Quantitative	Qualitative and Quantitative	Mixed
Master's Thesis	12			2
Doctoral Thesis	7	1	3	2
Article	14	1		
Paper	7		1	

Figure 6. Preferred Models in Research

In 3 studies, the preferred model type is not mentioned. 2 of these researches are qualitative research, 1 is a qualitative research considering the general process of the research and it is reflected in the data categories. In this case, 80% of the research qualitative, 8% of the qualitative and quantitative, 8% of mixed and 4% of the quantitative model has been preferred.

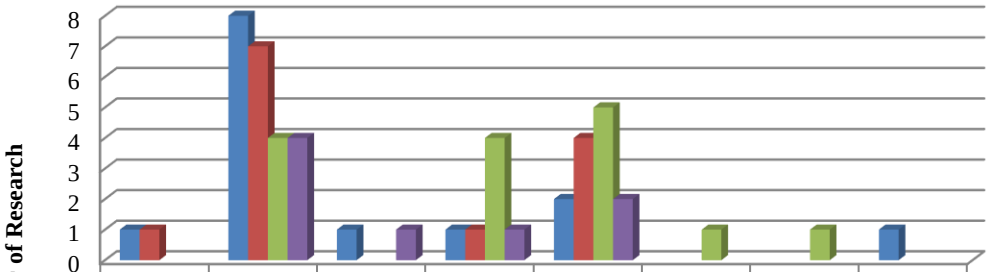


	Case Study	Semi-experimental	Case Study and Survey	Case Study and Semi-experimental	Teaching Experiment	Phenomenology	Nested Embedded Pattern	Other
Master's Thesis	9		1		2			2
Doctoral Thesis	6	1	1	2	1		1	1
Article	13	1						1
Paper	6			1		1		

Figure 7. Preferred Pattern Types in Research

68% of the studies were case studies , 4% were semi-experimental, 4% were case studies and survey, 6% were case studies and quasi-experimental, 6% were teaching experiments, 2% were phenomenology and 2% nested embedded patterns are preferred (Figure 7). In 4 studies (8%), the preferred pattern type was not specified.

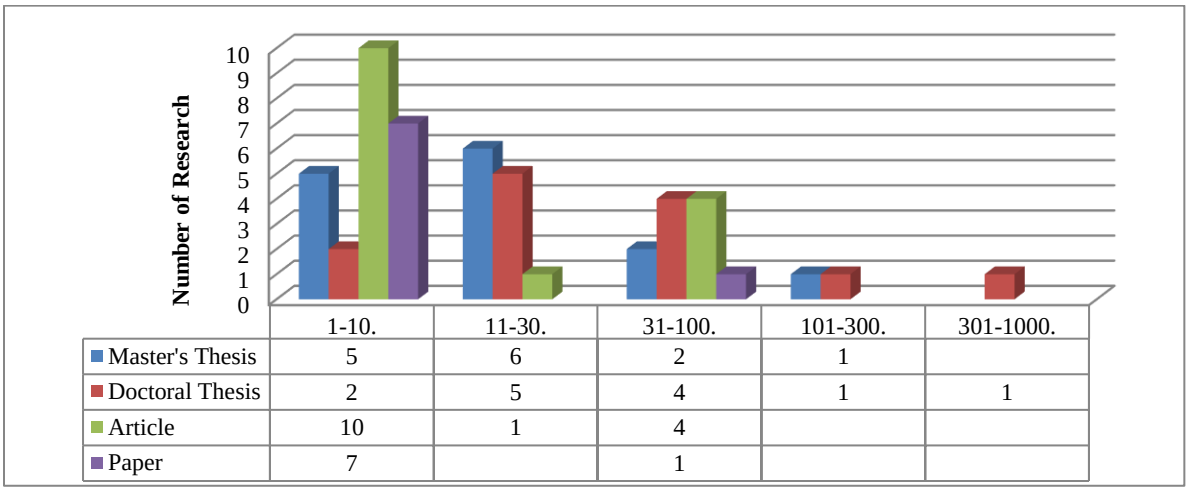
Findings of Distribution of Sample Level, Sample Size and Sampling Type



	Primary School Students	Secondary School Students	Secondary and High School Students	High School Students	Undergraduate Students	High School Maths Teacher (PhD Students)	High, Undergraduate and Graduate Students	Undergraduate and Graduate (Master) Student
Master's Thesis	1	8	1	1	2			1
Doctoral Thesis	1	7		1	4			
Article		4		4	5	1	1	
Paper		4	1	1	2			

Figure 8. Sample Level of Research

When the sample levels of the researches were examined, it was found that most of the researches were at the level of secondary school (46%), undergraduate (26%), high school (14%), primary school (4%) and graduate degree (PhD students) (2%). In 4 researches, it was determined that the process of forming information together with the participants in different teaching levels were conducted.

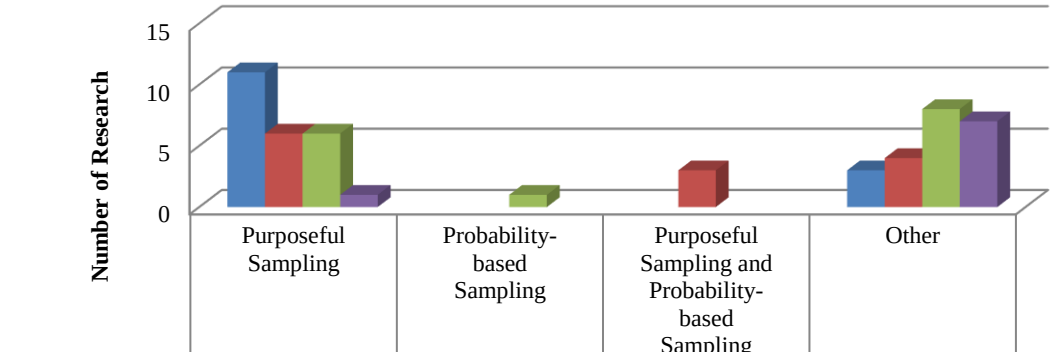


	1-10.	11-30.	31-100.	101-300.	301-1000.
Master's Thesis	5	6	2	1	
Doctoral Thesis	2	5	4	1	1
Article	10	1	4		
Paper	7		1		

Figure 9. Distribution of Sample Size by Research Type

It was determined that the studies were conducted with a small number of students. In addition, it was seen that the number of samples was limited by the number of tests among the larger study groups in determining the number

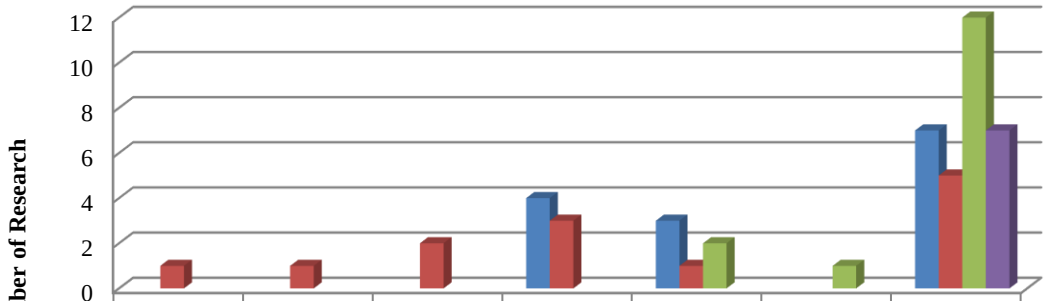
of samples. 48% of the studies were conducted in the range of 1-10, 24% in the 11-30 range, 22% in the 31-100 range, 4% in 101-300 and 2% in the 301-1000 range. At the same time, most of the theses are in the 11-30 range and most of the articles are in the sample sizes in the range of 1-10.



	Purposeful Sampling	Probability-based Sampling	Purposeful Sampling and Probability-based Sampling	Other
Master's Thesis	11			3
Doctoral Thesis	6		3	4
Article	6	1		8
Paper	1			7

Figure 10. Preferred Sampling in Research

It was observed that the preferred sampling type was specified in 28 (56%) of the investigated studies, while the other 22 (44%) did not indicate what the sampling type was. Purposeful and probabilistic sampling was used in 3 (6%) studies and probabilistic sampling was preferred in 1 (2%) study (Figure 10).



	Cluster Sampling	Deviant Case Sampling and Stratified Sampling	Extreme and Deviant Case Sampling	Criterion Sampling	Maximum Variation Sampling	Convenience Case Sampling	Other
Master's Thesis				4	3		7
Doctoral Thesis	1	1	2	3	1		5
Article					2	1	12
Paper							7

Figure 11. Sampling Methods

Of the 28 studies in which the sampling type was specified, 7 were selected as criterion sampling, 6 as maximum variation sampling, 2 as extreme and deviant case sampling, one cluster sampling, one convenience case

sampling, one case and stratified sampling methods were preferred. In 10 of these 28 studies, it was found that they did not specify to sampling methods.

Findings of Validity and Reliability Indication in Research

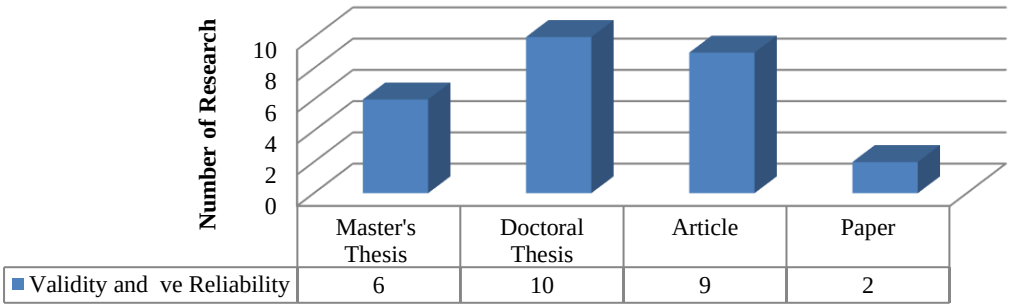


Figure 12. Determination of Validity and Reliability in Research

While 27 (54%) studies examined the process for validity and reliability, the other 23 (46%) studies did not mention this process. In 16 (32%) of the thesis, 9 (18%) of the articles and 2 (4%) of the papers were mentioned about the process to provide validity and reliability for the study. The validity and reliability of the studies are given in Figure 13.

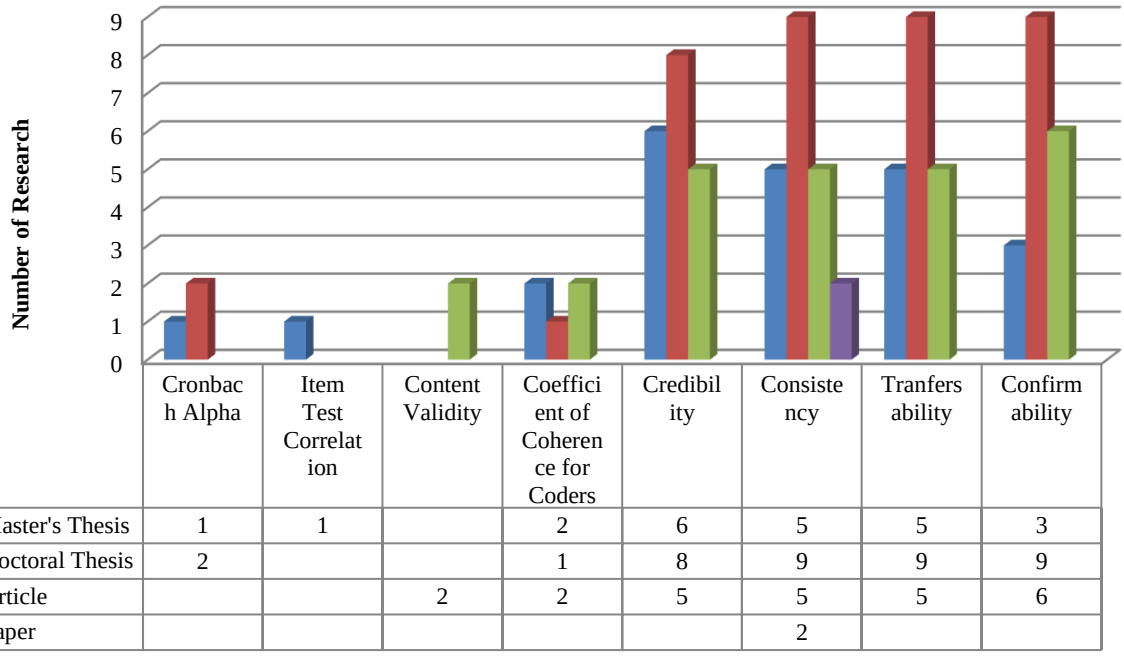
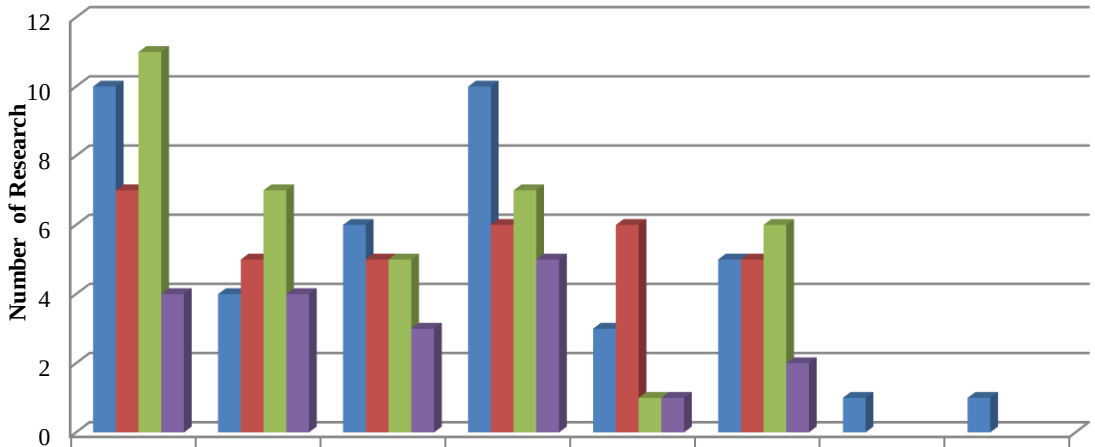


Figure 13. Validity and Reliability Types in Research

Since most of the studies examined in the study are qualitative researches, it was found that credibility (19), consistency (21), transferability (19) and confirmability (18) reflecting the validity and reliability of qualitative research were reflected. In addition, it was found that the most commonly used strategies for increasing the validity

and reliability of qualitative research were triangulation, expert opinion, participant confirmation and long-term observations. In addition, it was observed that the correlation coefficient between 5 coders was calculated. In 3 studies, it was found that the cronbach alpha coefficient and item test correlation were calculated in 1 to reflect the reliability of the scales. Content validity was also made in 2 studies.

Findings of Data Collection Tools Used

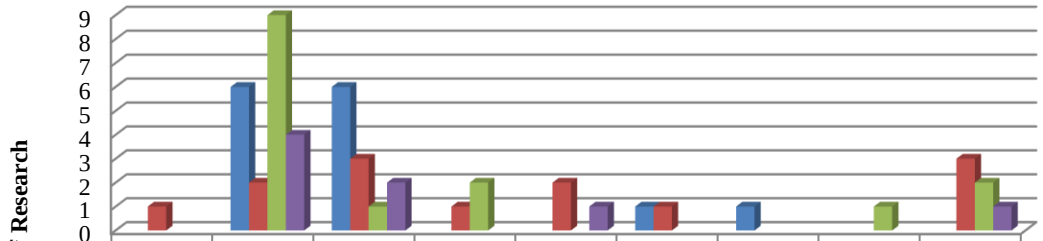


	Interview	Observation	Document	Open-ended Problems	Multiple Choice Testing (Achievement Test)	Activity-Worksheet	Survey	Scale
Master's Thesis	10	4	6	10	3	5	1	1
Doctoral Thesis	7	5	5	6	6	5		
Article	11	7	5	7	1	6		
Paper	4	4	3	5	1	2		

Figure 14. Preferred Data Collection Tools in Research

In most of the studies, it was determined that data triangulation (interview-observation-document analysis) and open-ended problems were used. At the same time, it is determined that multiple choice tests and activity-work sheets are among the preferred data collection tools. In addition, since most of the studies were conducted using more than one data collection tool, the data were generated as shown in Figure 14 above.

Findings Related to Data Analysis Methods



	Predictive Analysis	Descriptive Analysis	Content Analysis	Predictive Analysis and Content Analysis	Predictive Analysis and Descriptive Analysis	Predictive Analysis and Content Analysis	Content Analysis ve Thematic Analysis	Thematic Analysis	Other
Master's Thesis		6	6			1	1		
Doctoral Thesis	1	2	3	1	2	1			3
Article		9	1	2				1	2
Paper		4	2		1				1

Figure 15. Data Analysis Methods Used in Research

In most of the studies, descriptive (42%) and content (24%) analysis is preferred as data analysis method (Figure 15). In addition, 6% of the researches included descriptive and content analysis, 6% of the predictive and descriptive analysis together, 4% of the predictive and content analysis were used together. Predictive analyzes, thematic analysis and content-thematic analysis were used together in one study (2%). In addition, the data analysis method used in 6 (12%) studies was not specified.

Discussion and Conclusion

It is known that the abstraction processes should be valued for the students to think mathematically (Schoenfeld, 1992). In this context, it is important to examine students' thinking processes in depth. Examining students' knowledge contruction processes, In the literature, it can be seen that various approaches to theories can contribute to more detailed findings in cognitive analysis. In the research examined in the scope of this study, APOS and RBC theories, as well as procept theory, Piaget's abstraction processes, realistic mathematics education, projected learning roadmap and mathematical habits of mind, from the thoughts of Tall/Vinner and Gray/Tall, Bloom's taxonomy, mathematical power, Van Hiele geometric thinking levels, visualization, dynamic geometry software is also supported. At the same time, we can say that various encodings in the sub-problems of the research will be important in terms of directing new researches. The results of the findings obtained in line with the sub-problems of the research are presented below.

It is seen that the master thesis, doctoral dissertation and article distribution of the researches are close to each other. In addition, the number of papers is less. The fact that there are few studies in the type of papers may be that the studies made as papers were later expanded and accepted as journals. In addition, most of the studies were found to be in Turkish. This situation is likely to occur mostly in Turkey's graduate studies of the effect of teaching Turkish. It is determined that the related researches are between 2005-2019. According to findings in mathematics APOS, RBC, procept and descriptive content analysis included in the scope of the investigation it was determined that theories of abstraction of the fifteen-year history. It is seen that the highest number of studies was done in 2018 and the researches increased after 2014. This may be due to the revision of the mathematics curriculum in 2013. It may be thought that the emphasis of “students should be helped to create meaning and abstraction from their concrete experiences” (MEB,2013) might have attracted the attention of researchers. Also, such an increase

is a pleasing finding. In this sense, students' process of contruction knowledge is also important for the subjects they will learn next.

It is seen that these researches at different levels of education are subject to different areas of learning in the subjects of mathematics curriculum. In this sense, subjects were taken into consideration in which learning areas were to be included in the learning area, and the learning areas at the secondary and high school level were taken into account. The studies have been examined as numbers and algebra, geometry, probability and mixed topics. Albayrak's (2017) study of the content analysis of the researches about mathematical model and modeling published in our country is parallel with this situation. The subject of "*Equations and Functions*" has been the most studied subjects. These issues may have been preferred because of the inherent epistemological difficulties of the relevant concepts during teaching. In addition, it can be preferred to take measures for misleading and incomplete learning if it can be observed how the students abstract the concepts because it is important that pre-learning is conceptually meaningful and permanent in teaching advanced subjects.

Most of the research was conducted with APOS and RBC theories. Apart from these two theories, it is observed that abstraction reduction, abstraction-generalization and Piaget's abstraction theory and procept theory are included. RBC theory is observed to be more research than the others. This can be said to be more research based on sociocultural approaches, and because researchers take into account the impact of the environment in learning.

In the research, the preferred models are as follows; qualitative, quantitative and mixed. The number of qualitative research is quite high. These results do not correspond to some studies (Saban et al., 2010; Çiltaş, Güler & Sözbilir, 2012). But results are in line with the results of content analysis studies on different topics. (Albayrak, 2017; Aztekin & Taşpınar Şener, 2015). Similarly, Hart, Smith, Swars and Smith (2009) stated that qualitative methods have been used in researches in recent years. In this context, it can be said that qualitative methods can be used to analyze the learning processes in mathematics education research. At the same time, there are no studies using a mixed model except one study. This situation is similar to the studies of Gökçek et al. (2013) and Çiltaş, Güler and Sözbilir (2012). However, in mathematics education researches, it is thought that using mixed method will enrich the researches methodically. The types of patterns preferred in research are as follows: Case study, quasi-experimental, case study, case study and quasi-experimental, teaching experiment, phenomenology and nested embedded patterns. It is seen that mostly case study is preferred. This result may justify the practice of the theories in the research as appropriate to the case study. Besides, it can be said that only one research method and pattern should not be maintained.

When we look at the sample level, the highest level of middle school education, undergraduate, high school, primary school and graduate were found. It can be said that the high number of studies done with middle school students in construction knowledge processes is valuable in terms of structuring the learning processes in the upper levels. Even more similar researches at primary school level may also guide the middle school level.

When the sample size of the researches is examined, it is seen that the maximum of 11-30 ranges in the thesis and 1-10 in the articles are preferred. It has been found that the studies are generally conducted with a small number of students. 28 of the studies examined indicated the sampling type and the other 22 researches did not specify the sampling type. purposeful sampling was used in 24 of the studies, purposeful sampling and probabilistic-based sampling were used in 3 studies, probabilistic sampling was used in 1 research. In the descriptive content analysis, which is the majority of the qualitative researches, criterion, maximum variation, easily accessible status and density sampling, excessive and contradictory sampling were used for the purpose of sampling. In most of the studies, purposeful sampling was preferred but it was not specified which purposive sampling method was used. In 27 studies, while the process for validity and reliability was mentioned, the other 23 were not mentioned in this study. From these 27 studies; 16 of them are graduate thesis, 9 of them are articles and 2 of them are papers. It was determined that these studies knew the strategies used to increase the validity and reliability of qualitative research and that they made the most data diversification, expert opinion, participant confirmation and long-term observations. It can be said that the fact that almost half of the researches in which the majority of the researches consisted of qualitative research did not mention validity and reliability processes was an important deficiency in terms of research. In order to overcome this situation, researchers can be supported with the necessary trainings.

In the research, it was determined that the data collection (observation, interview, document) supported by open-ended questions, success tests, activity-work sheets, video and audio recordings were mostly used in data collection. In most of the studies, descriptive and content analysis is preferred as data analysis method. It can be said that this result is consistent with the majority of qualitative method and case study studies. It is known that researchers are expected to increase the variety of data collection tools in order to reach more valid results and to increase the reliability of the research findings. In this sense, it can be said that researches prefer to use data triangulation and other tools in data collection tools.

Suggestions

In addition to contributing to the literature examining the processes of knowledge creation, it also has the task of guiding teachers and prospective teachers. It is understood that the studies conducted in this context require more studies at different levels of education in order to fulfill this task. In addition, research examining the processes of creating knowledge on different mathematics topics should be conducted. In future researches, using mixed method may be beneficial in terms of advantage from qualitative and quantitative research models. In order for the methodological parts of the studies to be strong, the research methods lessons given to the researchers should be made more effective. The results of this study were obtained through 50 years of research conducted between 2005-2019 in Turkey. In future studies, it may be considered to carry out content analysis of the research conducted in the relevant field abroad.

Acknowledgments

This study is an enlarged version of the oral presentation presented at the 1. International Science and Education Congress in 2018.

Researchers' Contribution Rate

Contribution Categories		Author's Name and Contribution Rate	
Category 1	Study Design	F.T. 60%	B.C.G. 40%
	Data Collecting	F.T. 70%	B.C.G. 30%
	Data Analysis and Interpretation	F.T. 55%	B.C.G. 45%
Category 2	Manuscript	F.T. 50%	B.C.G. 50%
Category 3	Final Approval and Responsibility	F.T. 50%	B.C.G. 50%

Conflict of Interest

This study does not have any conflict of interest.

References

Açan, H. (2015). *8. sınıf öğrencilerinin dönüşüm geometrisinde bilgiyi oluşturma süreçlerinin incelenmesi[Examining the construction process of knowledge in 8th grade students' transformation geometry]*.(Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Dokuz Eylül University, Institu of Educational Sciences, İzmir.

Akkaya, R. (2010). *Olasılık ve istatistik öğrenme alanındaki kavramların gerçekçi matematik eğitimi ve yapılandırmacılık kuramına göre bilgi oluşturma sürecinin incelenmesi [The investigation of knowledge construction process of concepts in probability and statistical learning field according to the realistic mathematic education and constructivism theory]*. (Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Uludağ University, Institu of Social Sciences, Bursa.

Albayrak, E. (2017). *Türkiye'de matematik eğitimi alanında yayınlanan matematiksel model ve modelleme araştırmalarının betimsel içerik analizi [Descriptive content analysis of mathematical models and modeling study published in the field of mathematics education in Turkey]* (Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Atatürk University, Institu of Educational Sciences, Erzurum.

Arnon, I., Cottrill, J., Dubinsky, E., Oktaç, A., Fuentes, R., S., Trigueros, M. & Weller, K. (2014). *APOS Theory: A framework for research and curriculum development in mathematics education*. Springer Science & Business Media.

Au, W. (2007). High-stakes testing and curricular control: A qualitative metasynthesis. *Educational Researcher, 36*, 258-267. https://doi.org/10.3102/0013189X07306523.

Aztekin, S. & Taşpınar Şener, Z. (2015). Türkiye'de matematik eğitimi alanındaki matematiksel modelleme Araştırmalarının İçerik Analizi: Bir Meta-Sentez Çalışması [Content Analysis of mathematical modeling in mathematics education research in Turkey: A Meta-Synthesis Study], *Eğitim ve Bilim (Education & Science),40*(178), 139-161.

Bahar, A. (2017). *İlköğretim matematik öğretmen adaylarının olasılık kavramına yönelik bilgi oluşturma süreçlerinin incelenmesi [Investigation of elementary school mathematics teacher candidates' construction process of knowledge for probability concept].(*Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Dokuz Eylül University, Institu of Educational Sciences, İzmir.

Bayazit, İ. (2016). Subje düşüncesi: Bir matematiksel kavramın süreç ve obje olarak anlaşılması [Subject thought: Understanding of a mathematical concept as process and object]. E. Bingölbali, S. Arslan, & İ. Ö. Zembat , (Ed.), *Matematik eğitiminde teoriler [Theories in mathematics education]* (ss.183-199), Ankara: Pegem Academy Publishing.

Boyraz, D. Ç. & Aygün M. (2017). Türkiye'de matematikte tahmin konusuyla ilgili yapılmış çalışmalar [Studies have been done on the subject estimated in mathematics in Turkey]. *Millî Eğitim Dergisi [Journal of National Education]* 216, 165-185.

Bulut, S. (2018). *Ortaokul 6. sınıf öğrencilerinin üçgende alan bilgisini oluşturma sürecinin RBC+C modeline göre incelenmesi [Investigation of secondary school 6th grade students' construction process of information in triangle according to RBC + C model]*. (Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Bolu Abant İzzet Baysal University, Institu of Educational Sciences, Bolu.

Büyüköztürk, Ş., Kılıç, Çakmak E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2016). *Bilimsel araştırma yöntemleri (20.Baskı)[Scientific research methods (20th Edition)]*. Ankara: Pegem Academy Publishing.

Cooper, H., Hedges, L. V., & Valentine, J. C. (2009). *The handbook of research synthesis and metaanalysis* (2nd edition). New York: Russell Sage Publication.

Cottrill, J., Dubinsky, E., Nichols, D., Schwingendorf, K., Thomas, K., & Vidakovic, D. (1996). Understanding the Limit Concept: Beginning with a Coordinated Process Schema. *The Journal of Mathematical Behavior, 15*(2), 167-192.

Çalık, M., Ünal, S., Coştu, B. & Karataş, F.Ö. (2008). Trends in Turkish science education. *Essays in Education, Special Edition*, 23-45.

Çiltaş, A., Güler, G., & Sözbilir, M. (2012). Türkiye'de matematik eğitimi araştırmaları: Bir içerik analizi çalışması [mathematics education research in Turkey: a content analysis study]. *Kuram ve Uygulamada Eğitim Bilimleri[Educational Sciences in Theory and Practice], 12*(1), 565-580.

Davydov, V. V. (1990). *Types of Generalization in Instruction: Logical and Psychological Problems in the Structuring of School Curricula. Soviet Studies in Mathematics Education. Volume 2*. National Council of Teachers of Mathematics, 1906 Association Dr., Reston, VA 22091.

Deniz, Ö. (2014). *8. Sınıf öğrencilerinin gerçekçi matematik eğitimi yaklaşımı altında eğim kavramını oluşturma süreçlerinin APOS teorik çerçevesinde incelenmesi [Examination of 8th grade students' construction of the concept of slope based on realistic mathematics education in APOS framework]*. (Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Anadolu University, Institu of Educational Sciences, Eskişehir.

Dienes, Z.P., (1961). On abstraction and generalization. *Harward Educational Review, 31*(3), 281-301.

Dinçer, S. (2014). *Eğitim bilimlerinde uygulamalı meta-analiz[Applied meta-analysis in educational sciences]*. Ankara: Pegem Akademi.

Dreyfus, T. (2007). Processes of abstraction in context the nested epistemic actions model. Retrieved on April 5, 2019 from http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.379.4416.

Dubinsky, E. (1991). Reflective abstraction in advanced mathematical thinking. In D. Tall (ed.), *Advanced Mathematical Thinking* (pp. 95-123). Dordrecht, The Netherlands: Kluwer.

Dubinsky, E. (2000). Mathematical literacy and abstraction in the 21st century. *School Science and Mathematics, 100*(6), 289-97.

Dubinsky, E., Weller, K., McDonald, A., M., & Brown, A. (2005). Some historical issues and paradoxes regarding the concept of infinity: An APOS-based analysis: Part 1. *Educational Studies in Mathematics, 58*(3), 335-359.

Durlak, J. A. (1995). *Reading and understanding multivariate statistics.* Washington, DC: American Psychological Association.

Finfgeld, D. L. (2003). Metasynthesis: The state of the art-so far. *Qualitative Health Research, 13*(7), 893904.

Fraenkel, J. R. & Wallen, N. E. (2006). *How to design & evaluate research in education (4. baskı)*. London: McGraw Hill.

Göktaş, Y., Hasançebi, F., Varısoğlu, B., Akcay, A., Bayrak, N., Baran, M., & Sözbilir, M. (2012). Trends in educational research in Turkey: A content analysis. *Educational Sciences: Theory & Practice, 12*(1), 443-460.

Gray, E. M., & Tall, D. O. (1991). Duality, ambiguity and flexibility in successful mathematical thinking. In F. Furinghetti (Ed.), *Proceedings of PME XIII* (n.2, pp. 72-79), Assisi, Italy.

Gül, Ş., & Sözbilir, M. (2015). Fen *ve* matematik eğitimi alanında gerçekleştirilen ölçek geliştirme araştırmalarına yönelik tematik içerik analizi [Thematic content analysis for scale development research in science and mathematics education]. *Eğitim ve Bilim [Education and Science], 40*(178), 85-102. http://dx.doi.org/10.15390/EB.2015.4070.

Güler, H.K., & Arslan, Ç. (2018). Matematik öğretmeni adaylarının düzlemde dönme dönüşümü formüllerini oluşturma sürecinin incelenmesi [Investigation of prospective mathematics teachers' construction process of rotational transformation formulas on the plane]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi (Gazi University Journal of Gazi Education Faculty), 38*(2), 613-633.

Hart, L. C., Smith, S. Z., Swars, S. L., & Smith, M. E. (2009). An examination of research methods in mathematics education: 1995– 2005. *Journal of Mixed Methods Research, 3*(1) 26–41.

Hazzan, O. (1999). Reducing abstraction level when learning abstract algebra concepts. *Educational Studies in Mathematics, 40*, 71–90.

Hershkowitz, R., Schwarz, B., & Dreyfus, T. (2001). Abstraction in context: Epistemic actions. *Journal for Research in Mathematics Education, 32*(2), 195-222.

Jayarajah, K., Saat, R.M. & Rauf, R.A.A. (2014). A review of science, technology, engineering & mathematics (STEM) education research from 1999–2013: A Malaysian perspective. *Eurasia Journal of Mathematics, Science & Technology Education, 10*(3), 155-163 DOI: 10.12973/eurasia.2014.1072a.

Krippendorff, K. (2004). *Content analysis: an introduction to its methodology (2nd ed.).* Thousand Oaks, CA: Sage Publications.

Kutluca, T., Hacıömeroğlu, G., & Gündüz, S. (2016). Türkiye'de bilgisayar destekli matematik öğretimini temel alan çalışmaların değerlendirilmesi [Evaluation of computer-based studies of mathematics education in Turkey]. *Eğitimde Kuram ve Uygulama [Theory and Practice in Education], 12*(6), 1253-1272.

Leont'ev, A.N. (1981). *The problem of activity in psychology*. In J.V. Wertsch (ed. And Trans.), The Concept of Activity in Soviet Psychology, M.E. Sharpe, Armonk, NY, 37-71.

Lin, T. C., Lin, T. J. & Tsai, C.C. (2014). Research trends in science education from 2008 to 2012: A systematic content analysis of publications in selected journals. *International Journal of Science Education, 36*(8), 1346-1372, DOI: 10.1080/09500693.2013.864428.

Milli Eğitim Bakanlığı (MEB). (2013). *Ortaokul matematik dersi 5-8.sınıflar öğretim programı [Middle school mathematics lesson 5-8th grade curriculum]*. Ankara: Talim ve Terbiye Kurulu Başkanlığı.

Noss, R., & Hoyles, C. (1996). *Windows on mathematical meanings*. Kluwer, Dordrecht: The Netherlands.

Öksüz, R. (2018). *5. sınıf öğrencilerinin kesir kavramını oluşturma süreçlerinin APOS teorik çerçevesinde incelenmesi [Examining the construction process of the concept of fraction of 5th grade students within the theoretical framework of APOS]*. (Yayınlanmamış yüksek lisans tezi- Unpublished master thesis). Osmangazi University, Institu of Educational Sciences, Eskişehir.

Pershing, J. L. (2002). Using document analysis in analyzing and evaluating performance. *Performance Improvement, 41*(1), pp. 36-42.

Piaget, J. (1985). *The equilibration of cognitive structures*. Chicago, IL: University of Chicago Press.

Riffe, D., Lacy, S., & Fico, F.G. (2005).*Analyzing media messages: Using quantitative content analysis in research*. Mahwah, NJ: Lawrence Erlbaum. https://doi.org/10.4324/9780203551691

Russell, B. (1926). *Education and Good Life*. NY: Boni and Liveright.

Saban, A., Koçbeker Eid, B. N., Saban, A., Alan, S., Doğru, S., Ege, İ., Arslantaş, S., Çınar, D. & Tunç, P. (2010). Eğitim bilim alanında nitel araştırma metodolojisi ile gerçekleştirilen makalelerin analiz edilmesi [Analyzing the articles carried out with qualitative research methodology in the field of education and science]. *Selçuk Üniversitesi Ahmet Keleşoğlu Eğitim Fakültesi Dergisi[Journal of Selçuk University Ahmet Keleşoğlu Education Faculty], 30*, 125-142.

Sarantakos, S. (2005). *Social Research (3rd ed.)*. New York, NY: Palgrave Macmillan.

Selçuk, Z., Palancı, M., Kandemir, M., & Dündar, H. (2014). Eğitim ve bilim dergisinde yayınlanan araştırmaların eğilimleri: İçerik analizi [Trends of research published in the journal of education and science: Content analysis]. *Eğitim ve Bilim [Education and Science], 39*(173), 430-453.

Sierpinska, A. (1994). *Understanding in mathematics*. London: Falmer.

Skemp, R. (1986). *The psychology of learning mathematics*. Penguin: Harmondsworth.

Sözbilir, M., Kutu, H., & Yaşar, M. D. (2012). Science education research in Turkey: A content analysis of selected features of papers published. In J. Dillon& D. Jorde (Eds). *The World of Science Education: Handbook of Research in Europe* (pp.341-374). Rotterdam: Sense Publishers.

Suri, H., & Clarke, D. (2009). Advancements in research systhesis methods: From a methodologically inclusive perspective. *Review of Educational Research,* 79(1), 395-430. https://doi.org/10.3102/0034654308326349.

Tall, D. O. (1991). The psychology of advanced mathematical thinking. In D. O. Tall (Ed.), *Advanced mathematical thinking* (pp. 3-21). Dordrecht: Kluwer Academic Publishers.

Tatar, E., Kağızmanlı, T. B., & Akkaya, A. (2013). Türkiye'deki teknoloji destekli matematik eğitimi araştırmalarının içerik analizi[Content analysis of technology-based mathematics education research in Turkey]. *Buca Eğitim Fakültesi Dergisi [Buca Education Faculty Journal], 35*, 33-50.

Ulutaş, F., & Ubuz, B. (2008). Matematik eğitiminde araştırmalar ve eğilimler: 2000 ile 2006 yılları arası [Research and trends in mathematics education: 2000 to 2006]. *İlköğretim Online (Elementary Education Online), 7*(3), 614-626, 2008. [Online]: http://ilkogretim-online.org.tr.

Umdu Topsakal, Ü., Çalık, M., & Çavuş, R. (2012). What trends do Turkish biology education studies indicate?. *International Journal of Environmental and Science Education, 7*(4), 639-649.

Walsh, D. & Downe, S. (2005). Meta-synthesis method for qualitative research: A literature review. *Journal of Advanced Nursing, 50*(2), 204-211.

Wolf, F. M. (1986). *Meta-analysis: Quantitative methods for research synthesis.* London: Sage Publications.

Yıldırım, A., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri[Qualitative research methods in the social sciences]*. Ankara: Seçkin Publishing.

Appendix 1: Research Classification Form

Name of the Study:
Authors: **Year:**

1) Type of Research
- Doctoral Thesis
- Master Thesis
- Article
- Paper

2) Publication Language of Research
- Turkish
- English

3) Method of Research
- Qualitative
- Quantitative
- Qualitative and Quantitative
- Mixed

4) Learning Areas of the Research
- Number and Algebra
- Geometry
- Possibility
- General

5) Type of Construction Knowledge Process
- APOS
- RBC
- Reducing Abstraction
- Piaget's Abstraction Theory
- Abstraction and Generalization
- Procept

6) Pattern Types in Research
- Case Study
- Semi-experimental
- Case Study and Survey
- Case Study and Semi-experimental
- Teaching Experiment
- Phenomenology
- Nested Embedded Patterns
- Other (Not Specified)

7) Sample Level of Research
- Primary School Students
- Secondary School Students
- Secondary and High School Students
- High School Students
- Undergraduate Students
- High School Mathematics Teachers (PhD students)
- High School, Undergraduate and Graduate Students
- Undergraduate and Graduate (Master) Students

8) Sample Size of Research
- 1-10 person
- 11-30 person
- 31-100 person
- 101-300 person
- 301-1000 person

9) Sample Selection in Research
- Purposeful Sampling
- Probability Based Sampling
- Purposeful and Probability Sampling
- Other (Not Specified)

10) Sampling Methods
- Cluster Sampling
- Deviant Case and Stratified Sampling
- Extereme and Deviant Case Sampling
- Criterion Sampling
- Maximum Variation Sampling
- Convenience Case Sampling
- Other (Not Specified)

11) Validity and Reliability
- Credibility
- Transferability
- Consistency
- Confirmability
- Coefficient of Coherence for Coders
- Cronbach Alpha
- Item Test Correlation
- Content Validity

12) Data Collection Tools
- Interview
- Observation
- Document
- Open Ended Problems
- Multiple Choice Test (Achievement Test)
- Activity-Worksheet
- Survey
- Scale

13) Data Analysis
- Predictive Analysis
- Descriptive Analysis
- Content Analysis
- Descriptive and Content Analysis
- Predictive and Descriptive Analysis
- Predictive and Content Analysis
- Content and Thematic Analysis
- Thematic Analysis
- Other (Not Specified)

Appendix 2: Research Included in Descriptive Content Analysis

No	Authors and Year	Name of Research	Type
1	Ozmantar, F. M. (2005)	An investigation of the formation of mathematical abstractions through scaffolding	PhD
2	Yeşildere, S. (2006)	Farklı matematiksel güce sahip ilköğretim 6,7 ve 8. sınıf öğrencilerinin matematiksel düşünme ve bilgiyi oluşturma süreçlerinin incelenmesi	PhD
3	Çetin, İ. (2009)	Students' understanding of limit concept: An APOS perspective	PhD
4	Köse Tunalı, Ö. (2010)	Açı kavramının gerçekçi matematik öğretimi ve yapılandırmacı kurama göre öğretiminin karşılaştırılması	Master
5	Akkaya, R. (2010)	Olasılık ve istatistik öğrenme alanındaki kavramların gerçekçi matematik eğitimi ve yapılandırmacılık kuramına göre bilgi oluşturma sürecinin incelenmesi	PhD
6	Katrancı, Y. (2010)	Olasılığın temel kuralları bilgisinin yapılandırmacı kurama göre oluşturulması sürecinin incelenmesi	Master
7	Birinci, K. S. (2010)	Matematik öğretmen adaylarının ispatlama performanslarının süreç-nesne ilişkisi açısından incelenmesi	Master
8	Can, M. (2011)	Matematiksel soyutlama ve soyutlamanın indirgenmesi	Master
9	Yılmaz, R. (2011)	Matematiksel soyutlama ve genelleme süreçlerinde görselleştirme ve rolü	PhD
10	Sezgin Memnun, D. (2011)	İlköğretim altıncı sınıf öğrencilerinin analitik geometrinin koordinat sistemi ve doğru denklemi kavramlarını yapılandırmacı öğrenme ve gerçekçi matematik eğitimine göre oluşturması süreçlerinin araştırılması	PhD
11	Özcan, B. (2012)	İlköğretim öğrencilerinin geometrik düşünme düzeylerinin geliştirilmesinde bilgiyi oluşturma süreçlerinin incelenmesi	PhD
12	Çekmez, E. (2013)	Dinamik matematik yazılımı kullanımının öğrencilerin türev kavramının geometrik boyutuna ilişkin anlamalarına etkisi	PhD
13	Ercire, Y. (2014)	İrrasyonel sayı kavramına ilişkin yaşanılan güçlüklerin incelenmesi	Master
14	Deniz, Ö. (2014)	8. Sınıf öğrencilerinin gerçekçi matematik eğitimi yaklaşımı altında eğim kavramını oluşturma süreçlerinin APOS teorik çerçevesinde incelenmesi	Master
15	Şenay, Ş.C. (2014)	Matematik öğretmen adaylarının sayılar teorisine yönelik soyutlamayı indirgeme eğilimlerinin düşünme stilleri ve matematik öz yeterlikleri ile ilişkisinin incelenmesi	PhD
16	Çelebioğlu, B. (2014)	Kesir kavramına ilişkin bilgi oluşturma sürecinin incelenmesi	PhD
17	Açıl, E. (2015)	Ortaokul 3. sınıf öğrencilerin denklem kavramına yönelik soyutlama süreçlerinin incelenmesi: APOS teorisi	PhD
18	Ulaş, T. (2015)	Sekizinci sınıf öğrencilerinin özdeşlik kavramını oluşturma süreçlerinin incelenmesi	Master
19	Açan, H. (2015)	8. sınıf öğrencilerinin dönüşüm geometrisinde bilgiyi oluşturma süreçlerinin incelenmesi	Master
20	Bahar, A. (2017)	İlköğretim matematik öğretmen adaylarının olasılık kavramına yönelik bilgi oluşturma süreçlerinin incelenmesi	Master
21	Şefik, Ö. (2017)	Öğrencilerin iki değişkenli fonksiyon kavramını anlamalarının APOS teorisi ile analizi	Master
22	Şimşekler, Z. H. (2017)	Özel yetenekli çocuklarda matematiksel soyutlama	Master
23 KISITLI	Camci, F. (2018)	Altıncı sınıf öğrencilerinin tahmini yol haritası çerçevesinde tasarlanan bir öğretim deneyindeki matematiksel soyutlama süreçleri	PhD
24	Öksüz, R. (2018)	5. sınıf öğrencilerinin kesir kavramını oluşturma süreçlerinin APOS teorik çerçevesinde incelenmesi	Master
25	Bulut, S. (2018)	Ortaokul 6. sınıf öğrencilerinin üçgende alan bilgisini oluşturma sürecinin RBC+C modeline göre incelenmesi	Master
26	Koçyiğit Gürbüz, M. (2018)	Yedinci sınıf öğrencilerinin etkinlik temelli öğrenme yaklaşımı altında oran-orantı kavramlarını oluşturma süreçlerinin incelenmesi: APOS Teorisi	Master
27	Altaylı Özgül, D. (2018)	Ortaokul öğrencilerinin çokgenler konusundaki soyutlama süreçlerinin incelenmesi: RBC+C modeli	PhD
28	Altun, M., ve Yılmaz, A. (2008)	Lise öğrencilerinin tam değer fonksiyonu bilgisini oluşturma süreci	Article
29	Altun, M., ve Yılmaz, A. (2010)	Lise öğrencilerinin parçalı fonksiyon bilgisini oluşturma ve pekiştirme süreci	Article
30	Uygur Kabael, T. (2011)	Generalizing single variable functions to two-variable functions, function machine and APOS	Article
31	Altun, M., ve Durmaz, B. (2013)	Doğrusal ilişki bilgisini oluşturma süreci üzerine bir durum çalışması	Article
32	Kaplan A., ve Açıl, E. (2015)	Ortaokul 4. sınıf öğrencilerinin eşitsizlik konusundaki bilgi oluşturma süreçlerinin incelenmesi	Article
33	Biber, K.Ç., ve Argün, Z. (2015)	Matematik öğretmen adaylarının tek ve iki değişkenli fonksiyonlarda limit konusunda sahip oldukları kavram bilgileri arasındaki ilişkilerin incelenmesi	Article

34	Altaylı Özgül, D., ve Kaplan, A. (2016)	7. sınıf öğrencilerinin silindirin yüzey alanı konusundaki soyutlama süreçlerinin ve paylaşılan bilgilerinin incelenmesi	Article
35	Gür, H., ve Kobak Demir, M. (2016)	Öğretmen adaylarının parabol bilgisini oluşturma süreçleri ve bu süreçte öğretmenin rolü: Durum çalışması	Article
36	Güler, H.K., ve Arslan, Ç. (2017)	Consolidation of similarity knowledge via pythagorean theorem: A Turkish case study	Article
37	Sezgin Memnun, D., Aydın, B., Özbilen, Ö., ve Erdoğan, G. (2017)	The Abstraction Process of Limit Knowledge	Article
38	Güler, H.K., ve Arslan, Ç. (2018)	Matematik öğretmeni adaylarının düzlemde dönme dönüşümü formüllerini oluşturma sürecinin incelenmesi	Article
39	Gürbüz, M. Ç., Ağsu, M., ve Özdemir, M. E. (2018)	An analysis of how preservice math teachers construct the concept of limit in their minds	Article
40	Güler, H. K., ve Gürbüz, M. Ç. (2018)	Construction Process of the Length of $\sqrt[3]{2}$ by Paper Folding	Article
41	Akarsu Yakar, E., ve Yılmaz, S. (2018)	Üçgen eşitsizliği'ne yönelik 6.sınıf öğrencilerinin matematiksel düşünme gelişim aşamaları	Article
42	Kobak Demir, M., ve Gür, H. (2019)	Lise öğrencilerinin parabol bilgisini oluşturma süreçlerinde öğretmen etkisi	Article
43	Çomarlı, S.K., Gökkurt, B., ve Usta, N. (2016)	8. sınıf öğrencilerinin RBC+C modeline göre bilgi oluşturma süreçlerinin incelenmesi: Doğrusal denklemler örneği	Paper
44	Boz, B., ve Akgün, Ç. (2016)	Fonksiyon dönüşümleri üzerine bir inceleme: APOS teorisi	Paper
45	Gürbüz, M.Ç., ve Altun, M. (2016)	Değişken kavramını soyutlamaya yönelik ders tasarımı	Paper
46	Arslan, Z., Sönmez, N., ve Arslan, S. (2017)	Öğretmen adaylarının küresel düzlemde üçgen oluşturma sürecinin RBC soyutlama teorisi ışığında incelenmesi	Paper
47	Onkun Özgür, E., ve Yenilmez, K. (2018)	İlköğretim altıncı sınıf öğrencilerinin negatif tam sayılar kavramının oluşturma ve pekiştirme süreçlerinin RBC+C modeline göre incelenmesi	Paper
48	Kılıçoğlu, E., ve Kaplan, A. (2019)	Ortaokul 7.sınıf öğrencilerinin matematiksel soyutlama süreçlerinin incelenmesi	Paper
49	Akarsu Yakar, E., ve Yılmaz, S. (2019)	Üstün yetenekli bir 5.sınıf öğrencisinin Pisagor Teoremi'ne dair matematiksel düşünme gelişim aşamları	Paper
50	Yücel, A., ve Narlı, S. (2019)	Matematik dersinde ortaokul ve lise öğrencilerinin soyutlama seviyesini indirgemelerinin incelenmesi	Paper

Appendix 3

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Content Analysis of Research on Processes of Constructing Knowledge in Mathematics Education in Turkey
Discipline	Education
Type of Article	Research Article
Year of Data Collection	2019

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that this study is based on document analysis.

May 7, 2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Dokuz Eylül University, Institute of Education Sciences	PHD Student	Faden TOPUZ	
2.	Dokuz Eylül University, Faculty of Buca Education	Assoc. Prof	Berna CANTÜRK GÜNHAN	

Correspondent Author's Info

Institute	Dokuz Eylül Üniversity, Institute of Education Sciences İzmir/ Türkiye
Postal address	
E-mail	fadentopuz@gmail.com
Phone	

Tekin, O., & Emmioğlu-Sarıkaya, E. (2020). Flipped classroom model in high school mathematics. *Bartın University Journal of Faculty of Education*, 9(2), 301-314.

Bartın University Journal of Faculty of Education, 9(2), 301-314

buefad.bartin.edu.tr

Flipped Classroom Model in High School Mathematics

Oğuzhan TEKİN*[a], Esma EMMİOĞLU-SARIKAYA[B]

Article Info

DOI: 10.14686/buefad.559990

Article History:
Received: 02.05.2019
Accepted: 05.05.2020
Published: 05.06.2020

Keywords:
Flipped classroom,
Mathematics achievemet,
Attitudes.

Article Type:
Review article

Abstract

The aim of this study was to examine the effect of the flipped classroom model on 10th grade students' mathematics achievement and mathematical attitudes. The research has as a pre test post test quasi-experimental design with a control group. The participants consisted of 67 tenth grade students in two groups as control (n=33) and experiment (n=34). A non-interventional, regular mathematics instruction (technology integrated face to face classroom model) currenlty being implemented by state schools was applied in the control group. Flipped classoom model was used in the experimental group. The data were collected by using the "Mathematics Achievement Test" and the "Attitudes towards Mathematics Instrument". In the analysis of the data, a repeated samples t-test and independent samples t-test were used. The critical value was taken as .05 for all statistical tests. The findings of the study revealed that the experimental group students in flipped classroom model had statistically significantly higher scores on both mathematics achievement and mathematical attitudes than the control group students. Based on the findings of the current study, it was suggested that, flipped classroom model can be used in high school mathematics courses.

Ters Yüz Sınıf Modelinin Lise Matematik Dersinde Uygulanması

Makale Bilgisi

DOI: 10.14686/buefad.559990

Makale Geçmişi:
Geliş: 02.05.2019
Kabul: 05.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Ters yüz sınıf modeli,
Matematik başarısı,
Tutum.

Makale Türü:
Derleme makale

Öz

Bu araştırmanın amacı, tersyüz sınıf modelinin onuncu sınıf öğrencilerinin matematik başarılarına ve matematiğe yönelik tutumlarına etkisini incelemektir. Çalışma ön test son test kontrol gruplu yarı deneysel desen ile desenlenmiştir. Araştırmanın katılımcılarını onuncu sınıfta öğrenim görmekte olan 67 öğrenci oluşturmaktadır. Çalışma grubu kontrol (n=33) ve deney (n=34) olmak üzere iki gruba ayrılmıştır. Kontrol grubunda herhangi bir müdahale yapılmamış, devlet okullarında hali hazırda öğretmenlerin kullanmakta oldukları öğretim modeli (teknoloji destekli yüz yüze eğitim) uygulanmıştır. Deney grubunda tersyüz sınıf modeli uygulanmıştır. Araştırmanın verileri "Matematik Başarı Testi" ve "Matematiğe Yönelik Tutum Ölçeği" kullanılarak toplanmıştır. Verilerin analizinde, bağımlı örneklemler için t-testi ve bağımsız örneklemler için t-testi kullanılmıştır. Anlamlılık seviyesi tüm istatistiksel tester için .05 olarak kabul edilmiştir. Araştırma bulgularına göre, tersyüz sınıf modeli ile öğrenim gören deney grubu öğrencilerinin matematik başarılarının ve matematiğe yönelik tutumlarının kontrol grubu öğrencilerinden istatistiksel olarak anlamlı düzeyde yüksek olduğu saptanmıştır. Mevcut çalışmanın bulgularına dayanarak, tersyüz sınıf modelinin lise matematik derslerinde kullanılması önerilmektedir.

***Corresponding Author:** ogztekin@gmail.com
[a] Dr., The Ministry of National Education, Tokat/Turkey, http://orcid.org/0000-0002-6825-3309
[b] Assist. Prof. Dr., Tokat Gaziosmanpaşa University, Tokat/Turkey, http://orcid.org/0000-0002-6188-7173

Introduction

Blended learning approach which is defined as the usage of web-based technology in combination with face-to-face learning models for an educational purpose has increasingly been the subject of researches in the field of educational technology (Bersin, 2004). According to several research findings, blended learning has positive effects on students' academic achievement, attitudes, persistence, and course satisfaction (Delialioglu & Yildirim, 2007; Deschacht & Goeman 2015; Rovai & Jordan, 2004; Taradi, Taradi, Radic & Pokrajac, 2005; Tuckman 2002). Yet, some research findings have emphasized that blended learning has less or no effect on these variables compared to face-to-face learning approaches and that blended learning environments should be designed to include more communication, interaction, and activity in class rather than solely focusing on the usage of technological content (Graham, 2006; Means, Toyama, Murphy, & Baki, 2013; Oliver & Trigwell, 2005). It is claimed that the Flipped Classroom (FC) model can overcome this deficiency that blended learning methods face (Bishop & Verleger, 2013; Moffett & Mill, 2014).

The Flipped Classoom (FC) model, considered to be a sub-branch of blended learning is seen as an important development in the field of educational technologies in recent years (Tucker, 2012). This model, which was proposed and relatively new in the early 21st century, has brought a different perspective to the design of today's learning-teaching processes. The main objective of developing this approach is to be an alternative to the traditional methods to create more time in the classroom for active and real life learning activities. The FC is a learning approach where traditional learning enviroments are supported by web based technologies and blended with distance learning. Becker, Cummins, Davis, Freeman and Ananthanarayanan (2017) have considered this model as the most important development in educational technologies in blended learning approaches. The FC model aims to design learning environments that are independent of time, class environment, course tools, equipment and to offer active learning environments where students communicate and interact with their peers and teachers (Baker, 2000). The FC model has two basic dimensions, out of class and in class activities. For out of class activities, teacher prepares the course content via technology and presents it to the students with a teaching management system. For in class dimension, teacher designs problem solving activities related to these online contents as individual and group study (Gencer, Gurbulak & Adiguzel, 2014). In other words, the FC model is a system which is defined as the displacement of the exercise, project and homework given to the students for reinforcing the subject with theoretical part of the course and develops the skills of supporting students' learning and solving the problems they face (Bishop & Verleger, 2013). The FC model provides learning environments that are independent from lesson time and classroom environment, allows students to access the course content at their own desired time and place and lets them repeat as much as they wish according to their learning speed and style. With this model, students learn in accordance with their own learning speed and learning styles in a flexible learning environment (Tucker, 2012). In most of the time spent in the classroom, students participate in learning activities that they are active such as communicating, interacting with their peers and teachers, problem solving, questioning and discussion (Baker, 2000; Milman, 2012).

According to many educational researchers, one of the most important disadvantages of traditional face to face learning approaches do not provide enough intra class learning activities for students that they can be active due to time limitation and excessive cognitive load (Balaman & Tuysuz, 2011; Chen & Looi, 2007). In the FC model; it is essential that the learning environment is individualized, teacher has an active role as a guide to students, students take the role of learning responsibility and that more learning activities are planned in the classroom.

The use of internet and internet tools (rich audio and video content) has become indispensable for the new generation called digital citizens. To prepare courses as video content and let them follow through a teaching management system can be interesting for this generation who likes to watch videos from social media tools such as Yotube, Facebook, Instagram (Ozturk & Talas, 2015). The FC model uses the interest of students in web browsing and video viewing for educational purposes.

Previous research point out that, students studied with FC model, are more engaged with learning. Their learning skills are improved, they take more responsibility for their learning, their interaction with their teachers and peers are increased, and for teachers, the classroom management is easier (Baker, 2000; Bergmann & Sams, 2012; Fulton, 2012; Lage, Platt & Treglia, 2000; Milman, 2012; Siegle, 2014; Strayer, 2007). In addition, it has been stated that the model has positive effects on academic performance and permanence, cognitive load, attitudes, learning motivation, critical thinking, individual and independent learning and information technology literacy

(Abeysekera & Dawson, 2015; Bates & Galloway, 2012; Kong, 2014; Lemmer, 2013; Sun, Xie & Anderman, 2018). According to the findings of these studies, it is clearly seen that flipped classroom model is considered as an important development in educational technology; and therefore, its' application in the classrooms becomes widespread.

Individuals' academic achievements on a discipline are related to their attitudes toward the discipline. In general, attitude is defined as the tendency of people to react positively or negatively to a certain object (Turgut & Baykul, 2011). Attitudes involve not only curiosity and assessment but also the way a person learns because it involves such things as curiosity and assessment that stimulates interest in something in individual (Avci, Coskuntuncel & Inandi, 2011). Therefore, attitude is an important concept for the educators. In the literature it is clearly seen that, from primary school to tertiary education, mathematics has been the head of the disciplines where students develop negative attitudes (Mata, Monteiro & Peixoto, 2012; Peker & Mirasyedioglu, 2003; Zan & Martino, 2007). Whereas, mathematics is the door opener of a better life and career for many people (Stafslien, 2001). As well, mathematics is also seen as an assistant to understand life and the environment and produce ideas about them (Dursun & Dede, 2004). Therefore, one of the important objectives of the reform studies on education has been to provide a system that can help students to learn by understanding mathematics (Kazemi & Franke, 2004). Aysan, Tanriogen, and Tanriogen (1996) aimed to investigate the reasons for the failure of students in mathematics courses and stated that the teaching methods, the lack of adequate exercise, teacher behaviors, and the development of negative attitudes were the most important factors. Similarly, some studies showed that teachers and students state problems related with not having enough time for learning activities in the classroom, with classrooms that are too crowded, and students' being exposed to excessive cognitive load (Aybek, 2007; Kalem & Fer, 2003; Prince, 2004).

The FC model as a new approach in educational technologies provides students flexible and free learning environments, allows them to plan their learning according to their learning pace, gives them to take responsibility of their own learning, and offers much more learning activities during the class time compared to traditional learning aproaches. Previous studies showed that students' mathematics achievement are related with the number of problem solving activities carried out in the classroom (Ozsoy, 2014; Soylu & Soylu, 2006), doing effective repetition and practice (Dursun & Dede, 2004; Lamb & Fullarton, 2002), and using technology and alternative teaching methods (Baki, 2001; Din & Calao, 2001). Accordingly, it is expected that FC model uses technology to provide students opportunities for more problem-solving activities and for more practice and repetatitions since the FC model has student-centered features such as allowing students to repeat the subject as many times as they wish and learn the subjects according to their learning speed. However; the FC model has some limitations such as internet access problems, students coming to class without watching video contents, some students' resistance to do new practices and the lack of instant feedback during video sessions (Bergmann & Sams, 2012; Ramirez, Hinojosa & Rodriguez, 2014).

In the current study, it is expected that FC model would help students to have more positive attitudes toward mathematics and increase their mathematics achivement. Because, the most important feature of the FC model is transfering theoretical part of the course to the students via a teaching management system outside the classroom and to allow more individual and group learning activities in the classroom (Baker, 2000; Filiz & Kurt, 2015; Pierce & Fox, 2012). Although the studies on the application of the FC model continue to increase, the effects of FC in Turkish education context have not been fully discovered (Aydın & Demirer, 2017; Çakıroğlu & Öztürk, 2016). The aim of this study is to investigate the effect of using a flipped classroom model on 10th grade students' mathematics achievement and attitudes toward mathematics.

Method

Research Design

To examine the effect of FC model on students' mathematics achievement and attitudes toward mathematics, a quasi-experimental design was used. In this study, students were already assigned to the classrooms by the management of the school; therefore, a quasi-experimental design was used as true experimental design with random sampling and selection could not be used (Buyukozturk, 2015).

Participants

The participants of the study were 10th grade students studying in a state high school in the city of Tokat, Turkey, at the spring term of 2017-2018 academic year. There were five 10th grade classes in the school where the research was carried out. The mathematics achievement average scores in the previous year of these 5 classes were examined for assigning the participants of study group. Two classes whose mathematics achievement averages were closest to each other, assigned as the experimental group (Group A) and the control group (Group B). The control group consisted of 33 students, while the experimental group consisted of 34 students. As presented in Table 1, there was no statistically significant difference in the mean of the mathematical achievement scores of the control and experimental groups in the previous year, $t(65)=1.28$, $p>.05$.

Table 1. Mathematical Achievement Averages of Study Group

Groups	***N***	$\bar{X}$	***SD***	***t***	***df***
Class A	34	67.54	16.15	1.28	65
Class B	33	68.13	19.67		

*$p<.05$

Data Collection Tools

Mathematics achievement test: The mathematics achievement test that contains the Tetragons and Polygons in the field of geometry in mathematics as a multiple choice test consisting of 40 items was developed by two mathematics teachers. One of these teachers has a doctoral degree and the other one has a master's degree in mathematics education. The achievement test was used as a pretest before the implementation and as a posttest at the end of the implementation. For the content validity of the test, two experts, one of whom is a faculty member in the Faculty of Arts and Sciences and the other one is a faculty member in the Mathematics and Science Department of the Faculty of Education has been consulted. According to the expert opinions, it is stated that there were enough items covering the content of the tetragons and polygons unit in the achievement test. Before the implementation, the pilot application of the achievement test was conducted with 94 11th grade students who studied in the same school and had taken the mathematics course before. In the item analysis, Kuder-Richardson-20 (KR-20) formula was used to determine the internal reliability of multiple choice tests. The fact that the KR-20 reliability coefficient is close to (+1.00) indicates that reliability is high (Buyukozturk, 2015). As a result of the analyzes, the KR-20 reliability coefficient for all 40 items was calculated as 0.87. The discriminant coefficients of the items in the achievement test ranged from 0.29 to 0.61 and the mean discrimination coefficient for the entire test was calculated to be 0.41. If the item discrimination coefficients are greater than .40, it is stated that the test has a high degree of discrimination (Basol, 2018). The difficulty levels of the test items ranged from 0.25 to 0.84 and the mean difficulty of the whole test was 0.56. The medium difficulty of test items (.50) is a desired level and increases the reliability of the test (Basol, 2018). Based on these findings, no items were removed from the test and no correction was required.

The attitudes towards mathematics instrument: In the current study, the Attitudes Toward Mathematics Instrument was used to determine students' attitudes towards mathematics. The instrument that consists of 40 items was developed by Tapia (1996) and adapted to Turkish language by Tabuk & Hacıomeroglu (2015). It has a 5 point Likert type scale (1: strongly disagree to 5: strongly agree). The high score obtained from the attitudes towards mathematics instrument indicates a positive attitude. In the current study, the instrument was used before and after the experimental process as a pre-test and a post-test. The validity and reliability study of the original scale was performed by Tapia and Marsh (2002) and the Cronbach alpha internal consistency coefficient was calculated as .97 for the whole instrument. Results of confirmatory factor analysis showed that the instrument consisted of four factors: self-confidence (15 items), motivation (5 items), enjoyment (10 items), and value of mathematics (10 items). The Cronbach alpha internal consistency coefficient was calculated to be .96 for the self-confidence factor, .93 for the value of mathematics, .88 for the enjoyment factor, and .88 for the motivation factor of the instrument. The Cronbach alpha value was calculated as .87 for the instrument adapted to Turkish language (Tabuk & Hacıomeroglu, 2015). In the current study, it was calculated .88 for all measurements, indicating high score reliability.

Data Collection

In the current study, FC model was applied in the experiemental group and technology integrated face to face classroom model was applied in the control group. Video contents have been prepared for a flipped classroom in an instructional management system (EBA- http://eba.gov.tr/ebaders) by the researcher. The contents in the EBA application were shared with the experimental group students during 8 weeks. Experiment group students have accessed to these contents at home with their usernames and passwords and have studied the contents before the classroom time. In the classroom environment, they have asked the teacher about the points they had not understand from watching the video contents and they have participated in learning activities that they have been active such as problem solving, question-answer, individual, and group-study with their peers. In the control group, no intervention was made and the course flow continued as usual. The teacher lectured by using educational technology such as smart board and interactive materials, used classroom exercises, and assigned homework for students to do at home.

Data Analysis

The main assumptions for the use of parametric tests are the normal distribution of the data and the large sample at least 30 participants each group of the study (Buyukozturk, 2015). The sample size in the current study was greater than 30 in both the experimental group (n = 34) and the control group (n = 33) and the data obtained from the achievement test and the attitudes towards mathematics instrument were close to normal distribution since the kurtosis and skewness values were between -1 and +1 (Buyukozturk, 2015). As these assumptions were met in the current study, independent samples t-test was used for examining the statistical differences between intergroup factors (experimental group, control group) and dependent samples t-test was used for examining the statistical differences between intra-group factors (pretest, posttest).

Research Ethics

In the current study, ethical rules were met in data collection and analysis process by getting study permit and informing study group. The necessary permissions were obtained from Tokat National Education Directorate for data collection procedure (Number: 27001677-44-E14265175, Date: 19.12.2016).

Findings

In order to test the pre-experimental equivalence of the study group, mathematics achievement and attitudes toward mathematics scores were compared by using independent samples t-test. Results of the analysis revealed that experimental and control group students' pre-test mean scores were not statistically significanlty different from each other both for the mathematics achievement, $t(65)= .491$, $p>.05$, and for the attitudes toward mathematics, $t(65)=.509$, $p>.05$ (Table 2).

Table 2. Findings for the Equivalence of Groups

Measurements	**Groups**	***N***	$\bar{X}$	***SD***	***t***	***df***
Mathematics Achievement Test	Experimental Group	34	31.62	5.87	. 491	65
	Control Group	33	32.35	6.35		
Attitudes Toward Mathematics Instrument	Experimental Group	34	3.13	.53	1.94	65
	Control Group	33	3.15	.55		

*$p<.05$

Findings Regarding Mathematics Achievement

Dependent samples t-test was used to investigate the mean difference between the pre and post achievement tests scores of the experimental group students. Results of the analysis revealed that, the difference between pre-test (M=31.62, SD=5.87) and the post-test (M=70.07, SD=14.36) was statistically significant, $t(33)=14.62$, $p<.05$, large effect size, d=.87 (Table 3).

Table 3. Dependent Sample t-test for Experimental Group Students' Mathematics Achievement

Measurements	***N***	$\bar{X}$	***SD***	***t***	***df***
Pre test	34	31.62	5.87	14.62*	33
Post test	34	70.07	14.36		

*p<.05

Dependent samples t- test was used to examine the difference between the pre-test and post-test application of the achievement test of the control group students. Results of the analysis revealed that, the difference between pre-test ($\bar{X}$ =32.45, *SD*=6.31) and the post-test ($\bar{X}$=63.10, *SD*=12.55) mean scores was statistically significant, $t(32)=14.93$, $p<.05$, large effect size, $d=.84$ (Table 4).

Table 4. Dependent Sample t-test for Control Group Students' Mathematics Achievement

Measurements	***N***	$\bar{X}$	***SD***	***t***	***df***
Pre test	33	32.45	6.31	14.93*	32
Post test	33	63.10	12.55		

*p<.05

As seen above, dependent sample t-test results showed that both experimental group and control group students' mathematics achievement scores were increased from pre-test to post-test. With regard to the post-test mathematics achievement scores, the mean scores of the experimental group ($\bar{X}$= 70.07, *SD* =14.36) was higher than the mean scores of the control group ($\bar{X}$= 63.10, *SD* = 12.54). In order to examine whether this diffence was statistically significant, independent samples t-test was used. Results of the analysis revealed that experimental group and the control group students' post-test mathematics achievement scores were statistically significantly different, $t(65)=2.12$, $p<.05$, with a medium effect size, $d=.51$ (Table 5).

Table 5. Comparison of Mathematics Achievement Post-test Mean Scores of Control and Experimental Group

Groups	***N***	$\bar{X}$	***SD***	***t***	***df***
Experimental Group	34	70.07	14.36	2.12*	65
Control Group	33	63.10	12.55		

*p<.05

Findings Regarding Attitudes towards Mathematics

The difference between the pre-test and post-test Attitudes Toward Mathematics Instrument mean scores of the experimental group students was examined by using dependent samples t-test. Results of the analysis revealed that there was a statistically significant difference between the pre-test ($\bar{X}$=3.13, *SD*=.40) and the post-test ($\bar{X}$=3.55, *SD*=.55) mean scores, $t(33)=3.40$, $p<.05$, have medium effect size, $d=.68$ (Table 6).

Table 6. Mathematical Attitudes of Experimental Group Students

Measurements	***N***	$\bar{X}$	***SD***	***t***	***df***
Pre-test	34	3.13	.40	3.40*	33
Post- test	34	3.55	.55		

*p<.05

The difference between the pre-test and post-test Attitudes Toward Mathematics Instrument mean scores of the control group students was examined by using dependent samples t-test. Results of the analysis revealed that there was no statistically significant difference between the pre-test ($\bar{X}$=3.15, *SD*=.48) and the post-test ($\bar{X}$=3.18, *SD*=.58) mean scores of the atttudes toward statistics of the control group students, $t(32)= 1.71$, $p>.05$ (Table 7).

Table 7. Mathematical Attitudes of Control Group Students

Measurements	***N***	$\bar{X}$	***SD***	***t***	***df***
Pre-test	33	3.15	23.04	1.71	32
Post- test	33	3.18	19.21		

*p<.05

Independent samples t-test was used to investigate the difference between experimental and control group students' post-test mean scores of the Attitudes Toward Mathematics Instrument. Results of the analysis revealed experimental group students ($\bar{X}$=3.55, *SD*=.48) had statistically significanlty higher mean scores than the control group ($\bar{X}$=3.18, *SD* = .40) students, $t(65)=3.43$, $p<.05$. This mean difference had a large effect size, $d=.82$ (Table 8).

Table 8. Comparison of Mathematical Attitudes Post-test Mean Scores of Control and Experimental Group

Groups	***N***	$\bar{X}$	***SD***	***t***	***df***
Experimental Group	34	3.55	.48	3.43*	65
Control Group	33	3.18	.40		

*p<.05

Discussion and Conclusion

In the current study, the mathematics achievement of the experimental group students studying with the FC model was higher than the control group students studying with the technology integrated face to face classroom model, at the end of the semester. This study showed that the FC model might have positive effects on students' mathematics achievement. This might be through the educational advantages of the FC model. One of the most prominent features of the flipped classroom model is to include many learning activities such as problem solving, discussion, question-answer, individual, and group study in the classroom (Bergmann & Sams, 2012; Bishop & Verleger, 2013; Johnson & Renner, 2012). In the current study, outside of the classroom, the experimental group students followed the theoretical part of the subject via EBA, which is an online teaching management system. In the classroom, they have developed their own learning by taking part in active learning activities such as question-answer, problem solving, and individual and group studies. The activities have been carried out in the classroom support students' conceptual learning and help to make abstract concepts more concrete (Dursun & Dede, 2004). Therefore, the reason why the students studying with the flipped classroom model is more successful than students studying technology integrated face to face classroom might be that this model allows more time for problem solving, exercises and real life activities in the classroom (Akyuz & Pala, 2010; Baepler, Walker & Driessen, 2014; Cukurbasi & Kiyici, 2017; Herreid & Schiller, 2013; Ozer & Anil, 2011; Pierce & Fox, 2012; Seaton, Parker, Marsh, Craven & Yeung 2014).

Another educational advantage of the FC model is to enable students to repeat as many times as possible with the help of video contents (Bergmann & Sams, 2012). In the current study, experiment group students have come to the classroom by studying video content in the online teaching management system as much as they wish according to their own learning pace and they had a chance to ask questions to their teacher in classrooom. Therefore, the flipped classroom model allowed unlimited repetition of the lectures and hence could be effective in increasing students' mathematics achievement. Previous findings indicate that there is a positive relationship between mathematics achievement and repetition of the lectures (Polya, 2014; Savas, Tas & Duru, 2010).

Students' readiness, which is one of the laws of education, is an important factor for explaining academic achievement in any subject (Cooper, Robinson & Patall, 2006; Unal & Ozdemir, 2008). One advantage of the flipped classroom model is that students who watch video contents before entering the classroom come to class as more prepared than the students studying with face-to-face learning models (Yilmaz, 2017). Accordingly, the higher mathematics achievement in the experimental group in this study might be explained by FC model helping students' readiness for learning.

Students exhibit desired behavioral changes as well as high academic achievement in learning environments where classroom communication and interaction are healthy. Many research findings reveal that classroom

environments, which have effective communication and interaction, are effective in increasing achievement, and individuals with improved social skills learn more easily (Cakmak & Aktan, 2016; Greenberg, Weissberg, O'brien, Zins, Fredericks, Resnik, & Elias, 2003). Communication and interaction within the classroom are often included in the implementation of the FC model. There is a plenty of time in the class for many learning activities such as question-answer, discussion, individual and group studies which require student-student and student-teacher communication and interaction. During this time, students can freely ask questions to the teacher, get immediate feedback and interact with their peers.

In the current study, it was observed that the experimental group students studying with the FC model developed more positive attitudes toward mathematics than the control group students studying with the technology integrated face to face classroom model. Student-centered characteristics of the FC model might be effective in the emergence of this result. The FC model offers students free, individualized, and flexible learning environments where they can learn according to their learning pace and style (Strayer, 2007; Tucker, 2012). In addition, the flipped classroom model enables usage of information and communication technologies such as computers, tablets, mobile devices and internet actively, both in and out of the classroom (O'Flaherty & Phillips, 2015). For today's digital citizens, the usage of these technologies is inevitable. Therefore, the usage of technological tools that students like in lessons may have improved their attitudes towards mathematics as previous findings indicate that using technology in lessons positively impacts students' attitudes towards the course (Koseoglu, Yilmaz, Gercek & Soran, 2007; Yorganci & Terzioglu, 2013).

Based on the findings of the current study, we suggest that flipped classroom applications should be used in mathematics courses for high school students. In the current study, videos were preferred as a mean for delivering the content in the online learning environment. For further studies, using a mean that includes interaction, animation and simulation, or a combination of the videos and audios with texts, and their impacts on students' learning and attitudes can be examined.

Acknowledgments

This study was formed from Oğuzhan Tekin's Phd dissertation which was adopted on 21.01.2019 under Assist. Prof. Dr. Esma Emmioğlu Sarıkaya's supervision. We would like to thank Dr. Makbule Gözde Didiş-Kabar and the reviewers for their valuable contribution to the study.

Statement of Publication Ethics

We declare that the research has no unethical problems and observe research and publication ethics. The necessary permissions were obtained for data collection procedure (Tokat National Education Directorate, 19.12.2016, 27001677-44-E14265175).

Conflict of Interest

We declare that the current study has no conflict of interest.

Researchers' Contribution Rate

Authors	Literature review	Data Collection	Data Analysis	Results	Conclusion
Oğuzhan Tekin	☒	☒	☒	☒	☒
Esma Emmioğlu-Sarıkaya	☒	☒	☒	☒	☒

References

Abeysekera, L., & Dawson, P. (2015). Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research. *Higher Education Research ve Development*, *34*(1), 1-14.

Akyüz, G., & Pala, N. M. (2010). PISA 2003 sonuçlarına göre öğrenci ve sınıf özelliklerinin matematik okuryazarlığına ve problem çözme becerilerine etkisi [The effect of student and class characterıstıcs on mathematıcal lıteracy and problem solvıng ın accordance wıth pısa 2003 results]. *İlköğretim Online, 9*(2), 668-678.

Avcı, E., Coşkuntuncel, O., & İnandı, Y. (2011). Ortaöğretim on ikinci sınıf öğrencilerinin matematik dersine karşı tutumları [Attitudes of twelfth grade students towards mathematics]. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, *7*(1), 50-58.

Aybek, B. (2007). Konu ve beceri temelli eleştirel düşünme öğretiminin öğretmen adaylarının eleştirel düşünme eğilimi ve düzeyine etkisi [The effect of subject and skill based critical thinking instruction on teacher candidates' critical thinking tendency and level]. *Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *16*(2), 43-60.

Aydın, B. ve Demirer, V. (2017). Ters yüz sınıf modeli çerçevesinde gerçekleştirilmiş çalışmalara bir bakış: İçerik analizi [A comprehensıve analysis of the studies conducted in the framework of flippedclassroom model]. *Eğitim Teknolojisi Kuram ve Uygulama*, *7*(1), 57-82.

Aysan, F., Tanrıöğen G., & Tanrıöğren, A. (1996). Perceived causes of academic failure among the students at the faculty of education at Buca. *US Departmant of Education, 4*, 43-63.

Baker, W. J. (2000). The "classroom flip": Using web course management tools to become the guide by the side. *Cedarville University: Communication Faculty Publication*, 9-17.

Baki, A. (2001). Bilişim teknolojisi ışığı altında matematik eğitiminin değerlendirilmesi [Evaluation of mathematics education in the light of information technology]. *Milli Eğitim Dergisi*, *149*(1), 26-31.

Balaman, F., & Tüysüz, C. (2011). Harmanlanmış öğrenme modelinin 7. sınıf öğrencilerinin fen ve teknoloji dersindeki başarılarına, tutumlarına ve motivasyonlarına etkisinin incelenmesi [Researching the effect of blended learning model on the science and technology course success, attitudes and motivations of 7th class students]. *Batı Anadolu Eğitim Bilimleri Dergisi*, *2*(4), 75-90.

Başol, G. (2018). *Eğitimde ölçme değerlendirme [Assessment and evaluation in education]*. Ankara: Pegem Akademi.

Bates, S., & Galloway, R. (2012). The inverted classroom in a large enrolment introductory physics course: A case study. Web: https://www2.ph.ed.ac.uk/~ rgallowa/Bates_Galloway .pdf. ET: 02/07/2017.

Becker, S. A., Cummins, M., Davis, A., Freeman, A., Hall, C. G., & Ananthanarayanan, V. (2017). NMC horizon report: 2017 higher education edition. *The New Media Consortium*,1-60,Web: https://www.learntechlib.org /p/174879/ report_174879 .pdf. ET: 04/05/2017.

Bergmann, J. ve Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. Washington DC: International Society for Technology in Education/ ISTE.

Bersin, J. (2004). *The blended learning book: Best practices, proven methodologies, and lessons learned*. New Jersey: John Wiley & Sons.

Bishop, J. L., & Verleger, M. A. (2013, 23-26 June). *The flipped classroom: A survey of the research.* In American Society for Engineering Education National Conference proceedings, Atlanta.

Büyüköztürk, Ş. (2015). *Sosyal bilimler için veri analizi el kitabı [Manual of data analysis for social sciences].* Ankara: Pegem Yayınları.

Chen, W., & Looi, C. K. (2007). Incorporating online discussion in face to face classroom learning: A new blended learning approach. *Australasian Journal of Educational Technology*, *23*(3), 307-326.

Cooper, H., Robinson, J. C., & Patall, E. A. (2006). Does homework improve academic achievement? A synthesis of research, 1987–2003. *Review of Educational Research*, *76*(1), 1-62.

Cukurbasi, B., & Kiyici, M. (2017). Preservice teachers' views about flipped classroom model. *Bayburt Eğitim Fakültesi Dergisi, 12*(23), 87-102.

Çakıroğlu, Ü. & Öztürk, M. (2016, 16-17 Mayıs). *Tersyüz sinif modelinin uygulama eğilimlerinin incelenmesi [Examination of the application trends of the flipped classroom model]*. 10. Uluslararası Bilgisayar ve Öğretim Teknolojileri Sempozyumunda sunuldu, Rize.

Çakmak, V., & Aktan, E. (2016). Öğretmen öğrenci iletişiminin çeşitli değişkenlere göre incelenmesi [Investıgation of teacher-student communication according to various variables.]. *Electronic Journal of Social Sciences, 15*(56), 83-97.

Delialioğlu, Ö., & Yıldırım, Z. (2007). Students' perceptions on effective dimensions of ınteractive learning in a blended learning environment. *Journal of Educational Technology and Society, 10,* 133-146.

Deschacht, N., & Goeman, K. (2015). The effect of blended learning on course persistence and performance of adult learners: A difference-in-differences analysis. *Computers ve Education, 87,* 83-89.

Din, F. S., & Calao, J. (2001). The effects of playing educational video games on kindergarten achievement. *Child Study Journal*, *31*(2), 95-103.

Dursun, Ş., & Dede, Y. (2004). Öğrencilerin matematikte başarısını etkileyen faktörler matematik öğretmenlerinin görüşleri bakımından [The factors affecting students success in mathematics mathematics teachers perspectives]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *24*(2), 217-230.

EBA, (2017). Eğitim bilişim ağı. Web: http://eba.gov.tr/ebaders ET: 14.09.2017.

Filiz, O., & Kurt, A. A. (2015). Flipped learning: Misunderstandings and the truth. *Eğitim Bilimleri Araştırmaları Dergisi*, *5*(1), 215-229. DOI: 10.12973/jesr. 2015.51.13.

Fulton, K. (2012). The flipped classroom: Transforming education at Byron High School. *T.H.E. Journal,* 18-20.

Gençer, B. G., Gürbulak, N., & Adıgüzel, T. (2014, 5-7 Şubat). *Eğitimde yeni bir süreç: Ters-yüz sınıf sistemi [A new process in education: The flipped classroom system]*. Uluslararası Öğretmen Eğitimi Konferansı'nda sunuldu, Dubai, UAE.

Green, S. B., & Salkind, N. J. (2008). *Using SPSS for windows and macintosh* (Analyzing and Understanding Data–Fifth Edition). New Jersey: Pearson Prentice Hall.

Graham, C. R. (2013). Emerging practice and research in blended learning. *Handbook of Distance Education*, *3*, 333-350.

Greenberg, M. T., Weissberg, R. P., O'brien, M. U., Zins, J. E., Fredericks, L., Resnik, H., & Elias, M. J. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist, 58*(6-7),466-474, DOI: 10.1037/ 0003066X. 58.6-7.466.

Herreid, C. F., & Schiller, N. A. (2013). Case studies and the flipped classroom. *Journal of College Science Teaching*, *42*(5), 62-66.

Kalem, S., & Fer, S. (2003). Aktif öğrenme modeliyle oluşturulan öğrenme ortamının öğrenme, öğretme ve iletişim sürecine etkisi [The effect of learning environment created with active learning model on learning, teaching and communication process]. *Educational Sciences: Theory ve Practice*, *3*(2), 433-461.

Kazemi, E., & Franke, M. L. (2004). Teacher learning in mathematics: Using student work to promote collective inquiry. *Journal of Mathematics Teacher Education*, *7*(3), 203-235.

Kong, S. C. (2014). Developing information literacy and critical thinking skills through domain knowledge learning in digital classrooms: An experience of practicing flipped classroom strategy. *Computers and Education*, *78*, 160-173.

Köseoğlu, P., Yılmaz, M., Gerçek, C., & Soran, H. (2007). Bilgisayar kursunun bilgisayara yönelik başarı, tutum ve öz-yeterlik inançları üzerine etkisi [Effects of computer courses on achıevement, attıtudesand self-efficacy belıefs regardıng computers]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *33*(33), 203-209.

Lage, M. J., Platt, & Treglia, G. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education, 31*(1), 30-43.

Lamb, S., & Fullarton, S. (2002). Classroom and school factors affecting mathematics achievement: A comparative study of Australia and the United States using TIMSS. *Australian Journal of Education*, *46*(2), 154-171.

Lemmer, C. A. (2013). A view from the flip side: Using the inverted classroom to enhance the legal information literacy of the international LL. M. student. *Law Library. Journal, 105*, 461-491.

López-Pérez, M. V., Pérez-López, M. C., & Rodríguez-Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers and Education*, *56*(3), 818-826, DOI: 10.1016/j.compedu.2010.10.023.

Mata, M. D. L., Monteiro, V., & Peixoto, F. (2012). Attitudes towards mathematics: Effects of individual, motivational, and social support factors. *Child Development Research*, DOI: 10.1155/2012/876028.

Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. *Teachers College Record*, *115*(3), 1-47.

Milman, N. B. (2012). The flipped classroom strategy: What is it and how can it best be used? *Distance Learning*, *9*(3), 85-87.

Moffett, J., & Mill, A. C. (2014). Evaluation of the flipped classroom approach in a veterinary professional skills course. *Advances in Medical Education and Practice*, *5*, 415- 425, DOI: 10.2147/AMEP.S70160.

O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education*, *25*, 85-95.

Oliver, M. , & Trigwell, K. (2005). Can 'blended learning'be redeemed? *E-learning and Digital Media*, *2*(1), 17-26.

Özer, Y., & Anıl, D. (2011). Öğrencilerin fen ve matematik başarılarını etkileyen faktörlerin yapısal eşitlik modeli ile incelenmesi [Examining the factors affecting students' science and mathematics achievement with structural equation model]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *41*, 313-324.

Özsoy, G. (2014). Problem çözme becerisi ile matematik başarısı arasındaki ilişki [The relationship between problem solving skills and mathematical achievement]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *25*(3), 179-190.

Öztürk, M. F., & Talas, M. (2015). Sosyal medya ve eğitim etkileşimi [Interaction of social media and education]. *Zeitschrift für die Welt der Türken/Journal of World of Turks*, *7*(1), 101-120.

Peker, M., & Mirasyedioğlu, Ş. (2003). Lise 2.sınıf öğrencilerinin matematik dersine yönelik tutumları ve başarıları arasındaki ilişki. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 14*, 157-166.

Pierce, R., & Fox, J. (2012). Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American Journal of Pharmaceutical Education*, *76*(10), 196, DOI: 10.5688/ape7610196.

Polya, G. (2014). *How to solve it: A new aspect of mathematical method*. New Jersey: Princeton University Press.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223-231.

Ramírez, D., Hinojosa, C. ve Rodríguez, F. (2014). Advantages and disadvantages of flipped classroom: STEM students perceptions. 7th International Conference of Education, Research and Innovation ICER/2014, Seville, Spain, 17-19.

Rovai, A. P., & Jordan, H. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distance Learning*, *5*(2), 1-17.

Savaş, E., Taş, S., & Duru, A. (2010). Matematikte öğrenci başarısını etkileyen faktörler [Factors affecting students? Achievement in mathematics]. *İnönü Üniversitesi Eğitim Fakültesi Dergisi*, *11*(1), 113-132.

Seaton, M., Parker, P., Marsh, H. W., Craven, R. G., & Yeung, A. S. (2014). The reciprocal relations between self-concept, motivation and achievement: juxtaposing academic self-concept and achievement goal orientations for mathematics success. *Educational Psychology*, *34*(1), 49-72.

Siegle, D. (2014). Technology: Differentiating instruction by flipping the classroom. *Gifted Child Today*, *37*(1), 51-55.

Soylu, Y., & Soylu, C. (2006). Matematik derslerinde başariya giden yolda problem çözmenin rolü [The role of problem solving in mathematics lessons for success]. *İnönü Üniversitesi Eğitim Fakültesi Dergisi*, *7*(11), 97-111.

Stafslien, C. (2001). Gender differences in achievement in mathematics. Web: http://www.math.wisc.edu/~weinberg/MathEd/Gender_Term_Paper.doc. ET: 15.09.2017.

Strayer, J. (2007). *The effects of the classroom flip on the learning environment: A comparison of learning activity in a traditional classroom and a flip classroom that used an intelligent tutoring system*. Unpublished doctoral dissertation, The Ohio State University, Ohio, USA.

Sun, Z., Xie, K., & Anderman, L. H. (2018). The role of self-regulated learning in students' success in flipped undergraduate math courses. *The Internet and Higher Education*, *36*, 41-53.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th Edition). New York: Allyn & Bacon.

Tabuk, M., & Hacıömeroğlu, G. (2015). Matematiğe ilişkin tutum ölçeğinin Türkçeye uyarlama çalışması [Turkish adaptation study of attitudes towards mathematics instrument]. *Eğitimde Kuram ve Uygulama*, *11*, 245-260.

Tapia, M. (1996). *The attitudes toward mathematics instrument.* Paper presented at the annual meeting of the Mid-South Educational Research Association, Tuscaloosa, AL.

Tapia, M. ve Marsh, G.E. (2002). *Confirmatory factor analysis of the attitudes toward mathematics inventory.* Paper presented at the annual meeting of the Mid-South Educational Research Association, Chattanooga, Tennessee.

Taradi, S. K., Taradi, M., Radic, K., & Pokrajac, N. (2005). Blending problem-based learning with web technology positively impacts student learning outcomes in acid-base physiology. *Advances in Physiology Education*, *29*(1), 35-39.

Tucker, B. (2012). The flipped classroom. *Education Next*, *12*(1), 82-85.

Tuckman, B. W. (2002). Evaluating ADAPT: A hybrid instructional model combining web-based and classroom components. *Computers ve Education*, *39*(3), 261-269.

Turgut, M. F., & Baykul, Y. (2011). *Eğitimde ölçme ve değerlendirme [Assessment and evaluation in education]*. Ankara: Pegem Akademi.

Ünal, M., & Özdemir, M. Ç. (2008). Eğitim fakültelerinde ortak ders olarak okutulan yabancı dil derslerinde öğrencilerin bilişsel hazırbulunuşluk düzeylerinin akademik başarıya etkisi [The effect of cognitive readiness on the academic success of the students taking foreign language courses at faculties of education]. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi*, *9*(1), 13-22.

Yilmaz, R. (2017). Exploring the role of e-learning readiness on student satisfaction and motivation in flipped classroom. *Computers in Human Behavior*, *70*, 251-260.

Yorgancı, S., & Terzioğlu, Ö. (2013). Matematik öğretiminde akıllı tahta kullanmanın başarıya ve matematiğe karşı tutuma etkisi [The effect of using interactive whiteboard in mathematics instructıon on achievement and attitudes toward mathematics]. *Kastamonu Eğitim Dergisi*, *21*(3), 919-930.

Zan, R., & Di Martino, P. (2007). Attitude toward mathematics: Overcoming the positive/negative dichotomy. *The Montana Mathematics Enthusiast*, *3*, 157-168.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Flipped Classroom Model in High School Mathematics
Discipline	Instructional Technologies
Type of Article	Compilation
Year of Data Collection	2018

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that the data collection procedure has been already done.

Date 07/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	MEB	Dr.	Oğuzhan Tekin	
2.	Tokat Gaziosmanpaşa University	Assist. Prof. Dr.	Esma Emmioğlu-Sarıkaya	
3.				

Correspondent Author's Info

Institute	Milli Eğitim Bakanlığı
Postal address	Mehmet Akif Ersoy Anadolu İHL. Merkez/Tokat
E-mail	ogztekin@gmail.com
Phone	+905337254392

Atav, E. & Acarlı, D.S. (2020). The effect of experimental study method on teaching basic microbiology concepts. *Bartın University Journal of Faculty of Education, 9*(2), 315-333.

Bartın University Journal of Faculty of Education, 9(2), 315-333

buefad.bartin.edu.tr

The Effect of Experimental Study Method on Teaching Basic Microbiology Concepts

Esin ATAV[a], Dilek Sultan ACARLI*[b]

Article Info

DOI: 10.14686/buefad.536955

Article History:
Received: 07.03.2019
Accepted: 05.05.2020
Published: 05.06.2020

Keywords:
Biology teaching,
Misconceptions,
Microbiology applications.

Article Type:
Research Article

Abstract

In this study, the effects of experimental applications in the teaching of basic concepts in microbiology have been investigated. In the research, one-group pretest–posttest pre-experimental design was used. The study was conducted with 32 pre-service teachers. In the study, pre-service students' understanding of the basic concepts of microbiology, and the effects of microbiology applications on their learning were investigated by a concept test with a pre-test post-test application. Before each experimental application, the pre-service teachers were asked to define the basic concepts in the pre-test concept test. Then, the experimental application was carried out and two weeks later, they were asked to define the same concepts once more. Constructive content analysis method was used in the analysis of the data. Each concept was coded as giving the wrong answer and I don't know the answer 0, missing answer 1, correct answer 2 points. Thus, obtained pre-test and post-test scores were compared by using "Wilcoxon Marked Ranks Test", a nonparametric method. It was determined that laboratory applications were effective on pre-service teachers in obtaining accurate information about concepts they previously did not know and in correcting their misconceptions, if they had any.

Deneysel Çalışma Yönteminin Temel Mikrobiyoloji Kavramlarının Öğretimine Etkisi

Makale Bilgisi

DOI: 10.14686/buefad.536955

Makale Geçmişi:
Geliş: 07.03.2019
Kabul: 05.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Biyoloji öğretimi,
Kavram yanılgıları,
Mikrobiyoloji uygulamaları.

Makale Türü:
Araştırma Makalesi

Öz

Bu çalışmada, temel mikrobiyoloji kavramlarının öğretilmesinde deneysel uygulamaların etkisi araştırılmıştır. Araştırmada tek gruplu ön test son test deneysel desen kullanılmıştır. Çalışma, 32 öğretmen adayı ile gerçekleştirilmiştir. Öğretmen adaylarının temel mikrobiyoloji kavramlarına ilişkin bilgileri ve mikrobiyoloji uygulamalarının bu kavramları öğrenmeye etkisi, ön test ve son test olarak uygulanan bir kavram testi ile incelenmiştir. Her deneysel uygulamadan önce, bir ön test ile öğrencilerin verilen temel kavramları tanımlamaları istenmiştir. Daha sonra deneysel uygulama yapılmış ve iki hafta sonra, öğrencilerin aynı kavramları bir kez daha tanımlamaları istenmiştir. Verilerin analizinde yapılandırıcı içerik analizi yöntemi kullanılmıştır. Her kavram için yanlış ve bilmiyorum cevapları 0, eksik cevap 1, doğru cevap 2 puan verilerek kodlanmıştır. Böylece elde edilen ön test - son test puanları, nonparametrik bir yöntem olan "Wilcoxon İşaretli Sıralar Testi" kullanılarak karşılaştırılmıştır. Laboratuvar uygulamalarının öğretmen adaylarının, daha önce bilmedikleri kavramlar hakkında doğru bilgi edinmelerinde ve yanlış anlamalarını düzeltmede etkili olduğu belirlenmiştir.

***Corresponding Author:** dsultan@hacettepe.edu.tr
[a] Prof. Dr., Hacettepe University, Ankara/Turkey, http://orcid.org/0000-0001-5607-3493
[b] Assoc. Prof. Dr., Hacettepe University, Ankara/Turkey, http://orcid.org/0000-0003-1090-8912

Introduction

Many studies conducted in the field of positive sciences in the recent years have shown that students come to science classes with a series of concepts that hinder their learning and comprehension of certain subjects, and thus these studies have focused on students' comprehension of scientific concepts. These studies determined that students make sense of concepts in a way that is not compatible with the accepted scientific knowledge or the way experts of the field make sense of these concepts. Therefore, this difference in the students' perception is defined as "misconception" (Brown, 1992). Misconceptions denote concept structures, which are in conflict with scientific facts but developed or made by individuals (Dikmenli, Türkmen, Çardak & Kurt, 2005). Because they have the potential to hinder learning, they can also be seen as difficulties the teaching of the content of a certain topic (Brown, 1992).

Examining life in all its aspects, biology is quite rich in terms of concepts (Yakışan, Yel & Mutlu, 2009). In addition to having such rich conceptual content, biology is also a highly difficult class to both teach and learn because of its abstract and complex structure (Bahar, Johnstone & Hansell, 1999; Çimer, 2012). The fact that the concepts to be taught in biology courses are both high in numbers and of foreign origins make it difficult to teach them. Microbiology, a sub-branch of biology is one of the especially difficult fields to teach due to its content. It is harder for students to comprehend the working principles of studies on microorganisms compared to studies conducted on other groups of living beings. Thus, it is unavoidable to have misconceptions related to microbiology. In various studies on students' comprehension of biology concepts, it was determined that they have misconceptions: misconceptions were detected on such topics as diffusion, osmosis (Odom, 1995), photosynthesis (Anderson, Sheldon & Dubay, 1990; Amir & Tamir, 1994; Tekkaya & Balcı, 2003), respiration (Songer & Mintzes, 1994; Mann and Treagust, 1998; Yürük and Çakır, 2000), circulatory system (Yip, 1998), genetics (Cavello & Schafer, 1994; Stewart, Hafner & Dala, 1990; Kılıç, Atav, Sağlam, 2006; Kılıç & Sağlam, 2014), general biology (Tekkaya, Çapa & Yılmaz, 2000), and enzymes (Atav, Erdem, Yılmaz & Gücüm, 2004; Selvi & Yakışan, 2004). Classical methods such as lecturing and question-answer are not sufficient either in teaching concept-rich topics or getting rid of misconceptions. Studies also show that misconceptions are hard to get rid of by using traditional teaching methods and these methods are not sufficient in helping students develop correct concepts (Tekkaya & Balcı, 2003). Knowledge specifically in science branches like microbiology, where there is constant new development, is hard to acquire by traditional methods and wrong learnings can take place. One of the most significant reasons for this is that students cannot relate these concepts in their minds. In order for students to have the correct pile of knowledge, they should have a mental structure related to the concepts of microbiology and there should be a meaningful learning. Meaningful learning takes place when newly-learned concepts come together and connect with previous concepts in a conscious and orderly way (Güneş, Güneş & Çelikler, 2006). At this point, "structuralism," which explains how learning occurs and how individuals discover knowledge, comes to the fore (Colburn, 2000a). According to this approach, knowledge is actively structured in the person's mind by being related to previous knowledge and experiences (Anderson, 1992). It is first of all necessary to reveal students' previous knowledge in order to provide them meaningful learning (Pines & West, 1986; Tsai & Huang, 2002). Thus, revealing a person's formulation of the relationship between concepts that they have as well as putting forth their cognitive structures related to this would be the most effective way to determine whether a meaningful learning has taken place or not. Several techniques, which have been made for this reason, such as constructed grid, word relation test, branched tree, conceptual maps, and analogy (Bahar, 2003) are being used.

Along with traditional teaching methods, methods exclusive to the field such as observation and experiment have a central position in biology courses (Köhler, 2010, p. 146). In biology teaching, it is assumed that experiments are an important element of scientific research and information, and therefore should be a part of the courses. If students are carrying out an experiment either by themselves or in groups, it is called a real experimental course. This is generally named as "student experiment" (as well as a real experiment). There are also demonstration experiments in contrast to student experiments (Berck, 1999, p. 119). Experiments carried out in biology courses give students the opportunity to test scientific concepts and thus, learn better, and also help them to have an idea about scientific research methods and develop a positive attitude towards them (Berck, 1999, p. 120).

It is thought that an applied teaching of the basic concepts related to microbiology is effective for correct understanding of the concepts and the correct learning of the many topics that these concepts provide the basis for. Students come across these basic concepts in the microbiology, genetics, and reproduction subjects, and these concepts then constitute the basis for the comprehension of related topics. When basic concepts are learned

incorrectly or incompletely, the learning related concepts is also negatively affected. The fact that placing newly acquired knowledge in the mind by relating it to previously existing ones enables meaningful and permanent learning has already been put forth in many studies (Willerman & MacHarg, 1991; Venville, Gribble & Donovan, 2005). The correctness of the knowledge students have determines their comprehension and has an effect on their later learning. Positive sciences contains abstract and difficult to understand consecutive topics. When a concept, which is part of consecutive topics, cannot be learned, it is known that then the teaching of other concepts, which are related to this, cannot be effectively taught (Gökdere & Orbay, 2005).

In this study, the aim was to determine the students' comprehension levels of basic microbiology concepts and to identify what kind of meanings they have attached to these concepts. To this end, applied teaching modules, which consist of microbiology concepts students have trouble with, were constructed and the aim was to get students to reach the right cognitive structure related to these concepts.

Theoretical Framework

Concepts are mental tools which enable an individual to think. They make it possible for us to understand the physical and social world and to communicate meaningfully. Understanding concepts is necessary to understand principles, to solve problems, and to understand the world (Senemoğlu, 2013, s. 513). Developing concepts is a type of learning. Concepts enable an individual to distinguish a group of beings, events, ideas, and processes from other groups, and they also help him form relations with other groups, beings, events, ideas, and processes (Çaycı, Demir, Başaran & Demir, 2007). Concepts are the units of thought, and they are the pillars of knowledge. Relations between concepts constitute scientific principles (Yağbasan & Gülçiçek, 2003). Misconception can be defined as the incompatibility between what an individual knows about a thing and the scientific view on it (Treagust, 1988). These ideas that students have are logical and consistent in their view although most of the time they are not acceptable in science (Gilbert, Osborne & Fensham, 1982). These concepts of the students, which are not considered as scientifically correct, are called various things such as misconception (Huddle & Pillay, 1996; Nakhleh & Krajcik, 1994), alternative concepts (Gonzalez, 1997; Schoon & Boone, 1998), subjective ideas (Caramazza, McCloskey & Green, 1981; Fensham, 1988, s. 82), general sensation concepts, spontaneous knowledge (Eryılmaz & Tatlı, 2000; Treagust, 1988), pre-comprehension (Novak, 1988), children's science, and intuitional ideas (Bell, Gilbert & Osborne, 1983). Misconceptions can happen during formal and informal teaching activities. Each individual has a different life, and thus each individual has a different misconception from others. It is known that many misconceptions cannot be eliminated by using traditional teaching methods (Fisher, 1985). In the present study, experimental method will be used in eliminating misconceptions, and each pre-service teacher will be active during the teaching modules so that they can face their own misconceptions and correct them. In literature, several reasons are given for the misconceptions such as; teachers not having enough knowledge on the topic, students having insufficient pre-knowledge and incorrect prejudgments, methods being teacher-centred and based on rote learning, topics in the teaching programs being unrelated and not related to daily life, and course books having incorrect information and not being updated in regular intervals (Tekkaya et al., 2000). Applied teaching is seen as a strong way that could provide an alternative solution to eliminate the aforementioned reasons of misconceptions.

Individuals who have misconceptions find it difficult to reach the next learning level in a healthy way. That is why there are many studies conducted to determine and correct the misconceptions in science teaching. In many of the studies in the field of biology education, it was determined that there are various misconceptions in students from different levels of education on such concepts as photosynthesis (Amir & Tamir, 1994; Anderson et al., 1990), respiration (Mann & Treagust, 1998; Songer & Mintzes, 1994); Yürük & Çakır, 2000), digestion (Çakıcı, 2005), circulatory system (Sungur, Tekkaya & Geban, 2001; Yip, 1998), genetics (Brown, 1990; Cavello & Schafer, 1994; Stewart et al., 1990). When related literature is examined, it is noteworthy that there is no such study on the concepts related to microbiology. However, there are studies on misconceptions concerning bacteria, microorganisms, virus, and fungi. Study results usually indicate that virus and bacteria are confused with one another (Dumais & Hasni, 2009; Larson et al., 2009), and that there are misconceptions about the vitality characteristics of virus and bacteria (Kurt & Ekici, 2013; Romine, Barrow & Folk, 2013; Romine, Siegel & Roberts, 2009) and in which microorganisms can be found as well as what their effects are (Jones & Rua, 2006; Uzunkaya, 2007). Eser Çetin, Özarslan, and Işık (2015) researched the biology teacher candidates' views on germs by using a drawing-writing technique and found that the teacher candidates did not have scientific perceptions on germs as they described them by using words such as monster and alien, and drew them as either facial figures or cartoon characters. The same study also puts emphasis on the inclusion of microscope observations, videos, posters

etc., in lessons for the prevention of this type of anthropomorphic misconceptions. Studies about the concepts of microorganisms and bacteria have reported student perceptions such as seeing them as harmful and disease-causing rather than useful, having no other purpose, and thinking that bacteria are non-living germs (Eser, Çetin, Özarslan & Işık 2015; Karadon & Şahin, 2010; Kurt, 2013; Kurt & Ekici, 2013; Uzunkaya & Özgür, 2011). Hürcan Gürler & Önder (2014) have determined that 7th grade students are unable to distinguish between the concepts of bacteria and virus, and cannot associate them with daily life. While Kurt (2013) has determined in his study that biology teacher candidates have misconceptions that microbes are invisible. Aydın (2015), in a study they conducted with high school students determined that students associate the concept of microorganisms more with bacteria and viruses and that they have correct knowledge about the places microorganisms are present, and that the number of students with inaccurate ideas was very low, unlike the other studies. Bektaşlı (2018) determined that science teaching and biology teacher candidates had inadequate knowledge about the definition, structural features, and general features of archaebacteria, bacteria, and protista, and that they had many misconceptions. Within the scope of the project, misconceptions will be tried to be eliminated via the experimental method in laboratory environments, which will be designed by taking into consideration not only the misconceptions determined by the researchers but also the misconceptions presented in literature.

Method

Research Design

In the study, one-group pre-test–posttest pre-experimental design was used. In experimental design, whether or not the variable being tested had an effect was studied (Creswell, 2014, s. 219; Christensen, Johnson, & Turner, 2014, s. 258). This study was done in order to evaluate the pre-service teachers' comprehension levels of the basic concepts of microbiology and the effect of microbiology applications on learning of concepts. It is a qualitative study in which the data collected from the participants was in the form of written expression. It was carried out with a pre-test post-test inclusive concept test, the two evaluation results were digitized, and compared in this study.

Study Group

In order to determine the study group, one of the non-random sampling methods, "purposive sampling method" was used. In the purposive sampling method, it is essential to select the situations that are thought to have rich information to serve the purpose of the research (Yıldırım & Şimşek, 2006). In this study, in which the effect of experimental study method on teaching microbiology concepts was examined, was conducted with the participation of 32 biology pre-service teachers taking the "Microbiology Laboratory" course during the fall semester of 2016-2017 academic year. Microbiology laboratory is a course given in the first semester of 4th grade in the curriculum of the pre-service teachers in the sample.

Data Collection

Data were collected with four concept tests that were applied as pre-test and post-test. The concepts included in these tests were in the scope of topics covered by microbiology course and were determined by the researchers by considering the scope of topics covered in the course. The structure and scope validity of the identified concepts as basic microbiology concepts and their inclusion in the content of the applications were provided by the consensus of the researchers. In the tests, the participants were asked to write explanations against next to the given concepts. Experimental applications and concepts related to these experiments for each concept test are given below:

1. In the first concept test on the applications of topics titled "Microbiology Laboratory Order and Biosecurity" and "Sterilization," the concepts of *microorganism, bacteria, pathogen, endospore, sterilization, disinfection, pasteurization* and *contamination* were given, respectively.
2. In the second concept test on the applications of topics titled "Aseptic Techniques" and "Media Used in the Production of Microorganisms," the concepts were *aseptic, medium, bacterial culture, and bacteria planting.*
3. In the third concept test on the applications titled "Staining of Microorganisms" and "Culture Methods of Microorganisms," concepts were *isolation of microorganisms, inoculum, inoculation,* and *incubation.*

4. In the fourth concept test on the applications of the topics titled "Counting of Microorganisms", "Fungi, Viruses, Protozoon," and "Food Microbiology," the concepts of *virus, fungus, yeast,* and *mold* were used.

During the data collection process, students were asked to define the concepts given in the concept tests. Before moving onto laboratory applications concerning the concepts, pre-tests were applied to students. In both the pre-test and post-test, the students were given approximately 3 minutes for each concept. Likewise, two weeks after each application post-tests were also applied. Applications lasted 10 weeks including tests. The experiments were conducted twice every week, each application lasting 40 minutes. During the applications, the experiments were carried out by following the confirmatory method. In the confirmatory method, the process that the students are to follow (method, material) is given by the teacher and the students follow the instructions step by step and reach a conclusion (Colburn, 2000b). In this study, explanations about the application to be conducted were given to prospective teachers after theoretical information about the subject had been given. After the application process had been explained in detail, the materials and tools to be used have been introduced and presented for their use. It was ensured that the students themselves actively participated in the process and carried out the practices themselves. At the beginning of the semester, 4 working groups were determined and all applications were carried out by group work.

Data Analysis

Answers pre-service teachers gave in pre-tests and post-tests were transferred to computer environment and were evaluated with the help of MAXQDA, a qualitative data analysis program. In the analysis of the data, "constructive content analysis" (Mayring, 2002, s. 118) method was used. In constructive content analysis, a classification was done by checking whether the data fit the categories determined by the researcher. In this study, correct definitions expected for each of the 20 concepts were determined by the researchers before analysis, and pre-service teachers' answers were categorized as *incorrect, incomplete,* and *correct answer* or as *does not know the answer.* The coding of the data entered into the MAXQDA program according to these categories was done by one of the researchers, controlled by another, the opinions were discussed, and the data were arranged. Thus, the reliability of data analysis was increased. Each concept is coded by giving the wrong answer and I do not know the answer 0, missing answer 1, correct answer 2 points. Thus, the pre-service teachers were assessed over 40 points from the applications. The quantitative data obtained by scoring in this way were analyzed in the SPSS 23 program. In the comparison of pre-test and post-test scores of prospective teachers, firstly, Kolmogorov-Smirnov tests and normal distribution curves were examined to determine whether they were suitable for normal distribution. It was found that both pre-test and post-test scores calculated as a result of 4 applications and pre-test and post-test scores for each concept were not distributed normally. As a result, the non-parametric Wilcoxon Signed Ranks Test, which is a non-parametric method, was used to compare the total pre-test and post-test scores and the pre-test and post-test scores for each concept considering the lack of normal distribution and the small sample size. In this test, the same scores are kept out of the analysis and analyzed over the smallest sequence totals (Büyüköztürk, 2006, s .162). For this reason, the missing data of pre-service teachers in the applications have been entered into the SPSS program as the same data value with the previous or next score. Thus, the missing data was excluded from the analysis and the margin of error in the analyses was reduced.

Research Ethics

The research was carried out in accordance with the volunteerism of the participants. The participants were informed about the scope of the study and the right to leave the study at any time. The content of the study does not have any threats to the physical or mental health of the participants. Personality rights and private information of the participants were protected.

Findings

The total mean score of the answers given by the pre-service teachers to the concepts of microbiology was calculated as 15.75 for the pre-test and 30.60 for the post-test out of 40. The results of the Wilcoxon Signed Ranks Test for significance of this difference between pre-test and post-test scores are given in Table 1.

Table 1. Results of the Wilcoxon Signed Rank Test for the Difference between the Pre-test - Post-test Total Scores

Post-test - Pre-test	N	Mean Rank	Sum of Ranks	z	p
Negative Ranks	0	.00	.00	-4.94	.000
Positive Ranks	32	16.50	528.00		
Ties	0				

When Table 1 was examined, it was seen that there was a significant difference between the pre-test scores of the pre-service teachers regarding the microbiology concepts ($z = -4.94$, $p < .000$). It was seen that the difference observed when order points of difference scores were taken into consideration was favorable to posttest scores accordingly, it could be said that microbiology laboratory applications were effective in the learning of the concepts related to microbiology and microbiology laboratories of the pre-service teachers. Whether there was a meaningful difference between the answer given to each concept in the application in the pre-test and post-test was examined with the Wilcoxon Test which was calculated separately for each of the concepts Findings related to the tests were given in Table 2.

Table 2. Results of the Wilcoxon Signed Rank Tests for the Differences between the Pre-test -Post-test Scores of Microbiology Concepts

Concepts	Post-test – Pre-test	N	Mean Rank	Sum of Ranks	z	p
Microorganism	Negative Ranks	0	0	0	-2.83	.005
	Positive Ranks	8	4.50	36		
	Ties	24				
Bacteria	Negative Ranks	2	4.50	9	-1.73	**.083**
	Positive Ranks	7	5.14	36		
	Ties	23				
Pathogen	Negative Ranks	1	8	8	-2.30	.022
	Positive Ranks	10	5.80	58		
	Ties	21				
Endospore	Negative Ranks	1	8.50	8.50	-3.84	.000
	Positive Ranks	19	10.61	201.5		
	Ties	12				
Sterilization	Negative Ranks	0	0	0	-4.32	.000
	Positive Ranks	22	11.50	253		
	Ties	10				
Disinfection	Negative Ranks	0	0	0	3.42	.001
	Positive Ranks	14	7.50	105		
	Ties	18				
Pasteurization	Negative Ranks	1	4	4	-2.83	.005
	Positive Ranks	11	6.73	74		
	Ties	20				
Contamination	Negative Ranks	0	0	0	-5.07	.000
	Positive Ranks	28	14.50	406		
	Ties	4				
Aseptic	Negative Ranks	0	0	0	-3.76	.000
	Positive Ranks	16	8.50	136		
	Ties	16				
Medium	Negative Ranks	0	0	0	-2.64	.008
	Positive Ranks	8	4.50	36		
	Ties	24				
Bacterial culture	Negative Ranks	1	8	8	-2.04	.041
	Positive Ranks	9	5.22	47		
	Ties	22				
Bacteria planting	Negative Ranks	0	0	0	-3.31	.001

	Positive Ranks	13	7	91		
	Ties	19				
Isolation of	Negative Ranks	0	0	0	-3.45	.001
microorganisms	Positive Ranks	14	7.50	105		
	Ties	18				
Inoculum	Negative Ranks	0	0	0	-4.58	.000
	Positive Ranks	21	11	231		
	Ties	11				
Inoculation	Negative Ranks	0	0	0	-4.69	.000
	Positive Ranks	22	11.50	253		
	Ties	10				
Incubation	Negative Ranks	2	12.50	25	-3.85	.000
	Positive Ranks	21	11.95	251		
	Ties	9				
Virus	Negative Ranks	0	0	0		
	Positive Ranks	20	10.50	210	-4.18	.000
	Ties	12				
Fungus	Negative Ranks	0	0	0	-4.82	.000
	Positive Ranks	26	13.50	351		
	Ties	6				
Yeast	Negative Ranks	2	9	18	-3.51	.000
	Positive Ranks	18	10.67	192		
	Ties	12				
Mold	Negative Ranks	1	8	8	-3.63	.000
	Positive Ranks	17	9.59	163		
	Ties	14				

Table 2 shows, for each concept, the number of people that showed positive change (positive ranks), the number of people that showed negative change (negative ranks), and the number of people that did now show any change (ties).When these numbers in the table were examined, it was seen that 8 people in the concept of microorganism, 7 people in the concept of bacteria, 10 people in the concept of pathogen, 19 people in the concept of endospore, 22 people in the concept of sterilization, 14 people in the concept of disinfection, 11 people in the concept of pasteurization, 28 people in the concept of contamination, 16 people in the concept of aseptic, 8 people in the concept of medium, 9 people in the concept of bacterial culture, 13 people in the concept of bacteria planting, 14 people in the concept of microorganism isolation, 21 people in the concept of inoculum, 22 people in the concept of inoculation, 21 people in the concept of incubation, 20 people in the concept of virus, 26 people in the concept of fungus, 18 people in the concept of yeast, and 17 people in the concept of mold had positive changes in the post-test compared to the pre-test.

When Table 2 is examined once again, it shows that in the concepts of *bacteria* (2 persons), *pathogen* (1 person), *endospore* (1 person), *pasteurization* (1 person), *bacterial culture* (1 person), *incubation* (2 persons), *yeast* (2 persons) and *mold* (1 person), there is a negative change between the pretest and posttest in a small number of people. When these negative expressions were examined, it was seen that some pre-service teachers answered these concepts correctly in the pre-test and incompletely in the post-test.

When whether negative changes were statistically significant was examined, it was concluded that the changes experienced in all concepts other than the concept of bacteria were meaningful. The changes in response to the concepts of endospore, sterilization, contamination, aseptic, inoculum, inoculation, incubation, virus, fungus, yeast and mold are at $p < .001$ level; microorganism, disinfection, pasteurization, nutrient, bacterial cultivation, microorganism isolation, $p < .01$; Changes in response to the concepts of pathogen and bacterial culture were found to be significant at $p < .05$ level.

Frequencies of students' correct, incomplete and wrong (or I don't know) answers to the concepts are given in Table 3. When Table 3 is examined, it can be seen that ratio of correct answers is significantly higher in the post-test compared to the pre-test.

Table 3. Frequencies and Percentages of Answers Given to Concepts in the Pre-test and Post-test

Answer* / Concept	Pre-test			Post-test		
	C	**I**	**W/K**	**C**	**I**	**W/K**
Microorganism	20	10	2	26	6	-
	%62.5	%31.3	%6.3	%81.3	%18.8	
Bacteria	11	19	2	15	17	-
	%34.4	%59.4	%6.3	%46.9	%53.1	
Pathogen	22	4	6	31	-	1
	%68.8	%12.5	%18.8	%96.9		%3.1
Endospore	4	18	10	23	2	7
	%12.5	%56.3	%31.3	%71.9	%6.3	%21.9
Sterilization	5	17	10	23	9	-
	%15.6	%53.1	%31.3	%71.9	%28.1	
Disinfection	4	12	16	15	9	8
	%12.5	%37.5	%50	%46.9	%28.1	%25
Pasteurization	5	15	12	12	16	4
	%15.6	%46.9	%37.5	%37.5	%50	%12.5
Contamination	2	2	28	29	1	2
	%6.3	%6.3	%87.5	%90.6	%3.1	%6.3
Aseptic	5	1	26	18	4	10
	%15.6	%3.1	%81.3	%56.3	%12.5	%31.3
Medium	23	2	7	31	-	1
	%71.9	%6.3	%21.9	%96.9		%3.1
Bacterial culture	6	7	19	11	8	13
	%18.8	%21.9	%59.4	%34.4	%25	%40.6
Bacterial planting	14	11	7	25	6	1
	%43.8	%34.4	%21.9	%78.1	%18.8	%3.1
Isolation of microorganisms	8	5	19	21	3	8
	%25	%15.6	%59.4	%65.6	%9.4	%25
Inoculum	1	-	31	22	-	10
	%3.1		%96.9	%68.8		%31.3
Inoculation	3	-	29	25	-	7
	%9.4		%90.6	%78.1		%21.9
Incubation	5	-	27	23	1	8
	%15.6		%84.4	%71.9	%3.1	%25
Virus	10	17	5	30	1	1
	%31.3	%53.1	%15.6	%93.8	%3.1	%3.1
Fungus	1	11	20	12	19	1
	%3.1	%34.4	%62.5	%37.5	%59.4	%3.1
Yeast	3	13	16	9	20	3
	%9.4	%40.6	%50	%28.1	%62.5	%9.4
Mold	12	12	8	26	3	3
	%37.5	%37.5	%25	%81.3	%9.4	%9.4

*C: frequency of correct answers, I: frequency of incomplete answers, W/K: frequency of wrong and "I don't know" answers

Changes related to each concept in Table 3 are summarized briefly below:

The ratio of correct answers concerning the concept of microorganism increased from 62.5% to 81.3%. The ratio of incomplete answers decreased from 31.3% to 18.8% and the ratio of incorrect/"I don't know" answers, which were 6.3% in pre-test, were completely gone.

The ratio of correct answers concerning the concept of bacteria increased from 34.4% to 46.9%. That of incomplete answers decreased from 59.4% to 53.1%, and the ratio of incorrect answers and the "I don't know"s, which were 6.3% in the pre-test, were gone.

The ratio of correct answers concerning the concept of pathogen increased from 68.8% to 96.9%. That of incomplete answers, which were 12.5% in the pre-test, were gone. The ratio of incorrect and "I don't know" answers which were 18.8% decreased to 3.1%.

The ratio of correct answers concerning the concept of endospore increased from 12.5% to 71.9%. The ratio of incomplete answers which were 56.3% in the pre-test decreased to 6.3% and the ratio of incorrect and "I don't know" answers, which were 31.3%, decreased to 21.99%.

The ratio of correct answers concerning the concept of sterilization increased from 15.6% to 71.9%. That of incomplete answers, which were 53.1% in the pre-test, decreased to 28.1%, and the ratio of incorrect and "I don't know" answers, which were 31.3%, came down to zero.

The ratio of correct answers concerning the concept of disinfection increased from 12.5% to 46.9%. That of incomplete answers which were 37.5% in the pre-test decreased to 28.1%; however, the ratio of incorrect and "I don't know" answers which were 50% in the pre-test decreased merely to 25%.

The ratio of correct answers concerning the concept of pasteurization increased from 15.6% to 37.5%. That of incomplete answers which were 46.9% in the pre-test increased to 50%, and the ratio of incorrect and "I don't know" answers decreased from 37.5% to 12.5%.

The ratio of correct answers concerning the concept of contamination increased from 6.3% to 90.6%. The ratio of incomplete answers decreased from 6.3% to 3.1% and the ratio of incorrect and "I don't know" answer answers, which were 87.5% in the pre-test, decreased to 6.3%.

The ratio of correct answers concerning the concept of aseptic increased from 15.6% to 56.3%. That of incomplete answers increased from 3.1% to 12.5%; the ratio of incorrect and "I don't know" answers decreased from 81.3% to 31.3%.

The ratio of correct answers concerning the concept of medium increased from 71.9% to 96.9%. The ratio of incomplete answer came down to zero from 6.3%. The ratio of "I don't know" and incorrect answers decreased to 3.1% from 21.9%.

The ratio of correct answers concerning the concept of bacterial culture increased from 18.8% to 34.4%. That of incomplete answers increased from 21.9% to 25%, and the ratio of incorrect and "I don't know" answers decreased from 59.4% to 40.6%.

The ratio of correct answers concerning the concept of bacteria planting increased from 43.8% to 78.1%. The ratio of incomplete answers decreased from 34.4% to 18.8%, and the ratio of incorrect and "I don't know" answers decreased from 21.9% to 3.1%.

The ratio of correct answers concerning the concept of microorganism isolation increased from 25% to 65.6%. That of incomplete answers decreased from 15.6% to 9.4%, and the ratio of incorrect and "I don't know" answers decreased from 59.4% to 25%.

The ratio of correct answers concerning the concept of inoculums increased from 3.1% to 68.8%. No incomplete knowledge was detected in either the pre-test or the post-test concerning this concept. The ratio of incorrect and "I don't know answers decreased from 96.9% to 31.3%.

The ratio of correct answers concerning the concept of inoculation increased from 9.4% to 78.1%. No incomplete knowledge was detected in either the pre-test or the post-test concerning this concept. The ratio of incorrect and "I don't know" answers decreased from 90.6% to 21.9%.

The ratio of correct answers concerning the concept of incubation increased from 15.6% to 71.9%. No incomplete knowledge was detected in the pre-test, however 3.1% incomplete knowledge was detected in the post-test concerning this concept. The ratio of incorrect and "I don't know" answers decreased from 84.4% to 25%.

The ratio of correct answers concerning the concept of virus increased from 31.3% to 93.8%. That of incomplete answers decreased from 53.1% to 3.1%, and the ratio of incorrect and "I don't know" answers from 15.6% to 3.1%.

The ratio of correct answers concerning the concept of fungus increased from 3.1% to 37.5%. The ratio of incomplete answers increased from 34.4% to 59.4%, and the ratio of incorrect and "I don't know" answers which were 62.5% in the pre-test decreased to 3.1%.

The ratio of correct answers concerning the concept of yeast increased from 9.4% to 28.1%. That of incomplete answers increased from 40.6% to 62.5%, and the ratio of incorrect and "I don't know" answers decreased from 50% to 9.4%.

The ratio correct answers concerning the concept of mold increased from 37.5% to 81.3%. The ratio of incomplete answers decreased from 37.5% to 9.4%, and the ratio of incorrect and "I don't know" answers decreased from 25% to 9.4%.

Endospore, sterilization, pasteurization, contamination, aseptic, inoculum, inoculation and incubation concepts for which there is a significant increase in the number of correct answers are the ones for which the number of correct answers is significantly low in the pre-test. This indicates that students have come across these concepts for the first time and/or may have misconceptions based on their prior incomplete and/or incorrect knowledge for these concepts. The increase in the number of correct answers after the application indicates that pre-service teachers have shown a significant level of success and that their incorrect and incomplete knowledge, which may be misconceptions, has been eliminated to a great extent.

In order to illustrate in what way and how the frequency changes indicated in Table 3 are experienced, Table 4 gives an example of the answers of pre-service teachers for each concept, which show positive changes to the pre-test final test.

Table 4. Examples of Pre-service Teachers' Answers

Concepts	**Answers in pre-test***	**Answers in post-test***
Microorganism	*"Very small units found in the body"* (PT6**,W)	*"Very small organism that cannot be seen by naked eye"* (PT6, I)
Bacteria	*"Small organisms which cannot be seen by naked eye that are everywhere. Has many reproduction sites."(PT26, I)*	*"They are very small microorganisms. There are many different species of bacteria. They can be cultivated in the laboratory. They can be found everywhere and can easily reproduce." (PT26, C)*
Pathogen	*"The process of inspecting the living thing when an unwanted object is detected on it." (PT40, W)*	*"Disease causing organism." (PT40, C)*
Endospore	*"Do not know"(PT11, K)*	*"The process in which bacteria in the vegetative form protects itself when there are no suitable conditions and going back to the vegetative form when the conditions are suitable." (PT11, C)*
Sterilization	*"Protecting a structure in a sterile environment without compromising its structure and losing its function" (PT3, W)*	*"The process in which microorganisms are cleansed from all vegetative forms and spores." (PT3, C)*
Disinfection	*"It is the cleaning of an environment with chemical substances." (PT31, I)*	*"It is the process of purifying an environment from disease causing bacteria." (PT31, C)*
Pasteurization	*"Pasteurization of a chemical substance."(PT1, W)*	*The process of bringing something to high temperatures and suddenly coiling it down. Getting rid of microorganisms this way … Used in milk. The milk is sprayed into a medium of 140 ^{0}C and suddenly cooled down after 2-3 seconds. " (PT1, I)*
Contamination	*"Do not know"(PT16, K)*	*"The mixing of unwanted organisms or substances to the experiment due to the*

		environment not being sterile when conducting the experiment." (PT16, C)
Aseptic	*"Dilution of substances by the addition of water." (PT20, W)*	*"Purified from microorganisms, no contamination" (PT20, C)*
Medium	*"Cultures in which we create microorganisms and keep them under necessary conditions" (PT19, W)*	*"Environment created for the repercussions of microorganisms (excluding intracellular parasites)" (PT19, C)*
Bacterial culture	*"Culture medium prepared for production of bacteria under appropriate conditions" (PT1, W)*	*"The sample of bacteria produced in a medium" (PT1, C)*
Bacteria planting	*"Do not know"(PT28, K)*	*"Transfer of bacteria into sterilised medium under aseptic conditions." (PT28, C)*
Isolation of microorganisms	*"Do not know "(PT39, K)*	*"Separation of certain microorganisms from a population of microorganisms." (PT39, C)*
Inoculum	*"Do not know "(PT33, K)*	*"Microorganism to be cultivated." (PT33, C)*
Inoculation	*"Do not know "(PT36, K)*	*"Cultivating a microorganism." (PT36, C)*
Incubation	*"Substances that prevent some bacteria from reproducing."(PT5, W)*	*"The production of the planted microorganisms under suitable conditions." (PT5, C)*
Virus	*"Small living things that we cannot see with naked eye." (PT34, W)*	*"Nucleic acids which are covered by a protein coat." (PT34, C)*
Fungus	*"Are fungi. They can be in harmful or useful forms." (PT14, I)*	*"Non-photosynthetic eukaryotic microorganisms. They have cell walls like plants and centrosomes like animals." (PT14, C)*
Yeast	*"There are yeast bacteria. Some bacteria species (yeast bacteria) can cause yeast production by reproducing in that environment." (PT26, W)*	*"Single celled fungi are called yeasts." (PT26, I)*
Mold	*"Do not know"(PT38, K)*	*"They are fungi in the form of mycelium that breed by forming multicellular strands." (PT38, C)*

*C: correct answers, I: incomplete answers, W: wrong answers, K: "I don't know"
**PT: Pre-service teacher (for coding of participants)

Discussion and Conclusion

There are many studies which emphasize going beyond traditional methods and make various suggestions such as using visual material, making practical experiments, relating the topics to daily life, and using techniques that would interest students in order to ensure a meaningful learning and to overcome the learning difficulties concerning concepts related to biology (e.g. Coştu, Karataş & Ayas, 2003; Çimer, 2012; Güneş, Şener Dilek, Demir, Hoplan & Çelikoğlu, 2010; Tekkaya et al., 2000). Based on these suggestions, in the present study, how pre-service teachers' knowledge about 20 key concepts of microbiology change at the end of the applied teaching with experiments, was investigated. During this applied teaching, teacher candidates were made to personally carryout the experiments in groups of 2-3 people (preparation of the medium, sterilization of the medium on autoclave, preparation of glassware for sterilization and their sterilization, use of flame and inoculation loop, cultivation of microorganisms from pure culture, isolation of microorganisms from various sources, examination of colony morphology, examination of bacteria, fungi, yeast samples under microscope, gram staining etc.) and abstract concepts were made to be concrete and able to be experienced by them. It is thought that study results will make important contribution to literature since conceptual structures of pre-service teachers are highly relevant in order for them to construct many other concepts related to microbiology and biology. In addition, it is thought that information related to these concepts affect daily life behaviours. Jones, Gardner, Lee, Poland and Robert (2013)

reported in their study, in which they determined the knowledge and behaviours of university students before and after microbiology courses, that there was a positive change in students' knowledge levels and behaviors. It has been observed that the students who have taken microbiology course had an increased - perception about the risks that may cause microbial contamination and started to take measures to prevent microbial contamination especially in the behaviours such as using a public telephone, touching a faucet in a public bathroom, handling money, borrowing soap from a friend while camping and, working in the dirt without gloves and taking out the trash. Therefore, it is considered that having the right information about the concepts related to microbiology is an important step for a change in the behaviours of people.

When findings are examined, it can be seen that the answers of pre-service teachers changed in general from "I don't know" to "correct" for *contamination, aseptic, inoculum, inoculation*, and *incubation,* which are concepts they have either heard for the first time or do have said they do not know the meaning of in the pre-test. In this case, it can be argued that the lab applications had an effect on their getting correct knowledge on concepts they have no knowledge of before. Moreover, it can be seen that the number of correct answers in the post-test increased for virus, fungus, yeast, mold, endospore, sterilization, disinfection, and pathogen for which they had given incorrect or incomplete answers in the pre-test. In other words, lab applications contributed to the correct comprehension of these concepts. It is also evident that for the microorganisms and bacteria, of which pre-service teachers somehow have some idea beforehand as these may be come across in daily life, the correct, incorrect or incomplete answers of pre-service teachers do not change much and continue more or less the same at the end of post-test as well. It was determined that there is some change in the positive direction for the incomplete and incorrect answers as far as the concept of microorganism is concern; however, it was also seen that the knowledge on the concept of bacteria does not change and the misconception continues for this concept. When literature is examined, it can be seen that there is a high level of misconception for such concepts as bacteria and fungus (e.g. Dumais & Hasni, 2009; Kinchin, De-Leij & Hay, 2005; Kurt & Ekici, 2013; Tekkaya et al., 2000). For instance, in a study conducted by Kurt and Ekici (2013), too, it was determined that pre-service teachers have misconceptions related to the concept of bacteria, and it was indicated that the primary reason for this is that bacteria is a difficult concept to learn since it is related to many fields. At the end of the study, it was emphasized that employing topic-appropriate teaching strategies, methods, and techniques would be beneficial in students learning the concepts properly. In the present study, while the applied teaching was very effective in the learning of such concepts as virus, fungus, yeast, and mold, as indicated by Kurt and Ekici (2013), it was insufficient in eliminating misconceptions about bacteria *which is related to various different fields.* One of the possible reasons for the misconceptions related to these concepts is the teachers. Özyürek (1983) argues that teachers underestimate and simply these concepts because they have already developed them and this affects the teaching process negatively. Moreover, it is noteworthy that pre-service teacher try to explain the given concepts by using daily speech expressions and find it difficult to express them in an academically correct way. Canpolat, Pınarbaşı, Bayrakçeken and Geban (2004) indicated that many studies put forth how using colloquial language in teaching science concepts may cause misconceptions in students and argued that teachers should use full and correct definitions of concepts as much as possible. At this point, teachers at primary and secondary schools have a huge responsibility for students to learn concepts properly, especially during their first encounter with the concepts they also see in daily life. It is necessary for teachers to have a basic foundation related to the concepts they teach, they should not cause misconceptions and they should be able to relate new concepts to daily life through practical applications (Güneş et al., 2010).

Misconceptions teachers have are considered to be one of the reasons of the misconceptions of students (Sander, 1993). In this respect, it is highly important to determine and eliminate the misconceptions of pre-service teachers, who will be tomorrow's teachers. Since misconceptions are permanent and continuous, it is difficult to eliminate them through traditional teaching methods, and also they are not sufficient in developing correct concepts in time (Tekkaya et al., 2000). Thus, results of this study are promising in order to eliminate misconceptions. As indicated in the findings, many incorrect answers were turned into correct answers after the laboratory applications. The fact that laboratory activities are not given sufficient precedence in our country makes it difficult for many concepts to be taught. Classical methods such as lecturing and question-answer are not enough to teach concepts. Indeed, findings of the study show that it is useful for pre-service teachers to use concepts during experiments and make applications experiencing their knowledge directly. It will be helpful for the correct teaching of concepts if teachers make experiments appropriate for applied teaching in other topics where misconceptions are prevalent. Moreover, if pre-service teacher are informed about the study results on misconceptions in biology education and

about how they could eliminate misconceptions during their education, it would be an important step in preventing misconceptions, which are difficult to correct.

In this study, the effect of experimental study method on the biology teacher candidates' learning of microbiology concepts was investigated. With microbiology experiments it has been determined that the teacher candidates have amended their wrong or missing knowledge determined before the experiments significantly after knowledge the experiments. It can be suggested to conduct this study, which was conducted in a single-group pre-test post-test experimental design, in a control-group pre-test post-test experimental design. In this way, the group where the same concepts are given only theoretically can be compared with applied learning group. The use of parametric tests in the analysis of the data from the experimental group with pre-test post-test control-group experimental design will also increase discourse power. The determination of the student expressions for concepts with the open-ended concept test used in this study is important for understanding the level of scientific language used by the students. However, it is also possible to consider studies using two- or three-stage concept tests for ease of application and evaluation.

Acknowledgments

This study is a part of the project numbered SHD-2016-9726, which was supported by the Hacettepe University Scientific Research Projects Coordination Unit.

Statement of Publication Ethics

During the writing process of this study scientific, ethical and citation rules were followed; no falsification was made on the collected data and this study was not sent to any other academic media for evaluation.

Conflict of Interest

We declare no conflict of interest in preparing this article.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Esin Atav	☒	☒	☒	☒	☒	☒
Dilek Sultan Acarlı	☒	☒	☒	☒	☒	☒

References

Amir, R., & Tamir, P. (1994). In-dept analysis of misconceptions as a basis for developing research-based remedial instruction: The case of photosynthesis. *The American Biology Teacher, 56*, 94-100.

Anderson, O. R. (1992). Some interrelationships between constructivist models of learning and current neurobiological theory, with implications for science education. *Journal of Research and Science Teaching, 29,* 1037-1058.

Anderson, C. W., Sheldon, T. H., & Dubay, J. (1990). The effects of instruction on college on majors' conceptions of respiration and photosynthesis. *Journal of Research in Science Teaching, 27*, 761-776.

Atav, E., Erdem, E., Yılmaz, A., & Gücüm, B. (2004). Enzimler konusunun anlamlı öğrenilmesinde analoji oluşturmanın etkisi [The effect of developing analogies for meaningful learning of the subject of enzymes]. *Hacettepe University Journal of Education, 27*, 21-29.

Aydın, S. (2015). High school science students' ideas about microorganisms and their place in the curriculum. *International Journal of Biology Education, 4*(2), 108-119.

Bahar, M. (2003). Misconceptions in biology education and conceptual change strategies. *Theory and Practice, 3*(1), 55-64.

Bahar, M., Johnstone, H. A., & Hansell, M. (1999). Revisiting learning difficulties in biology. *Journal of Biological Education, 33*(2), 84-87.

Bektaşlı, F. (2018). *Fen ve biyoloji öğretmen adaylarının arkebakteri, bakteri ve protista âlemleri hakkındaki bilgi düzeyleri ve kavram yanılgıları [Preservice science and biology teachers' knowledge level and misconceptions about archaebacteria, bacteria and protista kingdoms].* Master Thesis, Hacettepe University Graduate School of Educational Sciences Ankara, Turkey.

Bell, B. F., Gilbert, Y. K., & Osborne, R. J. (1983). Science teaching and children's view of the world. *Journal of in Science Teaching, 5,* 1-14.

Berck, K. H. (1999). *Biologiedidaktik Grundlagen und Methoden*. Wiebelsheim: Quelle Meyer Verlag.

Brown, C. R. (1990). Some misconceptions in meiosis shown by students responding to an advanced level practical examination question in biology. *Journal of Biological Education, 24*, 182-187.

Brown, D. E. (1992). Using examples and analogies to remediate misconceptions in physics: Factors influencing conceptual change. *Journal of Research in Science Tea*ching, *29*(1), 17-34.

Büyüköztürk, Ş. (2006). *Veri analizi el kitabı. [Data analysis manual].* Ankara: Pegem A Yayıncılık.

Canpolat, N., Pınarbaşı, T., Bayrakçeken S., & Geban, Ö. (2004). Kimyadaki bazı yaygın yanlış kavramalar [Some common misconceptions in chemistry]. *Gazi University Journal of Gazi Educational Faculty, 24(1),* 135-146.

Caramazza, A., McCloskey, M., & Green, B. (1981). Curvilinear motion in the absence of external forces. *Science, 210*, 1130-1141.

Cavello, A. M. L., & Schafer, L. E. (1994). Relationship between students' meaningful learning orientation and their understanding of genetic topics. *Journal of Research in Science Teaching, 31*, 228-232.

Christensen, L. B., Johnson, R. B., & Turner, L. A. (2014). *Research methods, design and analysis (12th ed.).* Pearson Education.

Colburn, A. (2000a). Constructivism: Science education's "grand unifying theory". *The Clearing House, 74*(1), 9-12.

Colburn, A. (2000b). An inquiry primer. *Science Scope, March*, 42-44.

Coştu, B., Karataş, F. Ö., & Ayas, A. (2003). Kavram öğretiminde çalışma yapraklarının kullanılması [Use of worksheets in concept teaching]. *Pamukkale University Journal of Education, 2*(14), 33-48.

Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed methods approaches (4th ed.)*, California: SAGE Publications.

Çakıcı, Y. (2005). Exploring Turkish upper primary level pupils' understanding of digestion. *International Journal of Science Education, 27,* 79–100.

Çaycı, B., Demir, M. K., Başaran, M., & Demir, M. (2007). Sosyal bilgiler dersinde işbirliğine dayalı öğrenme ile kavram öğretimi [Concept teaching with cooperative learning on social studies lesson]. *Kastamonu Education Journal, 15*(2), 619-630.

Çimer, A. (2012). What makes biology learning difficult and effective: Students' views? *Educational Research and Reviews, 7(3),* 61-71.

Dikmenli, M., Türkmen, L., Çardak, O., & Kurt, H. (2005). Biyoloji öğretmen adaylarının bazı genel biyoloji konularındaki kavram yanılgılarının iki aşamalı çoktan seçmeli bir araç ile belirlenmesi [Determination of biology student teachers' misconceptions about some biological concepts with a two tier multiple choice test]. *Dokuz Eylül University Journal of Buca Faculty of Education, 17,* 365-370.

Dumais, N., & Hasni, A. (2009). High school intervention for influenza biology and epidemics/pandemics: Impact on conceptual understanding among adolescents. *Life Sciences Education, 8,* 62-71.

Eryılmaz, A., & Tatlı, A. (2000). ODTÜ öğrencilerinin mekanik konusundaki kavram yanılgıları [METU students' misconceptions about mechanics]. *Hacettepe University Journal of Education, 18,* 93-98.

Eser, H., Çetin, G., Özarslan, M., & Işık, E. (2015). Biyoloji öğretmen adaylarının mikroplara ilişkin görüşlerinin çizme-yazma tekniğine göre incelenmesi [Investigation of the prospective biology teachers' views about microbes through the draw and write technique]. *International Journal of Education, Science and Technology, 1*(1), 17-25.

Fensham, P. (1988). *Development and dilemmas in science education* (1st ed.). The Falmer Press.

Fisher, K. M. (1985). A misconception in biology: Amino acids and translation. *Journal of Research in Science Teaching, 22*(1), 53-62.

Gilbert, J. K., Osborne, R. J., & Fensham, P. J. (1982). Children's science and its consequences for teaching. *Science Educations, 66*(4), 623-633.

Gonzalez, F. M. (1997). Diagnosis of Spanish primary school student's common alternative science concepts. *School Science and Mathematics, 97*(2), 68-74.

Gökdere, M., & Orbay, M. (2005). Fen bilgisi öğretmen adaylarının mekanik kavramlarını anlama düzeylerinin değerlendirilmesi [Evaluating science teacher candidates' level of understanding of mechanical concepts]. *XIV. National Educational Sciences Congress, 28-30 September 2005*. Pamukkale University Faculty of Education Denizli, Turkey.

Güneş, T., Güneş, H., & Çelikler, D. (2006). Fen bilgisi öğretmenliği programı biyoloji II ders konularının öğretilmesinde kavram haritası kullanımının öğrenci başarısı üzerine etkileri [The effect of concept map using on student success in the teaching of biology II subjects presented in science teacher programme]. *Ahi Evran University Journal of Education, 7*(2), 39-49.

Güneş, T., Şener Dilek, N., Demir, E. S., Hoplan, M., & Çelikoğlu, M. (2010). Öğretmenlerin kavram öğretimi, kavram yanılgılarını saptama ve giderme çalışmaları üzerine nitel bir araştırma [A qualitative research on the efforts of teachers about the concept teaching, determination and elimination of the misconceptions]. *International Conference on New Trends in Education and Their Implications 11-13 November 2010*. Antalya, Turkey.

Huddle, P. A., & Pillay, A. E. (1996). An in depth study of misconceptions in stoichiometry and chemical equilibrium at a South African University. *Journal of Research in Science Teaching. 33*(1), 65-77.

Hürcan Gürler, H., & Önder, İ. (2014). 7. sınıf öğrencilerinin fen ve teknoloji dersinde öğrendikleri "bakteri ve virüs" kavramlarını günlük yaşamla ilişkilendirme durumlarının belirlenmesi [Determination of the relationship building status of 7th grade students the concepts of bacteria and viruses that they learned in science and technology course with daily life]. *III. Congress of Educational Research in Sakarya 12 June 2014* (pp. 80-86). Sakarya, Turkey.

Jones, G., Gardner, G. E., Lee, T., Poland, K., & Robert, S. (2013). The impact of microbiology instruction on students' perceptions of risks related to microbial illness. *International Journal of Science Education, Part B: Communication and Public Engagement, 3*(3), 199-213.

Jones, M. G., & M. J. Rua. (2006). Conceptions of germs: Expert to novice understandings of microorganisms. *Electronic Journal of Science Education, 10*(3), 1-40.

Karadon, H. D., & Şahin, N. (2010). Primary school students' basic knowledge, opinions and risk perceptions about microorganisms. *Procedia-Social and Behavioral Sciences, 2*(2), 4398-4401.

Kılıç, D., & Sağlam, N. (2014). Students' understanding of genetics concepts: The effect of reasoning ability and learning approaches. *Journal of Biological Education, 48*(2), 63-70.

Kılıç, D., Atav, E., & Sağlam, N. (2006). 9. sınıf öğrencilerinin somatik ve eşey hücreleri kavramlarını anlama düzeyleri [9th grade students' level of understanding of somatic and germ cells concepts]. *7th National Science and Mathematics Education Congress 7-9 September 2006*. Gazi University, Ankara.

Kinchin, I. M., De-Leij, F. A. A. M., & Hay, D. B. (2005). The evolution of a collaborative concept mapping activity for undergraduate microbiology students. *Journal of Further and Higher Education, 29(1),* 1-14.

Köhler, K. (2010). Welche Fachgemäßen Arbeitsweisen werden im Biologieunterricht eingesetzt? In Ulrike Spörhase-Eichmann & Wolfgang Ruppert (Hrgs.), *Biologiedidaktik Praxishandbuch für die Sekundarstufe I und II (S* 146-159). Cornelsen Verlag.

Kurt, H. (2013). Biology student teachers' cognitive structure about "Living thing". *Educational Research and Reviews, 8* (12), 871-880.

Kurt, H., & Ekici, G. (2013). Biyoloji öğretmen adaylarının "bakteri" konusundaki bilişsel yapılarının ve alternatif kavramlarının belirlenmesi [Determining biology student teachers' cognitive structure and alternative concepts on the concept of "bacteria"]. *Turkish Studies, 8*(8), 885-910.

Larson, E., Ferng, Y., Wong, J., Alverez-Cid, M., Barrett, A., Gonzalez, M. J., Wang, S., & Morse, S. S. (2009). Knowledge and misconceptions regarding upper respiratory infections among urban Hispanic households: Need for targeted messaging. *Journal of Immigrant Minority Health, 11,* 71-82.

Mann, M., & Treagust, D. F. (1998). A pencil and paper instrument to diagnose students' conceptions of breathing, gas exchange and respiration. *Australian Science Teachers' Journal, 44,* 55-60.

Mayring, P. (2002). *Einführung in die qualitative sozialforschung*. Weinheim und Basel: Beltz Verlag.

Nakhleh, M. B., & Krajcik, J. S. (1994). Influence of levels of information as presented by different technologies on students' understanding of acid, base and pH concepts. *Journal of Research in Science Teaching, 34*(10), 1077-1096.

Novak, J. (1988). Learning science and the science of learning. *Studies in Science Education, 15*, 77-101.

Odom, A. L. (1995) Secondary and college biology student's misconceptions about diffusion and osmosis. *American Biology Teacher, 57*, 409-415.

Özyürek, M. (1983). Kavram öğrenme ve öğretme [Concept learning and teaching]. *Ankara University Journal of Faculty of Educational Sciences, 16*(2), 347-366.

Pines, L. A. & West, L. H. T. (1986). Conceptual understanding and science learning: An interpretation of research within a sources-of-knowledge framework. *Science Education, 70*(5), 583-604.

Romine, W. L., Barrow, L. H., & Folk, W. R. (2013). Exploring secondary students' knowledge and misconceptions about influenza: Development, validation, and implementation of a multiple choice influenza knowledge scale. *International Journal of Science Education, 35*(11), 1874-1901.

Romine, W., Siegel, M., & Roberts, T. (2009). *Analysing secondary science teachers 'alternative conceptions related to avian influenza.* Paper presentation at the National Association for Research in Science Teaching annual meeting, Garden Grove, CA.

Sander, M. (1993). Erroneous ideas about respiration: The teacher factor. *Journal of Research in Science Teaching, 30,* 919-934.

Schoon, J. K., & Boone, J. W. (1998). Self-efficacy and alternative conceptions of science of preservice elementary teachers. *Science Education, 82,* 553-568.

Selvi, M., & Yakışan, M. (2004). Üniversite birinci sınıf öğrencilerinin enzimler konusu ile ilgili kavram yanılgıları [Misconceptions about enzymes in university students]. *Gazi University Journal of Gazi Educational Faculty, 24*(2), 173-182.

Senemoğlu, N. (2013). *Gelişim, öğrenme ve öğretim kuramdan uygulamaya* (*23. bs.) [Development, learning and teaching from theory to practice (23. ed.)].* Ankara: Yargı Yayınevi.

Songer, C. J., & Mintzes, J. J. (1994). Understanding cellular respiration: an analysis of conceptual change in college biology. *Journal of Research in Science Teaching, 31,* 621-637.

Stewart, J., Hafner, D., & Dala, M. (1990). Students' alternative views of meiosis. *The American Biology Teacher, 52,* 228-232.

Sungur, S., Tekkaya, C., & Geban, Ö. (2001). The contribution of conceptual change texts accompanied by concept mapping to students' understanding of the human circulatory system, *School Science and Mathematics, 101,* 91–101.

Tekkaya, C. Çapa, Y., & Yılmaz, Ö. (2000). Biyoloji öğretmen adaylarının genel biyoloji konularındaki kavram yanılgıları [Pre-service biology teachers' misconceptions about general biology]. *Hacettepe University Journal of Education, 18,* 140-147.

Tekkaya, C., & Balcı, S. (2003). Öğrencilerin fotosentez ve bitkilerde solunum konularındaki kavram yanılgılarının saptanması [Determination of students' misconceptions concerning photosynthesis and respiration in plants]. *Hacettepe University Journal of Education, 24,* 101-107.

Treagust, D. F. (1988). Development and use of diagnostic tests to evaluate students' misconceptions in science. *International Journal of Science Education, 10*(2), 159-169.

Tsai, W. C., & Huang, Y. M. (2002). Mechanisms linking employee affective delivery and customer behavioural intentions. *Journal of Applied Psychology, 87,* 1001-1008.

Uzunkaya, A. (2007). *Kavram yanılgısı ve çoklu zekâ alanlarının ilişkilendirilmesine dayalı bir öğretimin kavram yanılgılarının giderilmesindeki etkisinin incelenmesi: Mikroorganizmalar [The study of the effects of instruction based on relating misconceptions and multiple intelligence areas on breaking misconceptions; Microorganism].* Master Thesis, Balıkesir University Institute of Science and Technology, Balıkesir, Turkey.

Uzunkaya, A. & Özgür, S. (2011). Dominant zekâ alanlarına dayalı bir öğretimin kavram yanılgılarının giderilmesindeki etkisi [Effects of an instruction based on dominant intelligence on overcoming misconceptions]. *Hacettepe University Journal of Education, 41,* 461-472.

Venville, G., Gribble, S. J., & Donovan, J. (2005). An exploration of young children's understandings of genetics concepts from ontological and epistemological perspectives. *Science Education, 89*(4), 614-633.

Willerman, M., & MacHarg, R. A. (1991). The concept map as an advance organizer. *Journal of Research in Science Teaching, 28*(8), 705-711.

Yağbasan, R., & Gülçiçek, Ç. (2003). Fen öğretiminde kavram yanılgılarının karakteristiklerinin tanımlanması [Describing the characteristics of misconceptions in science teaching]. *Pamukkale University Journal of Education, 1*(13), 102-120.

Yakışan, M., Yel, M., & Mutlu, M. (2009). Biyoloji öğretiminde bilgisayar animasyonlarının kullanılmasının öğrenci başarısı üzerine etkisi [Effect of computer animations upon student's achievement of biology education]. *Ahi Evran University Journal of Education, 10*(2), 129-139.

Yıldırım, A., & Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences]* Ankara: Seçkin Yayıncılık.

Yip, D. Y. (1998). Teachers' misconceptions of the circulatory system. *Journal of Biological Education, 32,* 207-215.

Yürük, N., & Çakır, Ö. S. (2000). Lise öğrencilerinde oksijenli ve oksijensiz solunum konusunda görülen kavram yanılgılarının saptanması [Determination of misconceptions in high school students about oxygenated and non-oxygenated respiration]. *Hacettepe University Journal of Education, 18*, 185-19.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	The Effect of Experimental Study Method on Teaching Basic Microbiology Concepts
Discipline	Biology Education
Type of Article	Research article
Year of Data Collection	2016-2017 (fall semester)

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that the content of the study does not have any threats to the physical or mental health of the participant. The research was carried out in accordance with the volunteerism of the participants. The participants were informed about the scope of the study and the right to leave the study at any time. Personality rights and private information of the participants were protected.

Date 08/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Hacettepe University	Prof. Dr.	Esin ATAV	
2.	Hacettepe University	Assoc. Prof. Dr.	Dilek Sultan ACARLI	
3.				

Correspondent Author's Info

Institute	Hacettepe University
Postal address	Hacettepe Üniversitesi Eğitim Fakültesi B Blok 4. Kat Matematik ve Fen Bilimleri Eğitimi Bölümü 06800 Beytepe/ANKARA
E-mail	dileksultan@gmail.com
Phone	0312 2978601

Yavrutürk, A.R.., İlhan, T., & Baytemir, K. (2020). Social support and school climate as predictors of school connectedness in high school students**.** *Bartın University Journal of Faculty of Education*, 9(2), 334-351.

Bartın University Journal of Faculty of Education, 9(2), 334-351

buefad.bartin.edu.tr

Social Support and School Climate as Predictors of School Connectedness in High School Students

Ali Rıza YAVRUTÜRK*[a], Tahsin İLHAN[b], Kemal BAYTEMİR[c]

Article Info

DOI: 10.14686/buefad.653345

Article History:
Received: 30.11.2019
Accepted: 05.05.2020
Published: 05.06.2020

Keywords:
High school students,
School connectedness,
Social support,
School climate

Article Type:
Research Article

Abstract

This study aimed to investigate the extent to which perceived social support and school climate in high school students predicted the school connectedness. The study was carried out with a total of 796 students including 421 girls and 375 boys attending different grades in 10 different secondary schools. Data collection tools included the Perceived School Experiences Scale, the Perceived Social Support Scale, and the School Climate Scale. Data were analyzed using Pearson Product Moment Correlation Coefficient, Multiple Linear Regression, independent groups t-test, One-way ANOVA, and Kruskal-Wallis H Test. According to the results of the study, all of the variables were found to be significantly correlated with each other. The results of the regression analysis indicated that school climate and family, friends, and teacher's variables, which are the sub-dimensions of social support, explained 42.7% of the total variance of school connectedness. As a result of the difference analysis, the school connectedness score was determined to not differ significantly by gender, while it yielded a significant difference by grade level. Also, the school connectedness scores of the students indicated a significant difference by school type and reasons for selecting the school.

Lise Öğrencilerinde Okul Bağlılığının Yordayıcıları Olarak Sosyal Destek ve Okul İklimi

Makale Bilgisi

DOI: 10.14686/buefad.653345

Makale Geçmişi:
Geliş: 30.11.2019
Kabul: 05.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Lise öğrencileri,
Okul bağlılığı,
Sosyal destek,
Okul iklimi

Makale Türü:
Araştırma Makalesi

Öz

Bu araştırmanın amacı, lise öğrencilerinde algılanan sosyal destek puanının ve okul iklimi puanının okul bağlılık puanını ne düzeyde yordadığını incelemektir. Araştırma, 10 farklı ortaöğretim kurumunda farklı sınıf düzeylerine devam eden 421 (% 52,9) kız ve 375 (% 47,1) erkek olmak üzere toplam 796 öğrenci üzerinde gerçekleştirilmiştir. Veri toplama araçları olarak Okul Yaşantıları Ölçeği, Algılanan Sosyal Destek Ölçeği ve Okul İklimi Ölçeği kullanılmıştır. Veriler, Pearson Momentler Çarpım Korelasyon Katsayısı, Çoklu Doğrusal Regresyon, bağımsız gruplar *t*-testi, Tek yönlü varyans analizi (ANOVA) ve Kruskal Wallis H Testi ile incelenmiştir. Araştırmanın sonuçlarına göre tüm değişkenlerin birbiri ile anlamlı olarak ilişkili olduğu görülmüştür. Regresyon analizi bulgularına göre, okul iklimi ve sosyal desteğin alt boyutlarından aile, arkadaş ve öğretmen değişkenlerinin okul bağlılığının toplam varyansının % 42,7'sini açıklamaktadır. Fark analizleri sonucunda okula bağlılık puanının cinsiyete göre anlamlı olarak farklılaşmadığı sınıf düzeyine göre ise anlamlı bir farklılaşmanın olduğu görülmüştür. Yine öğrencilerin okul bağlılık puanları, okul türü ve okul tercih etme nedenlerine göre anlamlı olarak farklılaştığı ortaya çıkmıştır.

***Corresponding Author:** a.r_yavruturk@outlook.com
[a] Graduate Student., Zile Anatolian Imam Hatip High School, Tokat, Turkey, https://orcid.org/0000-0002-6724-6019
[b]Prof. Dr., Tokat Gaziosmanpaşa University, Tokat, Turkey, https://orcid.org/ 0000-0002-5007-5022
[c]Assoc. Prof. Dr., Amasya University, Amasya, Turkey, https://orcid.org/0000-0002-7865-4325

Introduction

Given the time that the individual spends in school and the reflections of the school in daily life, the importance of the individual - school relationship is much more than it is estimated to be. The role played by the experiences such as the knowledge and skills acquired under the umbrella of the individual - school relationship, interactions with friends and teachers, and participation in class and extracurricular activities is remarkable. It is of great significance for schools to achieve their educational goals effectively for a healthy individual and a healthy society (Kalaycı and Özdemir, 2013). Therefore, individuals' connectedness to school is important for their versatile development (Dilmaç, Karababa and Oral, 2018). Maddox and Prinz (2003) describe school connectedness as a phenomenon associated with a student's school, school staff, and ideals that the school is trying to impart. Student's school connectedness is at the heart of the ongoing educational debate and is considered an important starting point for student's learning. In general, students' school connectedness is discussed as a framework including positive student behaviors such as attendance, participation, and effort and their psychological connections with the school environment (Önen, 2014).

The concept of school connectedness was first mentioned in Hirschi's (1969) theory of social control, which he laid out to explain the causes of crime. Social control theory discusses the phenomenon of crime in terms of individuals' level of commitment to social values and norms. This theory considers the school factor or school life as one of the basic institutions that provide individuals' commitment to social values. Also, a leading cause of criminal and violent behavior is thought to stem from the weakening of individuals' commitment to the school (cited by Kızmaz, 2006).

Many studies have made it possible to take a broader view of the subject by addressing school connectedness with various dimensions. While school connectedness is defined as believing that you are valuable and respected as a member of the school (Bronis, Samdal, and Wold, 1999; Midgley, Roeser, and Urdan, 1996), Osterman (2000) handles school connectedness as a basic psychological need in terms of the sense of belonging to the group. Also, Faircloth and Hamm (2005) discuss the concept of school connectedness in relation to the student's relationships with teachers and classmates, and they see student behaviors as a constantly changing and evolving relationship of activities, rather than merely limiting them to students' relationships with their friends and teachers. Studies reveal that school connectedness affects the student's school life in terms of affective, behavioral and social aspects.

According to Savi (2011), school connectedness is a concept that includes behavioral, emotional and cognitive aspects. The behavioral aspect of school connectedness will enable the student to behave more harmoniously in their social environment and friendship relations. These harmonious behaviors can be seen as behaviors that will benefit the student's psychosocial harmony and indirectly school success (Blumenfeld, Fredricks and Paris, 2004). In studies on the behavioral aspects of school connectedness (Cairns and Mahoney, 1997; Evertson and Weinstein, 2006; Posner and Vandell, 1999), various aspects of school connectedness have been discussed, and various definitions of school connectedness have been introduced. The behavioral aspect of school connectedness is defined as obeying school rules, avoiding absenteeism (Evertson and Weinstein, 2006), fulfilling school-related activities, doing homework, participating in school-related activities, and being active in lessons (Posner and Vandell, 1999), and participating in extracurricular activities (Cairns and Mahoney, 1997). The emotional aspect refers to attitudes, perceptions, interests, and emotions related to school. The cognitive dimension, on the other hand, can be evaluated in terms of two variables. These are feeling of achievement and psychosocial adjustment (Savi, 2011).

The school climate is undoubtedly one of the most important variables affecting the student's connectedness to school.The fact that the student has a feeling of belonging to the school, loves the school, and creates a comfortable psychological environment in the school will increase students' productivity (Mengi, 2011). A negative school environment, on the other hand, can cause feelings of stress, pressure, and loneliness in students, communication problems with teachers, the development of negative emotions about school and lessons, and a decrease in their motivation and success (Karan, 2012). Similarly, negative school climate shows a positive correlation with behavioral problems and low success, and also leads to consequences such as alienation from school (Arıman, 2007; Bilgiç, 2009; Durmaz, 2008). One of the most important factors affecting students' school connectedness is the school climate. Although every school has common goals, they have different climates. This climate affects all the staff working in the school as well as students' school connectedness (Thomasson, 2006). Çelik (2002) evaluates the organizational climate of the school as a set of internal characteristics that affect the behaviors of the members and distinguish one school from the other. Taşkıran (2008) states that schools have to provide a healthy

organizational environment and provide the highest level of personal, social, and academic learning for the people they serve.

Since a school with a positive school climate will have an increased attractiveness for students, it will also increase students' academic achievement in addition to satisfying the students with the quality of school life compared to schools with poor school life quality (Kayıkcı and Sayın, 2010; Özdemir, 2000). While factors such as positive educational environment (Cenkseven and Sarı, 2008), a sense of satisfaction (Erkan, Karip, Özdemir, Sezgin and Şirin, 2010) and positive teacher behaviors (Schlechty, 2001) positively affect school connectedness, some studies have laid out a negative relationship between school connectedness and basic problems of adolescence such as substance abuse (Furrer, Kindermann, Marchand, Skinner, 2008), risky sexual behaviors (Abbott, Catalano, Hawkins, Hill, and Kosterman, 1999; Furrer et al., 2008), violence (Saglam, 2016), and deviant behaviors; deviant behavior towards school equipment, violence, deviant behaviors towards school rules, substance abuse, etc. (Çukur and Ünal, 2011).

Social support is one of the most important factors affecting student's school connectedness. Because social support is a versatile concept that is difficult to conceptualize, define, and measure (Kaşık, 2009), a common definition cannot be found in the literature. However, many researchers have tried to define the concept of social support from different perspectives. Sarason, Levine, Basham, and Sarason (1983) and Lambert (1989) describe social support as the presence of people whom we know and trust that care, mind, and love us and who we believe will help us (cited by Yamaç, 2009), while Sorias (1988) refers to social support as the idea of a person as shown by the environment that confirms the person is accepted and respected. Yıldırım (1997), on the other hand, bases social support on Kurt Lewin's field theory and defines it as all of the factors that affect the individual's behavior at a given time. The teaching and learning experiences of students in secondary education in Turkey undergo an intensive examination program and curriculum. Students spend most of the day at school both in and out of the classroom by establishing social relations with their teachers, fellow students, and school personnel. According to Arslan (2009), physiological, cognitive, psychological, and social changes take place in the circles and inner world of the individual in adolescence which coincides with high school years. In this period, self-confusion and adaptation problems of adolescents who try to become adults increase. In this challenging period, the adolescent can develop a healthy identity only by solving the problems encountered. In this period, the social support to be given to adolescents will not only make them feel more valuable but also increase their self-esteem and enable them to solve their problems more easily and successfully. Also, some studies frequently report (Şahin, 2011) that individuals complain that they cannot share their problems with anyone, especially in adolescence, and find people that understand their problems. The examination of the causes of these complaints indicates that the main reason is the perceived social support. According to Taysi (2000), when an individual encounter a problem, they turn to their friends, family and close friends to get support for the solution of the problem. According to Başer (2006), regardless of the type of social support, it has a positive effect on individuals and is closely related to the individual's mental health. Furthermore, Özen (1998) considers social support as a psychological need.

Studies in the literature have shown that social support behaviors exhibited by their teachers towards students have a positive effect on the behavioral and emotional aspects of school connectedness (Bowen and Brewster, 2004). Many studies (Bowen and Woolley, 2007; Brown, Mcleod, Tressell and Unger, 2000; Crump, Simons-Morton, 2003) have revealed that the social support that students receive from their families and teachers increase their school connectedness. Daly, Shin, and Vere (2007) stated that positive peer norms and peer support positively affected students' school connectedness, while Akman (2010) found that low level of social support among students negatively affected students' school connectedness. İkiz and Sağlam (2017) stated that there was a positive relationship between the level of social support and the level of school connectedness among students, while Wentzel (1998) reported that interest in school, interest in the class, and taking responsibility, which are among academic motivation variables, increased as social support increased. Many studies (Demaray and Malecki, 2002; Guay, Larose, Ratella, and Senecal, 2005; Meeus, 1993; Pastore, Perkins, Santinello, and Vieno, 2007; Yıldırım, 2006) have concluded that the perceived social support has a positive effect on school connectedness. Given the positive impact of social support on high school students, it is inevitable to think that it has a significant impact on students' school connectedness. Therefore, it can be predicted that the school connectedness of high school students who perceive social support adequately is higher. This study aims to investigate whether different sources of social support (family, teachers, and friends) have a decisive role in terms of school connectedness levels of high school students.

The review of the literature indicates that school connectedness has also been studied according to gender, grade level, type of school, and the reason for choosing a certain school. There are many studies addressing students' school connectedness level according to gender variable (Akgül, 2013; Blumenfeld et al., 2004; Çalık, Kandemir, Kurt, Özbay, and Özer, 2009; Demir et al., 2012; Dindar, 2008; Maddox and Prinz, 2003; Sarı, 2013; Sarı et al., 2007; Taşkıran, 2008). Similarly, it is also possible to find studies in the literature addressing school connectedness according to variables such as grade level (Demir, Kaya and Metin, 2012; Dindar, 2008; Erkan et al., 2010; Hagborg, 1994; Sarı et al.), type of school (Coleman, 2003; Dindar, 2008; Karan, 2012; Kashdan and Robert, 2004), and the reasons for selecting the school (Koç, Avşaroğlu and Sezer, 2004; Erkal, Yalçın, and Sancar, 2012; Rahat, 2014; Şahin, Zoraloğlu, and Şahin Fırat, 2011). However, these studies mostly include university students in their samples. The fact that there is limited research into predicting school connectedness of secondary school students and addressing variables such as gender, type of school, grade level, and reasons for selecting the school increases the importance of this study.

The school occupies an important place in all periods of an individual's life. The school is also critical for adolescents in secondary education period to fulfill their developmental duties. The student needs an appropriate school climate and social support to overcome the problems encountered in the school environment. Ignoring these needs of students may bring about serious effects on the physical, psychological, social, and academic development of students. It can be said that having these negative experiences during adolescence, which is an important turning point of the development process, will cause greater damages to the individual in the coming years (Durmaz, 2008). For students to have a high level of school connectedness, they must have successfully and effectively solved the adaptation problems they have faced. In this respect, examining the school climate and social support resources perceived by students increases the importance of the study. The examination of the literature indicates that there are many studies investigating perceived school climate (Eser, 2010; Korkmaz, 2011; Tezcan, 2011) and perceived social support (Bilge and Kutsal, 2012; Çivitçi, 2011; Ergene and Yıldırım, 2003; Gençdoğan, 2006) of teachers, managers, families, and students at all levels of education in Turkey. However, no study has been found in the literature on the relationship of students' school connectedness with variables such as social support and school climate. The availability of few studies in the literature on school connectedness, which is very important for our students' educational lives, necessitates the conduct of this study. Therefore, this study aimed to reveal the relationship between high school students' school connectedness scores and their school climate scores and social support scores. At the same time, the study aimed to investigate school connectedness in terms of variables such as gender, school type, and grade level.

Method

Research Design

This study used relational screening and causal-comparative models. The relational screening model is a research model that examines the relationships between dependent and independent variables or the degree of change of variables (Büyüköztürk,Çakmak, Akgün, Karadeniz & Demirel, 2013; Karasar, 2012). Furthermore, the causal comparison model is made to determine the cause or sources of the relationship between the dependent and independent variables/variables (Büyüköztürk, vd. 2013). The predictor variables of the study are perceived social support and school climate. The predicted variable, on the other hand, is the school connectedness of secondary school students. Also, the study investigated whether school connectedness, which is a dependent variable, differed in terms of various variables.

Population and Sample/Study Group/Participants

The participants of this study consisted of 796 students including 421 girls (52.9%) and 375 boys (47.1%) studying in a province in the Central Black Sea Region. The distribution of the students by grade level was as follows: 9th-grade, 203; 10th-grade, 205; 11th-grade, 211; and 12th-grade, 177. The distribution of the students according to their school type included 169 students from science high school, 271 from Anatolian high school, 180 from vocational and technical high school, and 176 from Imam Hatip high school.

Data Collection Tools

Data collection tools included a Personal Information Form, the Perceived School Experiences Scale, the Perceived Social Support Scale, and the School Climate Scale. The properties of the measurement tools are as follows.

Personal information form (PIF). PIF was created by the researchers to collect information about participants' gender, grade level, school type, socio-economic level of the family, and reasons for coming to their school.

The perceived school experiences scale (PSES). The scale was developed by Anderson-Butcher, Amorose, Iachini, and Ball (2012) to measure the individual's perceptions of school life. Then, the scale was adapted to Turkish by Baytemir, Köşterelioğlu, and Köşterelioğlu (2015). The scale has a 5-point Likert type format and consists of 3 subscales and 14 items (Academic Press: 1, 2, 3, 4; Academic Motivation: 5, 6, 7, 8, 9, 10; School Connectedness: 11, 12, 13, 14). The total score of the scale varies between 14 and 70. There is no inversely scored item on the scale. The rating scale was formed as strongly disagree = 1 and agree strongly = 5. Confirmatory factor analysis for structure validity of the scale showed that the fit values were adequate (χ^2/sd = 2.87, RMSEA = .057, SRMR = .039, CFI = .99, NFI = .98, GFI = .94). In the criterion validity study, it was found that the dimensions of the School Experiences Scale had correlations between .40 and .51 with the Perceived Social Competence Scale. The Cronbach alpha reliability coefficients for all the scales were .93, and ranged from .83 to .85 for the subscales. Cronbach's alpha coefficients for this study were .79 for FAS, .78 for FRS, .84 for TES, and .84 for the overall scale.

The perceived social support scale (PSSS-R). The scale was developed by Yıldırım (2004) in Turkey conditions. It consists of three subscales (FAS, Family Support; FRS, Friend Support; TES, Teacher Support) and a total of 50 items. The rating scale was formed as" not suitable for me, partly suitable for me and suitable for me". FAS includes family support such as trusting and understanding the child truly, correcting mistakes gently, highlighting their strengths, and appreciating their success. FRS consists of content such as being supported by friends in case of exposure to injustice, sharing knowledge about the lessons, and being calmed down by friends when furious. On the other hand, TES consists of support such as correcting the mistakes of the child gently, emphasizing the superior aspects of the child, answering the questions about the course sincerely, and being fair. The validity of PSSS-R and its subscales was examined by factor analysis and similar tests. The construct validity of FAS, FRS, and TES subscales was examined with factor analysis, and the factor construct of each subscale was determined. First, the alpha reliability coefficient was calculated for the reliability of PSSS-R and its subscales, and also, test-retest reliability was examined. The values were found to be as follows: the alpha value for the overall PSSS-R = .91; α = .83 for FAS; α = .77 for FRS; and α = .83 for TES. Cronbach's alpha coefficients for this study were .79 for FAS, .78 for FRS, .84 for TES, and .84 for the overall scale.

The school climate scale (SCS). The scale developed by Çalık and Kurt (2010), consists of 22 items prepared in the form of a 5-point Likert type. The rating scale included scoring between "Never = 1" and "Always = 5". The scale consists of three factors such as (1) supportive teacher behaviors (8 items), (2) success-orientation (4 items), and (3) safe learning environment and positive peer interaction (10 items). According to the results of the original validity and reliability study of the scale, the factor load values of the items in this three-factor structure ranged from .45 to .85, and the total variance explained was approximately 45%. The internal consistency coefficients calculated to determine the reliability level of the scores obtained from the factors varied between .77 and .85. Cronbach's Alpha internal consistency coefficients obtained through analyses conducted on data collected in this study for "supportive teacher behaviors", "success-orientation", and "safe learning environment" dimensions of the scale were calculated as .85, .71, and .73, respectively. The internal consistency coefficient of the overall scale was calculated as .84. Based on these results, the scale was found to have sufficient psychometric properties to measure students' perceptions about school climate. Cronbach's alpha coefficient for the present study was found to be .81 for the overall scale.

Data Collection

The data were collected in the first semester of the 2018-2019 academic year. A total of 870 students from different school types were reached. The scales were administered by the researchers in the classroom environment.

Data Analysis

Statistical analysis of the data obtained from the measurement tools was performed using IBM SPSS 22.0 statistical software package. The values in the data set were reviewed for incorrect coding before starting the statistical analyses. The missing data were completed by averaging the series. Mahalanobis distance was employed to determine the extreme values and outliers that could affect the results of the study. For this reason, Mahalanobis values for the .01 significance level were calculated as 12.60; accordingly, 74 observations were removed from the data set, therefore, the analyses were conducted with the remaining 796 data sets. Afterward, multicollinearity,

variance inflation factor (VIF), and tolerance values between variables were examined. Also, the histogram graph and scatter plot matrix were examined to determine the assumptions of linearity and normality. As a result of these investigations, the data set was determined to meet all the assumptions regarding regression analysis. Correlation analyses were employed to test the relationship of school connectedness scores with school climate and social support scores, which was followed by multiple linear regression analysis conducted to determine the extent to which perceived social support scores and school climate scores predicted school connectedness scores. Also, independent groups t-test, one-way analysis of variance (ANOVA), and Kruskal-Wallis H tests were conducted to determine whether school connectedness scores of the participants differed in terms of gender, type of school, grade level, and the reasons for selecting the school. Independent groups t-test was used to examine school connectedness scores according to gender. ANOVA test was used because the scores related to grade-level were distributed normally. The Kruskal-Wallis H test was used because the scores related to school type and reason for school preference did not show a normal distribution.

Research Ethics

Prior to the application, the participants were informed about the purpose, importance, and data collection tools of the study. The volunteering principle was taken into consideration in the participation of the individuals in the study. In addition, get permissions were from relevant institutions for data collection.

Findings

This section involves correlation and multiple linear regression analyses used to test the relationship of school connectedness with school climate and social support in high school students, and independent groups t-test, ANOVA, and Kruskal-Wallis H tests used to test whether there were differences in school connectedness scores according to gender, school type, grade level, and students' school preferences variables.

Findings Related to the Independent Variables as Predictors of the Dependent Variable

This section first addresses relationships between variables and descriptive statistics. Then, it presents the results of multiple regression analysis. Table 1 gives the relationships between variables and descriptive statistics.

Table 1. Pearson Correlation Coefficients and Descriptive Statistics between Variables

	Variables	1	2	3	4	5	*X*	SS
1	School Connectedness	-					3.94	.68
2	School Climate	.58**	-				3.53	.45
3	FAS	.27**	.21**	-			2.70	.22
4	FRS	.23**	.15**	.37**	-		2.56	.26
5	TES	.53**	.47**	.39**	.36**	-	2.51	.32

Note: FAS: social support from family, FRS: social support from friends, TES: social support from teachers.

*N = 796, ** p<.01, * p<.05*

As is seen in Table 1, there was a significant positive relationship between all variables (p <.01). The school climate had the highest relationship with school connectedness (r = .58), which was followed by the social support from the teacher (r = .58), social support from the family (r = .27), and social support from friends (r = .23). Also, the standard deviation and mean values of the subscales of the social support were close to each other. Similarly, school connectedness scores and school climate scores had the highest scores, while social support subscales had the lowest scores.

After the Pearson Product Moment Correlation analysis, multiple linear regression analysis was performed to investigate the extent to which social support subscale scores and school climate independent variables predicted students' school connectedness scores. The findings from the multiple linear regression analysis are presented in Table 2.

Table 2. Findings Related to The Multiple Linear Regression Analysis

Variable	B	Standard Error B	B	T	P	Dual r	Partial r
Constant	-.64	.26		-2.44	.02*		
School Climate	.65	.046	.43	13.94	.00**	.58	.44
Family Support	.15	.092	.05	1.67	.10	.27	.06
Friend Support	.12	.077	.05	1.55	.12	.23	.05
Teacher Support	.63	.071	.30	8.88	.00**	.53	.30

*N = 796, ** p<.01, * p<.05; R^2 = .42.7*

The school climate, which is one of the independent variables, and family, friends, and teachers variables, which are the subscales of social support, explained 42.7% of the total variance of the school connectedness score. When the relative order of importance of predictor variables on school connectedness score was analyzed according to the beta coefficient (β), they turned out to be listed as school climate, social support from teachers, social support from the family, and social support from friends. The examination of t-test results related to the significance of regression coefficients indicated that school connectedness was mostly predicted by school climate, which was followed by social support from the teacher. On the other hand, although the relationship of social support from family and friends with school connectedness was significant in the correlation analysis, their contribution to school connectedness was not found statistically significant in the regression analysis (p> .05)

Findings Related to School Connectedness in terms of Some Variables

Independent groups t-test was employed to answer the question 'Do school connectedness scores of high school students differ according to gender variable?" The results of the analysis are summarized in Table 3.

Table 3. T-test Results of School Connectedness by Gender Variable

Gender	N	$\bar{X}$	SS	DF	T	P
Female	421	3.95	.68	794	.31	.81
Male	375	3.94	.68			

*N = 796, ** p<.01, * p<.05*

As shown in Table 3, there was no significant difference between school connectedness scores and gender ($t_{(796)}$ =. 31, p> .05). The mean school connectedness scores of male students ($\bar{x}$ = 3.94) were close to the mean school connectedness scores of female students ($\bar{x}$ = 3.95).

One-way analysis of variance (ANOVA) was employed to answer the question "Do school connectedness scores of high school students differ according to grade level?" The results of the analysis are summarized in Table 4.

Table 4. Results of Anova Test between School Connectedness and Grade Level

Variables	Levels	N	$\bar{X}$	S	F	P	Significant Difference
Grade Level	(1)9th-grade	203	4.02	.64	3.25	.02*	1>2, 1>4
	(2)10th-grade	205	3.90	.70			2>4
	(3)11th-grade	211	4.00	.69			3>4
	(4)12th-grade	177	3.80	.69			-
	Total	796	3.94	.68			

*N = 796, ** p<.01, * p<.05*

The examination of the analysis results in Table 4 indicated that there was a significant difference between school connectedness and grade level (F (3, 792) = 3.24, p <.05). Scheffe results were used to investigate the groups that caused the differences emerging in one-way analysis of variance. As a result of the study, 9th-grade students were found to have higher school connectedness than 10th-grade students, and 9th, 10th, and 11th-grade students had higher school connectedness than 12th-grade students (p <.01).

ANOVA test was employed to answer another question "Do school connectedness scores of high school students differ according to school type?", however, the variance of the groups was observed to be not homogeneous (p <.05). For this reason, the Kruskal-Wallis H test was employed. The results of the Kruskal-Wallis H test for school type are given in Table 5.

Table 5. Results of The Kruskal-Wallis H Test for School Connectedness and School Type

School Type	N	X̄	Rank averages	X^2	DF	P	Significant difference
(1)Science High School	169	3.81	343.83	36.71	3	.00**	1<3
(2)Anatolian High School	271	3.93	383.36				-
(3) Voc.and Tech. High School	180	4.12	484.89				-
(4) Imam Hatip High School	176	3.94	385.95				-
Total	796	3.94					

*N = 796, ** p<.01, * p<.05*

As is seen in Table 5, the lowest rank average was found to belong to Science High School type, while the highest rank average belonged to Vocational and Technical High School type. Findings indicated that school connectedness scores differed significantly according to school type. Mann-Whitney U test was employed to determine which school types this difference stemmed from. As a result of the analysis, the score differences between science high school and vocational and technical high school types were observed to be significant (p <.01). In other words, the school connectedness scores of the students in technical high schools were significantly higher than the scores of science high school students.

ANOVA analysis was employed to answer the other question of the study, "Do the school connectedness scores of high school students differ according to the reasons for selecting the school?" However, the variance of the groups was found to be not homogeneous. For this reason, Kruskal-Wallis H test was used. Table 6 shows the Kruskal-Wallis H test results for reasons for selecting the school.

Table 6. Kruskal-Wallis H Test Results Related to School Connectedness and The Reason for Selecting The School

Reason for Selecting the School	N	X̄	Rank averages	X^2	DF	P	Significant difference
(1)My score	381	3.86	366.55	15.46	3	.00**	3>1
(2)Family	145	4.00	415.33				-
(3)Myself	220	4.01	440.01				-
(4) Other (friend, teacher)	50	3.90	410.51				-
Total	796	3.90					

*N = 796, ** p<.01, * p<.05*

The examination of Table 6 indicated that the lowest rank average regarding the reason for selecting the school belonged to “my score” and the highest rank average belonged to “myself”. Findings revealed that school connectedness scores differed significantly by reasons for selecting the school. Mann-Whitney U test was employed to determine which school type this difference came from. As a result of the analysis, the score differences between “my score” and “myself” reasons for selecting the school were found to be significant ($p < .01$). In other words, the school connectedness scores of the students who chose the reason for school preference as “myself” were significantly higher than the scores of the students who chose the reason for school preference as “my score”.

Discussion and Conclusion

This study pursued two main objectives. First, the study aimed to reveal the extent to which school climate and perceived social support scores predicted the level of school connectedness scores in secondary school students. Second, the study intended to determine whether school connectedness scores differed according to gender, type of school, grade level, and students' preference of the current school. The findings obtained with this regard were discussed in light of the literature.

As a result of regression analysis, the social support received from teachers and school climate were found to be significant predictors of school connectedness. On the other hand, although the social support received from family and friends was correlated to school connectedness, they were not determined to be significant predictors of school connectedness. These results are consistent with related studies in the literature (Bronis et al., 1999; Demir, Kaya, and Metin, 2012; Erkan et al., 2010; Faircloth and Hamm, 2005; Kalaycı and Özdemir, 2013; Maddox and Prinz, 2003; Midgley et al. 1996; Taşkıran, 2008). With this regard, as high-level school climate scores increase students' school connectedness scores (Blumenfeld et al., 2004; Cairns and Mahoney 1997; Cenkseven and Sarı, 2008; Evertson and Weinstein 2006; Mengi, 2011; Osterman, 2000; Posner and Vandell, 1999; Savi, 2011), low school climate score, on the other hand, is associated with the decreased school connectedness scores (Abbott et al., 1999; Çukur and Ünal, 2011; Furrer et al., 2008; Sağlam, 2016; Schlechty, 2001; Şahin, 2011). Students feel more connected to schools with an open school climate. In this case, the school climate can be said to affect school connectedness scores of students positively. Also, the fact that schools have good teachers, positive teacher and student relationships in the school, a democratic environment in the school, and an environment in which students feel or express themselves better can be seen as the reasons that affect the school connectedness scores of students, positively. On the other hand, in a school climate where the student does not feel well and cannot express themselves better, they may feel excluded. In this case, it negatively affects the student's school connectedness scores.

One of the predictors of secondary school students' school connectedness scores is social support. The findings indicate that the social support perceived by secondary school students from their teachers supports their school connectedness. Studies in the literature have shown that one of the concepts emphasized about school connectedness is the social support that students perceive from teachers (Arslan, 2009; Başer, 2006; Brown et al., 2000; Crump, Simons-Morton, 2003; Özen, 1998; Şahin, 2011; Taysi, 2000). However, in this study, the low level of the relationship between the perceived social support from friends and family and school connectedness is similar in some studies (Çivitçi, 2011; Yıldırım & Ergene, 2003), but in some other studies (Arslan, 2009; Kapıkıran and Özgüngör, 2009) shows that perceived social support from friends and families has a high relationship with school connectedness. (Blumenfeld et al., 2004; Çukur and Unal, 2011; Furrer et al., 2008; Scott, 2016; Schlechty, 2001). The social support that secondary school students perceive from their teachers was found to predict the school connectedness score more than the social support perceived from family and friends. Thomson (2005) and Manlove (1998) consider teachers and classroom activities as the most important factor that increases the school connectedness scores of secondary school students. Consistent with the findings of the present study, some researchers (Erkan et al., 2010; Kızılay, 2008; Osterman, 2000) have concluded that as secondary school students are in their adolescence period, the social support they perceive from their family predicts their school connectedness less than the social support they perceive from their teachers. Peer relationships are very important in the secondary school period. However, in the study, students mostly attributed their school-related connectedness to teachers. It can be said that this situation may be because the main subject of the school in terms of teaching activities and student engagement is the teacher. Similarly, as secondary education is a preparatory process for higher education, it can be said that the student gives more importance to the social support received from the teacher in terms of achieving the goals towards higher education.

As a result of the t-test conducted to examine the level of the students' school connectedness according to the gender variable, no significant difference was found between the school connectedness scores of the students. Although the findings of some of the studies in the literature on whether the school connectedness scores of secondary school students differ according to gender overlap the findings of this study (Akgül, 2013; Blumenfeld et al., 2004; Çalık et al., 2009; Demir et al., 2012; Dindar, 2008; Maddox and Prinz, 2003; Sarı, 2013; Sarı et al., 2007; Taşkıran, 2008), there are also some studies whose findings do not match the results of the present study (Akgül, 2013; Brown, Higgins, Pierce, Hong, and Thoma, 2003; Doğan, 2012; Durmaz, 2008; Erkan et al., 2010; Uwah, McMahon, and Furlow, 2008). Doğan (2012) found that male students had higher school connectedness scores than female students. Nevertheless, some studies (Bourke and Smith, 1998; Brown et al., 2000; Dindar, 2008; Durmaz, 2008; Erkan et al., 2010; Karatzias, Power, Flemming, Lennan and Swanson, 2002; Marks, 1998; Saraç, 2015; Thomson, 2005) have shown that female students perceive the climate of their school more positively than male students. Furthermore, according to Erkan et al. (2010), the school connectedness scores of female students were higher compared to male students because female students adapted to the learning environment more easily and they had more positive peer interaction. Dindar (2008), on the other hand, found that school connectedness scores of female students were higher compared to male students because female students were more interested in guidance activities and communicated more easily with teachers and administrators.

In the present study, a significant difference was observed in school connectedness scores of the students according to school type. According to this difference, the highest rank average was in vocational and technical high school, which was followed by Imam Hatip high school, Anatolian high school, and science high school, respectively. Some of the studies in the literature (Coleman, 2003; Dindar, 2008; Durmaz, 2008; Karan, 2012; Kashdan and Roberts, 2004; Şencan, 2009; Taşkıran, 2008) are consistent with the findings of this study. Taşkıran (2008) and Dindar (2008) concluded that students in vocational high schools studied subjects that they were interested in and which they chose according to their abilities, and that this had a positive effect on their school connectedness scores. Also, Akgül (2013) argued that high-level of school connectedness scores of secondary school students in vocational high schools was related to the quality of teacher and student relationships in these high schools. Teacher-student relationships in workshops, laboratories, and similar educational environments in vocational high schools are more supportive and closer than those of Anatolian high schools and this may have resulted in higher school connectedness scores in vocational high schools. In the study, the finding that students in vocational high schools are more connected to school than students in science high schools may indicate that the school environment in vocational high schools is perceived as more stress-free and that the pressure of exams is lower than science high schools, which can affect students' school connectedness scores positively.

The grade level was another variable that brought about a significant difference in school connectedness scores. The results of the analysis indicated that 9^{th}-grade students had higher school connectedness compared to the 10^{th}-grade students, while students in the 9^{th}, 10^{th}, and 11^{th}-grade had higher school connectedness compared to students in the 12^{th}-grade. The findings of some studies in the literature (Akgül, 2013; Demir et al., 2012; Dindar, 2008; Erkan et al., 2010; Hagborg, 1994; Sarı et al., 2007; Sığınır, 2013; Taşkıran, 2008) are consistent with the findings of this study. According to Doğan (2012), since students who start high school generally continue their education in the environment where they live, they do not have much trouble in the adaptation process because they already know the school where they will be studying. The school adaptation process is largely achieved within a month. However, students in higher education go to schools which are generally in different cities (Aktaş, 1997; Rahat, 2014; Taşkıran, 2008; Yılmaz, Yılmaz, and Karaca, 2008) and in different socio-cultural environments (Saraç, 2015; Sığınır, 2013; Yılmaz et al., 2008); therefore, adaptation processes may take longer. Besides, some studies (Baykara, 2009; Doğan, 2012; Durmaz, 2008; Karan, 2012; Sarı et al., 2007) show that as the grade level of secondary school students increases, the level of their school connectedness decreases. Dogan (2012) claimed that as the grade level of students increased, their relationships with their teachers did not continue positively and that their school connected scores decreased because they better analyzed the weaknesses of the school and adopted the attitudes and behaviors of the school administration less during the learning process.

The last finding of the study is related to the differences in the school connectedness scores of the students according to their reasons for selecting the school. The findings indicated that there was a significant difference in the school connectedness scores of the students according to the reason for school preference and that the school connectedness of the students who preferred the school based on their reasons was higher than students who preferred their school based on other reasons. Although there was no study comparing the reasons for school preference and school connectedness in the literature, the examination of studies on the adaptation levels of university students as predictors of school connectedness scores (Aktaş, 1997; Koç, Avşaroğlu and Sezer, 2004;

Erkal, Yalçın, and Sancar, 2012; Rahat, 2014; Şahin, Zoraloğlu, and Şahin Fırat, 2011), the students who selected their school on their own will were found to have more adaptation to the school, on the other hand, the students who selected their school only by their scores or with the guidance of others had more difficulty in adapting to the school. Similar results may be true for secondary school students. The fact that secondary school institutions are mostly located in the environments where students live and that the choice of schools on the student side is limited suggests that students often choose the schools that they are more comfortable with. "My score" option was found to be evaluated as the reason for selecting the school more by students in higher education than students in secondary education. However, students pointed out school counselors as the lowest reason in the selection of schools, which suggests that school counselors were not effective enough in the reasons for school preference of students.

According to the findings of this study, the predictor power of school climate, which is one of the predictors of school connectedness, was higher compared to the predictor power of social support. However, the cross-sectional design of the study could not reveal the true cause-effect relationship between the variables. For this reason, the relationships between variables can be understood more clearly with experimental or longitudinal studies. In the study, the fact that the social support perceived from friends and family predicted school connectedness scores at a low level was not expected. Although there are some studies consistent with this finding, the study can be repeated with different samples and the results can be evaluated comparatively. Similarly, qualitative studies using observation, interview, and portfolio file analysis can be conducted to investigate the school climate perceptions and social support perceptions more deeply in terms of students' school connectedness scores. Also, the source of difference in students' school connectedness scores by grade level can be investigated to find out whether the difference comes from students' individual and developmental characteristics or they stem from the structural features of schools. Similarly, the differences in school connectedness scores of students according to school type can be investigated more deeply to discover which characteristics of students and schools this difference comes from. In the study, social support scores and school climate were found to significantly predict school connectedness scores of the students. Therefore, for students to have a high level of school connectedness, teachers, especially school counselors, should offer supportive and informative guidance activities that will increase the social support score of the students and improve the school climate. Developing a common understanding within school-parent cooperation under the supervision of school counselors in schools through consultation services will make a positive contribution to the school engagement scores in terms of social support perceived by students from the family and teachers. Furthermore, school counselors can arrange informative seminars and parent visits about social support and school climate for all stakeholders of the teaching and learning (teachers, school administration, parents, school clerks, etc.) to increase the school connectedness scores of the students.

Acknowledgments

This article was generated from the study of master thesis titled " Social support and school climate as the providers of school addiction in high school students".

Statement of Publication Ethics

Authors declare that the research has no unethical problems and observe research and publication ethics.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Ali Rıza Yavrutürk	☒	☒	☒	☒	☒	☐
Tahsin İlhan	☒	☒	☒	☒	☒	☐
Kemal Baytemir	☐	☒	☒	☒	☐	☒

Conflict of Interest

Authors declare that there is no conflict of interest related to the current study.

References

Abbott, R., Catalano, R. F., Hawkins, J. D., Hill, K. G., & Kosterman, R. (1999). Preventing adolescent health - risk behaviors by strengthening protection during childhood. *Archives Pediatrics & Adolescent Medicine, 153* (3), 226 - 234.

Akgül, T. (2013). *Ortaöğretim öğrencilerinin okul iklimine ilişkin algıları ile insani değerleri benimseme düzeyleri arasındaki ilişki.[Relationship between perceived school climate and adoption levels of human values by secondary school students].* Master Thesis, Fırat University, Elazığ.

Akman, Y. (2010). *İlköğretim ikinci kademe öğrencilerinin şiddet ve okul iklimi algıları arasındaki ilişki.* Yüksek Lisans Tezi *[The relationship between school climate and violence perception of 6th, 7th and 8th grade students].* Master Thesis, Gazi University, Ankara.

Aktaş, Y. (1997). Üniversite öğrencilerinin uyum düzeylerinin incelenmesi: Uzunlamasına bir çalışma. *Hacettepe University Journal of Education, 13*, 107- 110.

Anderson-Butcher, D., Amorose, A., Iachini, A., Ball, A. (2012). The development of the perceived school experiences scale. *Research on Social Work Practice, 22* (2), 186 - 194.

Arıman, F. (2007). *İlköğretim 7. ve 8. sınıf öğrencilerinin zorbalık eğilimleri ile okul iklimi algıları arasındaki ilişkinin incelenmesi [Researching the relationship between the school climate and bullying tendancy among the 7th and 8th grade students in primary school].* Master Thesis, Yeditepe University, İstanbul.

Arslan, Y. (2009). *Lise öğrencilerinin algıladıkları sosyal destek ile sosyal problem çözme arasındaki ilişkinin incelenmesi. [The examination of the relationship between high school students? perceived social support and their social problem solving levels].* Master Thesis, Selçuk University, Konya.

Başer, Z. (2006). *Aileden algılanan sosyal destek ile kendini kabul düzeyi arasındaki ilişkinin incelenmesi [The analyze of the relation between the perceived social support taken from the family and the level of self-acceptance].* Master Thesis, Ataturk University, Erzurum.

Baykara, E. (2009). *Öğretmen ve yöneticilerin okul iklimine ilişkin algıları ile toplam kaliteye ilişkin tutumları arasındaki ilişki (Üsküdar örneği) [Teacher and administrator perceptions regarding school climate and attitudes about the relationships between total quality (Uskudar example)].* Master Thesis, Yeditepe University, İstanbul.

Baytemir, K., Köşterelioğlu, M. A., & Köşterelioğlu, İ. (2015). Algılanan okul yaşantıları ölçeğinin türkçeye uyarlanması: Geçerlilik ve güvenirlilik çalışması [Adaptation of perceived school experiences scale to Turkish: validity and reliability study]. *Cankiri Karatekin University Journal of Institute of Social Sciences, 6* (2), 597 - 608.

Bilge, F., & Kutsal, D. (2012). Lise öğrencilerinin tükenmişlik ve sosyal destek düzeyleri [A study on the burnout and social support levels of high school students]. *Education and Science, 37* (164), 283 - 297.

Bilgiç, S. (2009). *İlköğretim öğrencilerinde okul yaşam kalitesi algısının arkadaşlara bağlılık ve empatik sınıf atmosferi değişkenleriyle ilişkisinin incelenmesi [Investigation of the relationships between the perception of school life quality and the variables of attachment to friends and empathic classroom atmosphere among elementary school students].* Master Thesis, Cukurova University, Adana

Blumenfeld, P. C., Fredricks, J. A., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74* (1), 59 - 109.

Bourke, S., & Smith, M. (1998). Quality of school life and intentions for further education: The case of rural high school. *Education Psychology, 18* (2), 28 - 45.

Bowen, G. L., & Brewster, A. B. (2004). Teacher support and the school engagement of Latino middle and high school students at risk of school failure. *Child and Adolescent Social Work Journal, 21* (1), 47 - 67.

Bowen, G. L., & Woolley, M. E. (2007). In the context of risk: Supportive adults and the school engagement of middle school students. *Family Relations, 56,* 92 - 104.

Bronis, M., Samdal, O., & Wold, B. (1999) Relationship between student's perceptions of school environment, their satisfaction with school and perceived academic achievement: An international study. *School Effectiveness and School İmprovement, 10*, 296 - 320.

Brown, M. B., Mcleod, L. E., Tressell, M. S., & Unger, D. G. (2000). The role of family support in interparental conflict and adolescent academic achievement. *Journal of Child and Family Studies, 9,* 191 - 202.

Brown, M. R., Higgins, K., Pierce, T., Hong, E., & Thoma, C. (2003). Secondary students' perceptions of school life with regard to alienation: The effects of disability, gender and race. *Learning Disability, 26*, 227 - 238.

Bursalıoğlu, Z. (2003). *Eğitim yönetiminde teori ve uygulama*. [*Theory and practice in educational management*]. Ankara: Pegem A Publishing.

Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2013). *Bilimsel araştırma yöntemleri (18. bs.) [Scientific research methods (18th ed.)]*. Ankara: Pegem Academy Publishing.

Cairns, R. B., & Mahoney, J. L. (1997). Do extracurricular activities protect against early school dropout? *Developmental Psychology, 33* (2), 241 - 253.

Cenkseven, F., & Sarı, M. (2008). İlköğretim öğrencilerinde okul yaşam kalitesi ve benlik kavramı [Quality of school life and self-concept among elementary school students]. *Journal of Human Sciences, 5* (2), 1 - 17.

Coleman, P. K. (2003). Perceptions of parent – child attachment, social self – efficacy and peer relationships in middle childhood. *Infant and Child Development, 12*, 351 - 368.

Crump A. D., & Simons-Morton, B. G. (2003). Association of parental involvement and social competence with school adjustment and engagement among sixth graders. *Journal of School Health, 73* (3), 121 - 125.

Çalık, T., Kandemir, M., Kurt, T., Özbay, Y., & Özer, A. (2009). İlköğretim okulu öğrencilerinin zorbalık statülerinin okul iklimi, prososyal davranışlar, temel ihtiyaçlar ve cinsiyet değişkenlerine göre incelenmesi. [Examination of primary school students' bullying status on the basis of the variables of school climate, pro-social behaviors, basic needs and gender]. *Educational Administration: Theory and Practice, 15,* (60), 555 - 576.

Çalık, T., & Kurt, T. (2010). Okul iklimi ölçeğinin (OİÖ) geliştirilmesi. [Development of the school climate scale (SCS)]. *Education and Science, 35,* (157), 167 - 180.

Çelik, V. (2002). *Okul kültürü ve yönetimi [School culture and management]*. Ankara: Pegem A Publishing.

Çivitçi, N. (2011). Lise öğrencilerinde okul öfkesinin yordayıcıları olarak okula yabancılaşma ve algılanan sosyal destek. *Elementary Education Online, 10* (3), 861- 871.

Çukur, Ş. C., & Ünal, H. (2011). Okula bağlılık, okulda uygulanan disiplin teknikleri ve okulda mağdurluğun lise öğrencilerinin sapkın davranışları üzerindeki etkisi [The effects of school bonds, discipline techniques in school and victimization on delinquency of high school students]. *Educational Sciences: Theory & Practice ,11* (2), 574 - 570.

Daly, B., Shin, R., & Vera, E. (2007). The relationships of peer norms, ethnic identity and peer support to school engagement in urban youth. *Professional School Counseling, 10* (4), 379 - 388.

Davidson, L. M., Demaray, M. K., Hodgson, K. K., Malecki, C. K., & Rebus, P. J. (2005). The relationship between social support and student adjustment: A longitudinal analysis. *Psychology in the Schools, 42*, 691 - 706.

Demaray, M. K., & Malecki, C. K. (2002). The relationship between perceived social support and maladjustment for students at risk. *Psychology in the Schools, 39* (3), 305 - 316.

Demir, Ö., Kaya, H. İ., & Metin, M. (2012). Lise öğrencilerinde okul kültürünün bir öğesi olarak okul yaşam kalitesi algısının incelenmesi [An investigation of high school students' school quality of life perceptions as an element of school culture]. *Pegem Journal of Education & Instruction, 2* (4), 9 - 28.

Dilmaç, B., Karababa, A., & Oral, T. (2018). Ortaokul öğrencilerinde okula bağlılığın yordanmasında algılanan sosyal destek ve değerin rolü [The role of perceived social support and value in prediction of school attachment among secondary school students]. *H. U. Journal of Education, 33* (2), 269 - 279.

Dindar, M. M. (2008). *Farklı türdeki ortaöğretim kurumlarında öğrenim gören öğrencilerin okul iklimi algılarının karşılaştırılması [Comparing the understanding of school climate of the students who take education in different kind of secondary schools*]. Master Thesis, Yeditepe University, İstanbul.

Doğan, S. (2012). Lise öğrencilerinin okul iklimi algıları [School climate perceptions of high school students]. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 5* (10), 55- 92.

Durmaz, A. (2008). *Liselerde okul yaşam kalitesi (Kırklareli ili örneği)* [*Quality of school life in high schools (the case of Kırklareli province)*]. Master Thesis, Trakya University, Edirne.

Ergene, T., & Yıldırım, İ. (2003). Lise son sınıf öğrencilerinin akademik başarılarının yordayıcısı olarak sınav kaygısı, boyun eğici davranışlar ve sosyal destek [Social support, submissive acts, and test anxiety as predictors of academic achievement among high school students]. *H. U. Journal of Education, 25*, 224 - 234.

Erkal, S., Yalçın, A. S., & Sancar, B. (2012). Ankara üniversitesi sağlık bilimleri fakültesi öğrencilerinin ebelik ve hemşirelik bölümlerini seçme nedenleri [Ankara unıversity faculty of health sciences students' reasons for selecting midwifery and nursing divisions]. *Ankara University Faculty of Health Sciences, 1 (1),* 73- 90

Erkan, S., Karip, E., Özdemir, S., Sezgin, F., & Şirin, H. (2010). İlköğretim okulu öğrencilerinin okul iklimine ilişkin algılarını yordayan değişkenlerin incelenmesi [Examining the variables predicting primary school students' perceptions of school climate]. *H. U. Journal of Education, 38,* 213 - 224.

Eser, Ş. (2010). *Okul öncesi öğretmenlerinde iş doyumu, meslektaş ilişkileri ve okul idaresi desteği arasındaki ilişkilerin incelenmesi* [*Interrelations among job satisfaction, colleague relationships and managerial support in early childhood teachers: The case of Tekirdağ*]. Master Thesis, Canakkale Onsekiz Mart University, Canakkale

Evertson, C. M., & Weinstein, C. S. (2006). *Handbook of classroom management: Research, practice and contemporary ıssues. London*: Lawrence Erlbaum Associates.

Faircloth, B. S., & Hamm, J. V. (2005). Sense of belonging among high school students representing four ethnic groups. *Journal of Youth Adolescence, 34* (4), 293 - 309.

Falci, C., & McNeely, C. (2004). School connectedness and the transition into and out of health - risk behavior among adolescents: A comparison of social belonging and teacher support. *Journal of School Health, 74* (7), 284 - 292.

Furrer, C., Kindermann, T., Marchand, G., & Skinner, E. (2008). Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology, 7* (4), 765 - 781.

Gençdoğan, B. (2006). Lise öğrencilerinin sınav kaygısı ile boyun eğicilik düzeyleri ve sosyal destek algısı arasındaki ilişkiler. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 7* (1), 143- 152.

Guay, F., Larose, S., Ratella, C. F., & Senecal, C. (2005). Perceptions of parental involvement and support as predictors of college students' persistence in a science curriculum. *Journal of Family Psychology, 19* (2), 286 - 293.

Hagborg, W. J. (1994). An exploration of school membership among middle and high school students. *Journal of Psychological Assessment, 12*, 312 - 323.

İkiz, F. E., & Sağlam, A. (2017). Ortaokul öğrencilerinin şiddet eğilimleri ile okula bağlılık düzeyleri arasındaki ilişkinin incelenmesi [The relation between tendency to violence and the level of school engagement]. *Elementary Education Online, 16* (3). 1235- 1246.

Kalaycı, H., & Özdemir, M. (2013). Lise öğrencilerinin okul yaşamının niteliğine ilişkin algılarının okul bağlılıkları üzerine etkisi [The influence of students' perceptions toward quality of school life on their school engagement]. *GEFAD / GUJGEF, 33* (2), 293- 315.

Kapıkıran, Ş., & Özgüngör, S. (2009). Ergenlerin sosyal destek düzeylerinin akademik başarı ve güdülenme düzeyi ile ilişkileri [The relationship between the social support and the achievement and motivation of adolescents]. *The Journal of Child and Adolescence Mental Health, 16* (2), 21 - 30

Karan, İ. (2012). *Ortaöğretim öğrencileri için çok boyutlu okul iklimi algısı ölçeğinin geliştirilmesi* [*Development of multi-dimensional perception of school climate scale for secondary school students*]. Master Thesis, Yeditepe University, İstanbul.

Karasar, N. (2012). *Bilimsel Araştırma Yöntemi: Kavramlar, İlkeler, Teknikler [Scientific research method: concepts, principles, techniques*]. Ankara: Nobel Publishing.

Karatzias, A., Power, K. G., Flemming, J., Lennan, F., & Swanson, V. (2002). The role of demographics, personality variables and school stress on predicting school satisfaction/dissatisfaction: Review of the literature and research finding, *Education Psychology, 22* (1), 33 - 50.

Kashdan, T. B., & Roberts, J. E. (2004). Social anxiety's impact on effect, curiosity, and social self – efficacy during a high self – focus threat situation. *Cognitive Therapy and Research, 28* (1), 119 - 141.

Kaşık, D. (2009). *Ergenlerde karar verme stilleri ve algılanan sosyal destek düzeylerinin sosyal yetkinlik beklentisi ve bazı değişkenler açısından incelenmesi* [*Adolescent self-esteem and decision-making style of the decision with the perceived level of social support, social competence and level of expectation in terms of some variable treated as a comparative analysis*]. Master Thesis, Selcuk University, Konya.

Kayıkçı, K., & Sayın, Ö. (2010). Ortaöğretim kurumlarında öğrenim gören öğrencilerin okuldan memnuniyet düzeyleri [Satisfactıon levels of high school students]. *Milli Eğitim Dergisi, 187,* 207- 224.

Kılıçoğlu, G. (2010). *İlköğretim okulu öğretmenlerinin örgütsel bağlılık algılarının bazı değişkenler açısından incelenmesi* [*Examining the elementary school teachers' organizational commitment perceptions according to some variables*]. Master Thesis, Ege University, Izmir.

Kızılay, M. (2008). *İlköğretim okullarında ikinci kademe öğrencilerin okula bağlılık durumlarına ilişkin öğrenci ve öğretmen görüşleri* [*Ideas of students and teachers about the state of devotion of 6, and 8 grade students in primary school*]. Master Thesis, Yeditepe University, İstanbul.

Kızmaz, Z. (2006). Okullardaki şiddet davranışının kaynakları üzerine kuramsal bir yaklaşım [A theoretical approach to the roots of violence behaviors at schools]. *Cumhuriyet Üniversitesi Sosyal Bilimler Dergisi, 30*, 47- 70.

Koç, M., Avşaroğlu, S., & Sezer, A. (2004). Üniversite öğrencilerinin akademik başarıları ile problem alanları arasındaki ilişki [Relationship between academic success and problematic areas of the university students]. *Selcuk University - Journal of Institute of Social Sciences, 11*, 483 - 498.

Korkmaz, M. (2011). İlköğretim okullarında örgütsel iklim ve örgüt sağlığının örgütsel bağlılık üzerindeki etkisi [The effects of organizational climate and organizational health on organizational commitment in primary schools]. *Educational Administration: Theory and Practice*, *17*(1), 117-139.

Maddox, S. J., & Prinz, R. J. (2003). School bonding in children and adolescents: conceptualization, assessment and associated variables. *Clinical Child and Family Psychology Review, 6,* 31 - 49.

Manlove, J. (1998). The influence of high school dropout and school disengagement on the risk of school aged pregnancy. *Journal of Research on Adolescence, 82,* 187 - 220.

Marks, G. N. (1998). Attitudes to school life: Their influences and their effects on achievement and leaving school. *Australian Council for Education Research, 5,* 38 - 54.

Meeus, W. (1993). Occupational identity development, school performance and social support in adolescence: findings of a dutch study. *Adolescence, 28,* 809 - 818.

Mengi, S. (2011). *Ortaöğretim 10. ve 11. Sınıf öğrencilerinin sosyal destek ve öz yeterlilik düzeylerinin okula bağlılıkları ile ilişkisi* [*Relations for the social support and self-efficacy with school bonding of the secondary education 10th and 11th classes students*]. Master Thesis, Sakarya University, Sakarya

Midgley, C., Roeser, R. W., & Urdan, T. C. (1996). Perceptions of the school psychological environment and early adolescents psychological and behavioral functioning in school: The mediating role of goals and belonging. *Journal of Educational Psychology, 88,* 408 - 422.

Osterman, K. F. (2000). Students need for belonging in the school community. *Review of Educational Research, 70* (3), 323 - 367.

Önen E. (2014). Öğrencinin okula bağlılığı ölçeği: Türk ortaokul ve lise öğrencileri için uyarlama çalışması [Student engagement instrument: adaptation study for turkish secondary and high school students]. Turkish Psychological Counseling and Guidance Journal, *5* (42), 221 - 234.

Özdemir, S. (2000). *Eğitimde örgütsel yenilenme [Organizational renewal in education]*. Ankara: Pegem A Publishing.

Özen, D. Ş. (1998). *Eşler arası çatışma ve boşanmanın farklı yaş ve cinsiyetteki çocukların davranış ve uyum problemleri ile algıladıkları sosyal destek üzerindeki rolü* [*The role of marital conflict and divorce on behavior and adjustment problems and perceived social support of children at different sex and age*]. Doctoral Dissertation, Hacettepe University, Ankara

Pastore, M., Perkins, D. D., Santinello, M., & Vieno, A. (2007). Social support, sense of community in school and self - efficacy as resources during early adolescence: An integrative model. *American Journal of Community Psychology*. *39*, 177 - 190.

Posner, J. K., & Vandell, D. L. (1999). After school activities and the development of low - income urban children: A longitudinal study. *Developmental Psychology, 35* (3), 868 - 879.

Rahat, E. (2014). *Benlik kurgusu, sosyal destek, başa çıkma stilleri ve yılmazlığın üniversite yaşamına uyumu yordama güçlerinin incelenmesi* [*An investigation predictive role of self-construal, social support, coping styles and resilience on adjustment to university life*]. Master Thesis, Gaziosmanpasa University, Tokat.

Sağlam, A. (2016). *Ortaokul öğrencilerinin şiddet eğilimleri ile okula bağlılık düzeyleri arasındaki ilişkinin incelenmesi* [*The investigation of the relationship between violence tendencies and school engagement levels of secondary school students*]. Master Thesis, Dokuz Eylul University, Izmir.

Saraç, K. (2015). *Okul ikliminin ortaokul öğrencilerinin algılarına göre değerlendirilmesi* [*An evaluation of school climate as perceived by students*]. Master Thesis, Eskisehir Osmangazi University, Eskisehir

Sarı, M. (2013). Lise öğrencilerinde okula aidiyet duygusu [Sense of school belonging among high school students]. *Anadolu University Journal of Social Science, 13* (1), 147 - 160.

Sarı, M., Ötünç, E., & Erceylan, H. (2007). Liselerde okul yaşam kalitesi: Adana İli Örneği [Quality of life in high schools: the case of adana province]. *Educational Administration: Theory and Practice, 50,* 297 - 320.

Savi, F. (2011). Çocuk ve ergenler için okula bağlanma ölçeği: Geçerlik ve güvenirlik çalışması [School attachment scale for children and adolescents: the study of validity and reliability]. *Elementary Education Online, 10* (1), 80 - 90.

Schlechty, P.C. (2001). *Shaking up the school house: How to support and sustain educational innovation*. San Francisco: Jossey – BassWileyimprint.

Sığınır, A. (2013). *Meslek liselerindeki yönetici davranış boyutlarının okul iklimine etkisi* [*Vocational high school climate executive size effects of conduct*]. Master Thesis, Yeditepe University, Istanbul.

Sorias, O. (1988). Sosyal destek kavramı. *Ege Journal of Medicine, 27* (1), 353- 357.

Şahin, N. G. (2011). *Üniversite öğrencilerinin kendini açma, öznel iyi oluş ve algıladıkları sosyal destek düzeylerinin karşılaştırılması* [*Comparison of levels pertain to self-disclosure, subjective well-being and perceived social support of university students*]. Master Thesis, Dokuz Eylul University, Izmir.

Şahin, İ., Zoraloğlu, Y. R., & Şahin Fırat, N. (2011). Üniversite öğrencilerinin yaşam amaçları, eğitsel hedefleri, üniversite öğreniminden beklentileri ve memnuniyet durumları [University students' aims in life, educational goals, expectations from the university and their state of satisfaction]. *Educational Administration: Theory and Practice, 17* (3), 429 - 452.

Şencan, B. (2009). *Lise öğrencilerinin algıladıkları sosyal destek düzeyi ile sosyal yetkinlik beklentisi düzeylerinin bazı değişkenlere göre incelenmesi* [*Research of the perceived social support level by high school students and social self-efficacy expectation level according to some variable*]. Master Thesis, Cukurova University, Adana.

Taşkıran, A. (2008). *Meslek lisesi öğrencilerinin okul iklimi algıları ile mesleki olgunluk düzeyleri arasındaki ilişki* [*The relation between the school climate perception and professional ripeness levels for the students of vocational high schools*]. Master Thesis, Yeditepe University, İstanbul.

Taysi, E. (2000). *Benlik saygısı, aile ve arkadaşlardan sağlanan sosyal destek: Üniversite öğrencileriyle yapılan bir çalımsa* [*Self esteem, perceived social support from friends and parents: A study with university students*]. Master Thesis, Ankara University, Ankara.

Tezcan, T. (2011). *Okul öncesi öğretmenlerinin yaşam kalitesi ve iş doyumlarının bazı değişkenler açısından incelenmesi (Bolu ili örneği* [*The research about the life qualities and the job satisfaction of the pre-school education teachers from the standpoint of some factors (the Bolu sample)*]. Master Thesis, Abant Izzet Baysal University, Bolu.

Thomasson, L. V. (2006). *A study of the relationship between school climate and student performance on the virginia standards of learning tests in elementary schools.* Doctoral Dissertation. Virginia Commonwealth University. Virginia. USA.

Thomson, S. (2005). Engaging students with school life. *Youth Studies Australia, 24* (1), 10 - 15.

Uwah, C. J., McMahon, H. G., & Furlow, C. F. (2008). School belonging, educational aspirations, and academic self - efficacy among African American male high school students: Implications for school counselors. *Professional School Counseling, 11* (5), 296 - 305.

Wentzel, K. R. (1998). Social relationship and motivation in middle school: The role of parent, teacher and pers. *Journal of Educational Psychology*, *90* (2), 202 - 207.

Yamaç, Ö. (2009). *Üniversite öğrencilerinin algıladıkları sosyal destek ile başa çıkma stilleri arasındaki ilişki* [*The relationship the styles of the defeating the stress with the social support which the university students percepted*]. Master Thesis, Selcuk University, Konya.

Yıldırım, İ. (1997). Algılanan sosyal destek ölçeğinin geliştirilmesi, güvenilirliği ve geçerliği. *H. U. Journal of Education, 13*, 220- 235.

Yıldırım, İ. (2004). Algılanan sosyal destek ölçeğinin revizyonu. *Eurasian Journal of Educational Research, 17*, 221 - 236.

Yıldırım, İ. (2006). Akademik başarının yordayıcısı olarak gündelik sıkıntılar ve sosyal destek *[*Daily hassles and social support as predictors of academic achievement]. *H. U. Journal of Education, 30*, 258 - 267.

Yılmaz, E., Yılmaz, E, & Karaca, F. (2008). Üniversite öğrencilerinin sosyal destek ve yalnızlık düzeylerinin incelenmesi [Examining the level of social support and loneliness of university students]. *Genel Tıp Dergisi, 18* (2), 71- 79.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Social Support and School Climate as Predictors of School Connectedness in High School Students
Discipline	Social and Humanities
Type of Article	Research Article
Year of Data Collection	2018-2019

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that.....

Date 16/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Zile Anadolu İmam Hatip Lisesi	Master of Art	Ali Rıza Yavrutürk	
2.	Tokat Gaziosmanpaşa Üniversitesi	Prof. Dr.	Tahsin İlhan	
3.	Amasya Üniversitesi	Assoc. Prof. Dr.	Kemal Baytemir	

Correspondent Author's Info

Institute	Zile Anadolu İmam Hatip Lisesi
Postal address	Zile Anadolu İmam Hatip Lisesi , Zile -TOKAT, 60400
E-mail	a.r_yavruturk@outlook.com
Phone	0 530 328 58 05

Fidan, A., & Seferoğlu, S. S. (2020). Online environments and digital parenting: an investigation of approaches, problems, and recommended solutions. *Bartın University Journal of Faculty of Education*, *9*(2), 352-372.

Bartın University Journal of Faculty of Education, 9(2), 352-372

buefad.bartin.edu.tr

Online Environments and Digital Parenting: An Investigation of Approaches, Problems, and Recommended Solutions

Ayça FİDAN*[a], Süleyman Sadi SEFEROĞLU[b]

Article Info

DOI: 10.14686/buefad.664141

Article History:
Received: 24.12.2019
Accepted: 22.04.2020
Published: 05.06.2020

Keywords:
Digital parenting,
Parenting strategies,
Online environments,
Online risks and threats.

Article Type:
Review article

Abstract

Digital parenting enabled children to take advantage of the opportunities offered by digital media and online environments, while on the other hand it required the protection of children against the risk of these environments. In this context, it was aimed to present the online risks children are facing in the digital age, the strategies used by the parents to cope with such risks and the difficulties faced by the parents when using these strategies. To this end, a descriptive review was conducted. Thus, online risks and threats in the digital age were elaborated. In addition, the digital parenting approaches, strategies to cope with online risks and the difficulties parents face when dealing with these risks are discussed. Risks faced in social media and online games, and cyber bullying are determined as online risks. Parents often put restrictions and prohibitions as methods to cope with online risks. Furthermore, guidance and raising awareness in the use of online environments according to the age group of the child stands out. In case of difficulties faced by parents, there are situations such as privacy violations and parental complacency.

Çevrim-içi Ortamlar ve Dijital Ebeveynlik: Yaklaşımlar, Sorunlar ve Çözüm Önerileri Üzerine Bir İnceleme

Makale Bilgisi

DOI: 10.14686/buefad.664141

Makale Geçmişi:
Geliş: 24.12.2019
Kabul: 22.04.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Dijital ebeveynlik,
Ebeveynlik yaklaşımları,
Çevrimiçi ortamlar,
Çevrimiçi riskler.

Makale Türü:
Derleme makale

Öz

Dijital ebeveynlik, çocukların dijital medya ve çevrimiçi ortamların sunmuş olduğu fırsatlardan yararlanmasını sağlarken diğer taraftan bu ortamların verebileceği zararlara karşı ise çocukları korumayı gerektirmektedir. Bu bağlamda bu çalışmanın amacı, dijital çağda çocukları bekleyen çevrimiçi risklerin, bu risklerle baş etme yöntemleri olarak ebeveynlerin kullanmış olduğu stratejilerin ve bu stratejileri kullanırken ebeveynlerin karşılaştığı güçlüklerin ortaya konmasıdır. Çalışmada dijital ebeveynlikle ilgili alan yazın incelenerek bir betimsel tarama yapılmıştır. Bu bağlamda çevrimiçi riskler, dijital ebeveynlikte öne çıkan yaklaşımlar, ebeveynlerin çevrim-içi risklerle baş etme stratejileri ve bu risklerle baş ederken karşılaştıkları zorluklar ayrıntılı olarak irdelenmiştir. Sosyal medya ile çevrimiçi oyunlarda karşılaşılan riskler ve sanal zorbalık dijital ortamlarda karşılaşılan çevrimiçi risklerdir. Dijital ebeveynlikte öne çıkan yaklaşımlar; kısıtlayıcı, öğretici, birlikte kullanımı etkinleştirme ve müdahale etmeme olarak belirlenmiştir. Ebeveynler çevrimiçi risklerle baş etme yöntemleri olarak genelde kısıtlama ve yasaklar koyma yolunu tercih etmektedirler. Ayrıca çocuğun yaş grubuna göre çevrimiçi ortamları kullanma konusunda rehberlik yapma ile bilinçlendirme çabaları gözlenmektedir. Ebeveynlerin karşılaştıkları zorluklar olarak ise gizlilik ihlali ve ebeveyn kayıtsızlığı gibi durumlar öne çıkmaktadır.

***Corresponding Author:** ayca.fidan@ege.edu.tr
[a] Lecturer Ayça FIDAN, Ege University, İzmir/Turkey, http://orcid.org/0000-0002-2199-6148
[b] Prof. Dr. Süleyman Sadi SEFEROĞLU, Hacettepe University, Ankara/Turkey. http://orcid.org/0000-0002-5010-484X

Introduction

Emerging information and communication technologies (ICTs) provide end users with many opportunities to make their life easier. However, these technologies carry a variety of risks and threats, along with the new opportunities they offer. Users of various ICT technologies are influenced by these risks and threats in various ways. Children who are among these groups are the most vulnerable to risks and threats faced in online environments. This is why it is accepted, especially by educators, that children need support and guidance in ICT technology use. It is seen, however, that different methods of support are suggested in the literature (Lim, 2016; Livingstone, Blum-Ross, Pavlick, & Ólafsson, 2018). On the other hand, it is also clear that parents have a great responsibility for keeping their children away from the risks they face, or for raising their awareness about what they are supposed to do in online environments (Kabakçı-Yurdakul, Dönmez, Yaman, & Odabaşı, 2013). Therefore, it can be said that parenting in the digital age requires parents to ensure the security of children in online environments, along with the responsibility of organizing and controlling their online activities (Huang, Li, Chen, & Straubhaar, 2018). In this context, it will be helpful to expand the concept of parenting in the digital age.

What is Digital Parenting?

Emerging technologies in the digital age have been spread across every layer of society. This situation has altered family relations, the way parents direct their children about the use of media, the way parents and children communicate with each other, and media consumption habits of parents (Lim, 2016). In other words, parenting in the digital age requires certain responsibilities in online environments and going beyond traditional parenting.

A digital parent is described as someone who has basic technology literacy; is aware of online risks and threats and knows how to protect his/her child against these risks; can incorporate digital technologies into parenting applications; regulate his/her child's interaction with digital media; and follows developments in technology (Huang, Li, Chen, & Straubhaar, 2018; Kabakçı-Yurdakul et al., 2013; Mascheroni, Ponte, & Jorge, 2018). Digital parenting allows helping children take advantage of opportunities provided by digital media and online environments, while requiring parents to protect their children from the harms that these environments might cause (Livingstone & Helsper, 2008).

It is possible to address digital parenting in two ways: The first one of these includes a parent's own use of digital media in the form of "his/her access to digital media, frequency of use and level of use," while the other includes the parental awareness level of how the child uses digital media and his/her supervision of the child's use of digital media. Therefore, digital parenting should not be considered only as the parent's monitoring and managing digital media and Internet use of his/her child, and establishing rules about it. This is because in today's world where portable devices and wireless network access offer access to information anywhere and anytime, parents also benefit from these opportunities for their own parenting practices (Lupton, Pedersen, & Thomas, 2016). Therefore, digital parenting also comprises activities such as: parents' exchanging information among themselves and receiving information and advice from each other; taking advantage of the Internet in an effective way for their children's learning activities such as school and course activities; being able to download educational applications or games needed; and being able to reach the learning resources needed by their children and using them effectively (Livingstone et al., 2018; Lupton et al., 2016). These digital parenting activities are summarized in Figure 1.

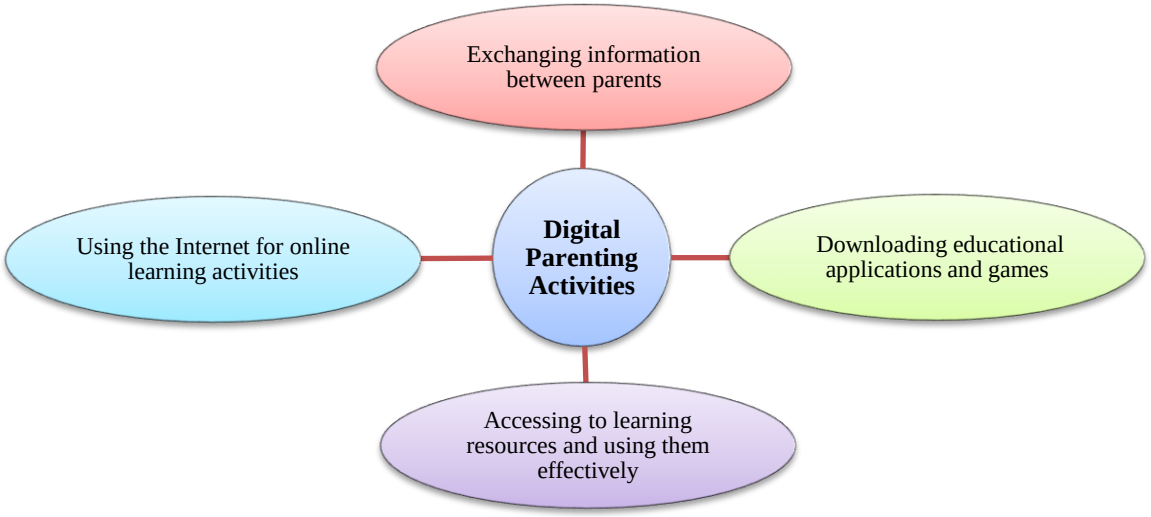


Figure 1. Digital parenting activities (Livingstone, Blum-Ross, Pavlick, & Ólafsson, 2018; Lupton et al., 2016)

Significance and Purpose of the Study

As access to the Internet is enhanced to be anywhere and anytime with the widespread use of mobile devices among users, children's access to the Internet is increasing in their bedrooms. It has been thought that this situation is causing parents to have less control over the content that their children consume. Moreover, the fact that many children are more competent than their parents in the use of technology or navigating in online environments further amplifies the feeling of lack of parental control (Lim, 2016; Willett, 2015). There is a great deal of dangers awaiting children in online environments. Parents have great responsibilities to keep their children away from such dangers. Therefore, it can be said that it is necessary to select online materials consciously and monitor children's behaviours in online environments to protect them from potential online risks and threats (Willett, 2016). In this context, it is thought that it is important to offer insights into digital parenting approaches adopted in various environments.

Thus, the aim of this study is to reveal online risks and threats that await children in the digital age, the strategies that parents use as methods of dealing with such risks, and the difficulties encountered while using these strategies. Answers to the following questions were sought to achieve this goal:

1. What are the online risks and threats awaiting children in the digital age?
2. What are the approaches that are prominent in digital parenting?
3. What are the ways in which parents cope with the difficulties they face in digital environments?
4. What are the obstacles parents face in their interventions in situations that they face in digital environments?

Method

In this study, a literature review was conducted to reveal the online risks and threats that await children in the digital age, the strategies that parents use as coping with these risks, and the difficulties encountered while using these strategies.

In order to collect data for the study the "Web of Science" (WoS) and Google Scholar databases were used. WoS was preferred because articles published in journals that are prestigious and have high impact factor are indexed in this database. Google Scholar is also used because some reports are only accessible through this platform. When doing the search, keywords such as the following were used: "digital parenting and media, digital parenting and online risks, parenting mediation and online environments, parenting approaches and online environments, parenting in the digital age, digital games and parenting, social media and parenting, cyberbullying and parenting." Articles reached through the search conducted were included in the study providing that (a) their full text was open access, and (b) they were related to digital parenting. Out of 159 documents reached in WoS, only 29 of them met the above criteria, which included in the study. In addition, two research articles and three research reports that are reached through Google Scholar were included in the study as well. In other words, articles related to the use of various digital technologies and media such as digital games and social media, digital parenting and online environments, as well as articles on the parenting strategies used in these environments were examined. In short, the total number of studies examined reached to 34 (see Appendix 1).

Content analysis was conducted in this study. The articles were addressed and analysed according to the following criteria: the online media where they were used, the parenting approaches that were used, and age - as one of the demographic characteristics of the participants. In this context, they were examined in detail under the following headings: online environments and the risks they create, the ways in which parents cope with the risks in these environments, the challenges they face when dealing with these risks, and the approaches that are prominent in digital parenting.

Findings and Discussion

The findings are presented in a way that the sub-problems determined in line with the purpose of this study are answered separately. In this context, the online risks and threats awaiting children in the digital age, the approaches emerging in digital parenting, strategies of the parents to cope with the online risks and the difficulties faced by them when coping with these risks were scrutinized in detail.

Online Risks and Threats Encountered in Digital Environments

The first research question of this study was "*What are the online risks and threats awaiting children in the digital age?*" To answer this question, an attempt was made to determine the online risks encountered in digital media in the literature. Online risks observed in the literature in relation to digital media is summarized in Figure 2.

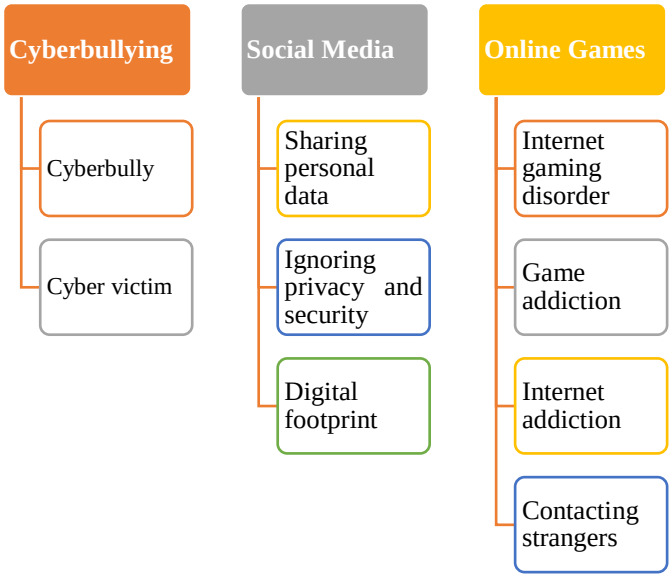


Figure 2. Online risks and threats

Access to the Internet is becoming increasingly easy in society in general. Especially mobile devices, which are more common- have made it possible to access to the Internet anywhere and anytime, significantly contributing to the increased use of the Internet among the younger generation. Because of this, children and adolescents more frequently use the Internet. There are so many different types of applications that can be used for various reasons such as accessing social media, online games, video sites, forums, and blogs. According to "Digital in 2018" report (Kemp, 2018), 8% of Facebook users worldwide and 7% of the users of the Instagram users are children in the age range from 13 to 17. In Turkey, the time spent on the Internet in one day is around seven hours and nine minutes, while the time spent on social media is two hours and forty-eight minutes. The widespread use of the Internet by children and adolescents brings a variety of risks due to their limited self-regulation capacities and their sensitivity to peer pressure (O'Keeffe, Clarke-Pearson, & Council on Communications and Media, 2011). Especially adolescent children have been reported to tend to disclose their personal information -in order to enrich their experiences in online environments such as social networking sites or online games- and to establish strong social relationships with individuals who they think are their peers (Mesch, 2009; Shin & Khang, 2016). This endangers children's private life. In this process, problems can arise, including exposure to inappropriate content, endangering personal data, and cyber-bullying. What may be considered another risk is that children also take actions such as unconsciously sharing information in various environments or disturbing others through these environments. In addition, children do not know how their actions will affect their lives in the future and also may not know that their actions are recorded. For these reasons, parents are expected to be aware of these risks and develop strategies to cope with these risks. In this context, it is thought that it is beneficial to present the online risks and threats that children face.

Cyberbullying as an Online Risk/Threat

Differing from normal bullying in terms of detectability and visibility due to the use of digital technologies, and including behaviours that aim to hurt someone (Keith & Martin, 2005), cyberbullying is described as a form of aggression performed through various online tools and/or platforms (Horner, Asher, & Fireman, 2015; Kowalski, Giumetti, Schroeder, & Lattanner, 2014; Wang, Iannotti, & Nansel, 2009). The fact that children have broad access to the Internet and that they use digital technologies extensively, as well as the lack of social clues due to the absence of a face-to-face interaction in these environments, is shown as a factor essential to facilitating and expanding cyberbullying (Mesch, 2018; Mishna et al., 2012). Mesch (2009) has stated that there are three

fundamental factors causing the increased prevalence of cyberbullying and differentiation of it from traditional bullying. He has listed these factors as (1) that bullying actions in virtual environments do not require a common physical environment, and in this way, such bullying activities can carry on continuously, (2) that the activities are unanimous, and (3) that children are not aware of the consequences of cyberbullying.

The literature on cyberbullying indicates increased tendency for cyberbullying behaviour or risk of cyber victimization as the time spent on the Internet increases (Chang et al., 2015; Çelik, Çelen, & Seferoğlu, 2015; Demir & Seferoğlu, 2016; Durak & Seferoğlu, 2016; Erdur-Baker & Kavşut, 2007; Gölpek-Sarı & Seferoğlu, 2019; Horzum & Ayas, 2011; Kavuk & Keser, 2015; Kowalski & Limber, 2007; Yenilmez & Seferoğlu, 2013; Yiğit & Seferoğlu, 2017; Yiğit, Keskin, & Yurdugül, 2018). In this process, females are more likely to be cyber victims than males (Kokkinos, Antoniadou, Asdre, & Voulgaridou, 2016; Sasson & Mesch, 2017), and adolescents cyberbully or be victims of cyberbullying more frequently than other age groups (Mesch, 2009). Moreover, it has been stated that peer behaviour is also associated with cyberbullying and that peers encourage each other to engage in online risky behaviours such as "meeting with and talking to strangers in online environments, sending insulting messages to others, and so forth" (Sasson & Mesch, 2017). It has also been stated that social networks are the most suitable environment for cyberbullying actions and therefore pose a great risk (Mesch, 2009). For this reason, raising awareness of children about using the Internet safely (Kabakçı-Yurdakul & Yaman, 2018) is shown to be among the responsibilities of parents to prevent the increasingly widespread cyberbullying behaviours. However, parents face a variety of difficulties when they try to cope with this problem.

The main challenge faced in coping with cyberbullying is that children and parents approach technology differently and use technology to do different things (Keith & Martin, 2005). The proliferation of personal portable devices and wireless Internet access make it easier for children to access the Internet. However, this complicates for parents to exert control over activities on the Internet (Mishna et al., 2012). In order for families to cope with these difficulties, it is of great importance to offer them training on and raise their awareness of this subject (Yenilmez & Seferoğlu, 2013) because the social support provided by parents can prevent cyberbullying actions and cyber victimization (Yiğit, Keskin, & Yurdugül, 2018). On the other hand, it should be underlined that it is necessary to use different strategies according to the age and gender of the child.

When the literature was examined, it was found that parents used various approaches to prevent cyberbullying. The most common of these are restrictive strategies described as the act of limiting online activities (Wright, 2017; Wright, 2018). Some studies have suggested that these strategies may have a positive effect on preventing or reducing cyberbullying (Chang et al., 2015, Vazsonyi, Jiskrova, Özdemir, & Bell, 2017; Wright, 2017), whereas in some other research, it has been expressed that the strategies have negative rather than positive effects and even promote cyberbullying (Ho, Chen & Ng, 2017; Kokkinos et al., 2016; Leung & Lee, 2011; Sasson & Mesch, 2017).

It has been stated that the younger age group responds more positively to restrictive strategies, whereas such restrictions cause a negative effect on adolescent children. It has been argued that measures such as limiting online activities of adolescent children or introducing various barriers to access increase the tendency of children to display bullying behaviours and encourage them to cyberbully (Ho, Chen, & Ng, 2017). On the other hand, there is also the argument that these strategies would reduce the likelihood of a child to cyberbully and reduce the risk of being a cyber victim (Mesch, 2018; Wright, 2017). Mesch (2009), however, has claimed that restrictive strategies isn't related to cyberbullying. When the subject is considered in terms of gender, it has been stated that adolescent girls are more likely to be cyber victims than boys (Sasson & Mesch, 2017). On the other hand, restrictive strategies result in more positive results in girls than in boys (Wright, 2017). Consequently, raising children's Internet literacy levels will reduce the risk that they behave adversely or face adverse behaviours in online environments (Chang et al., 2015). It is also stated that for this reason, parents frequently need to be in dialogue with their children (Mesch, 2018), and keep restrictive measures at a minimum level (Wright, 2018). In addition, it has been emphasized -in a guide book prepared by Parkside Academy (2018) to guide parents- that

parents should not tolerate cyberbullying behaviours of their children and report these behaviours in such conditions.

Social Media as an Online Risk/Threat Environment

It has been found that parents with adolescent children in particular, have a tendency to frequently use social media to keep in touch with their children, and to monitor what they do in that platform (Livingstone et al., 2018). It has also been observed that parents mostly prefer social media to share their knowledge resources and their parenting experiences with others (Lupton et al., 2016; Mesch, 2018). However, it is seen that parents are unable to effectively follow social media tools, unable to gain new knowledge of these technologies, and therefore, are unable to adequately monitor their children's online activities (Elsaesser et al., 2017). On the other hand, it is considered that situations such as unconscious use of social media by children and parents, their engaging in certain activities without considering the consequences, and their sharing of personal data without worrying about privacy can have consequences that may significantly affect their future prestige (O'Keeffe & Clarke-Pearson, & Council on Communications and Media, 2011).

Holloway, Green, and Livingstone (2013) argue that parents who share their children's photos and videos unconsciously on various social media sites may pose various problems for their children in the future. The most important of these problems can be expressed as the fact that such things that parents or children share become permanent on the Internet. When Internet users visit web pages, for example, each movement, record and transaction left behind about which pages they have visited are kept in a database. The trail of data created while using the Internet, the data accumulated separately for each user, is called a digital footprint (Surmelioğlu & Seferoglu, 2019; Weaver & Gahegan, 2007). This is seen as the most significant threat on social media sites that can affect the future reputation of children and adolescents (O'Keeffe & Clarke-Pearson, & Council on Communications and Media, 2011).

On the other hand, it is seen that answers to questions such as the following are being sought in the literature: "What sorts of posts do parents share most on social media? What kind of content do they prefer to share? How do they make these decisions, and what do they think are the effects of these decisions for themselves, their children, their friends, their families and others? What do they understand and know about how other actors and agencies use their personal data?" It has been stated in various studies that doing research on these issues is very important (Lupton et al., 2016). Additionally, questions like "What do children understand from digital parenting? How much digital parenting do they think their parents are capable of?" (Huang et al., 2018) also appear to be other issues for which answers are sought.

Digital Games as a Potential Risk/Threat

Digital games are another topic of interest to digital parents. This topic has been extensively examined in the literature, especially in recent years. Parents are expected to organize their children's game consumption and choose games that are suitable for certain ages. Risks such as the fact that games often contain violent elements, one is exposed to the screen for prolonged times during a game, and games involve addiction and aggression are considered as the factors that concern parents (Willett, 2015, 2016). However, in addition to these, today's newest and most popular game type "Massively Multiplayer Online Role-Playing Games" (MMORPGs) -of which the number of users has steadily increased to 20 million worldwide especially in recent years- are known to increase the concerns of parents.

MMORPG is a game type that is played online in a virtual world, involving many people synchronously in the game who are expected to fulfil various tasks individually or in groups by impersonating the characters they want through their avatars. Due to the features of these games such as a virtual world, group interaction, and impersonation of characters with unique characteristics, the popularity of these games is growing increasingly and children are playing these games excessively (Russell & Johnson, 2017). Interaction with this game is emerging to be an addictive behaviour that is called Internet gaming disorder, which cause players to have clinical and

psychological disorders. Internet gaming disorder is defined as a psychological disturbance that manifests itself as an excessive addictive behaviour resulting from triggering of certain parts of players' brains by emotions such as rewards and pleasure when they play Internet games (American Psychiatric Association, 2013).

Game addiction is an important issue that worries parents. There are several studies on this situation, which has been studied as video game addiction or Internet game addiction. Game addiction is generally more common in boys than in girls (Kim & Kim, 2015; Kveton & Jelinek, 2016). Kim and Kim have stated that Internet gaming addiction is especially observed in male adolescents and that this event is influenced by the relationship between children and their parents. They have expressed that strong relations between parents and children are an important factor in predicting Internet gaming addiction. Kveton and Jelinek have shown that video game addiction increases as age decreases, and that parental approaches do not affect video game addiction.

On the other hand, one of the most important features of these games is that they offer the ability to engage in voice or written communication between players in the game through the inter-player social interaction feature. It has also been stated that this feature amplifies the potential of these games to cause Internet addiction (Billieux et al., 2015). As a result, parents' concern is that because of the social interaction feature of digital game environments, their children can easily interact with strangers and get exposed to certain bullying behaviours. Being aware of children's behaviours in such environments is, naturally, becoming an increasingly important issue, as well as taking measures to protect them from the risks in such environments (Willett, 2015).

Russell and Johnson (2017) conducted a study to investigate the potential impact of Massively Multiplayer Online Role-Playing Games (MMORPG) on family relations. They interviewed four parents who had children playing games excessively. Consequently, Russell and Johnson stated that all parents believed that their children were addicted to games that their children should be guided, and they needed to get advice. The parents also thought that although the MMORPG offered the possibility of socializing, their children did not socialize.

Online games often allow children to interact with other people, as well as enabling them to play games wherever they are through mobile devices (Willett, 2016). This makes it even more difficult for parents to control their children and adversely influences domestic relations (Russell & Johnson, 2017). Parents need to make conscious choices about websites to avoid online risks for their children, as well as letting their children benefit from opportunities in online environments. However, it has been stated that making choices is not sufficient; parents need to assess various game sites, supervise their children's use of the Internet and the screen, observe their child, and guide their children based on these observations (Willett, 2015).

The approaches that parents use for digital games are similar to the approaches they use on other platforms such as "active parenting, restrictive parenting and playing together." These involve a dialogue between the parent and the child on the positive and negative aspects of games, restriction of children's game consumption, and parents' playing games with their children (Martins, Matthews, & Ratan, 2017; Nikken & Jansz, 2006). In the Nikken and Jansz study, it was also found that the most adopted approach by the parents was the restrictive approach, and the least adopted approach was the playing-together approach.

Emerging Approaches in Digital Parenting

The second research question of this study was "*What are the approaches that are prominent in digital parenting?*" In order to answer this question, an attempt was made to determine parenting approaches that varied depending on children's age and were prominent in the literature.

Approaches adopted in digital parenting can vary depending on the age of the child (Cabello-Hutt, Cabello, & Claro, 2018) and the platform used. Parents have great responsibilities in terms of the proper and safe use of digital media, especially because children in the preschool period are in cognitive and functional stages of development. It has been stated that digital media have both positive and negative effects on the development of preschool children. Negative effects are more prominent in physical, psychological and social areas, whereas positive effects are more prominent in academic and cognitive fields (Wu et al., 2014). Lim (2016) has indicated that preschool

children have little control over the use of digital media devices and content that they can access, so parents, in particular, play a critical role in the creation and arrangement of children's media environment. Measures such as the following can be given as examples of interventions that can be used for preschool children: "downloading appropriate applications, games and videos for mobile devices used by children; adjusting parental control filters to prevent children from being affected by harmful content; and restricting screen usage time." Moreover, interventions such as the use of digital media together or guiding the child on the use of digital media can also enable the child to make sensible choices (Lim, 2016).

According to the report entitled "Parenting for a Digital Future" by Livingstone et al. (2018), parents often use enabling and restrictive strategies, but these strategies also vary by age group. It has been determined that often restrictive strategies are prevailing in the younger age group (below age 5), while the strategies for "using together with the child" are also used. In the age range of 5–12, activities such as active speech, and raising awareness about online use are used, in addition to establishing some rules. Wu et al. (2014) also showed that parents mostly adopted the restrictive approaches in preschool children. However, they stated that a combination of the instructive approach and the "using-together" approach should be used, in addition to the restrictive approaches. Thus, parents who have children in the preschool age group are advised to establish more rules and bans than those with school-age children and adolescents, whereas parents with children in the 5-12 age group are advised to adopt the instructive approach and the "using digital media together with the child" approach in addition to the restrictive approach (Wu et al., 2014). These digital parenting approaches are listed in Table 1.

Table 1. Digital Parenting Approaches

Digital Parenting Approaches	**Measures**
Restrictive	Rules and prohibitions, monitoring, managing, access barrier
Instructive	Guidance, awareness, orientation
Using together	Interactive use of digital media
Enabling	Awareness, guidance, put restrictions, interaction
Nonintervention	Parents cannot follow or guide their children's online activities because they do not have enough technology literacy knowledge

On the other hand, for adolescent children, the responsibilities that fall on parents' shoulders are becoming somewhat more complex. The "using-together" strategies appear to decrease in this age group compared to other age groups, and restrictive strategies appear to be replaced by the enabling strategies (Livingstone et al., 2018). Moreover, activities such as "children's having their own devices and acting independently; having their own social media accounts; being able to download the games and applications they want to their mobile devices; being able to navigate the Internet independently; and being more competent to use digital media than their parents" bring various risks (Lim, 2016). Although children in this age group are highly competent in digital skills, their use of digital technologies for a long time increases the likelihood that they will encounter digital risks (Mesch, 2018; Rodríguez-de-Dios, van Oosten, & Igartua, 2018).

As a result of their interviews with experts, Marsh, Downs and Cranor (2017) have grouped digital parenting approaches used in online environments for adolescent children in five subcategories. Two of these are described as technical and non-technical monitoring methods used to monitor children's behaviours in online environments. Technical monitoring methods are described as parents' monitoring their child's online behaviour by installing various software on the computer or mobile devices, while non-technical monitoring methods include behaviours such as browsing the child's social media accounts, reading his or her messages, and browsing the search history in Internet browsers. Other approaches have been stated as the establishment of various rules such as limited access to online environments; discourse of fear defined as the act of scaring the child about how s/he should not behave in online environments; educating and raising awareness of the child about appropriate online behaviour; and

communication between parents and children. The intervention method called discourse of fear is thought to push the child to deny that a behaviour is risky rather than discouraging him/her from doing risky behaviours (Marsh et al., 2017). Therefore, parents need to have knowledge about online practices as well as such risks and to carefully choose their interventions. This is because it has been stated that children in this age group do not make decisions by thinking logically but by using their emotions, and therefore, may cyberbully or be cyber victims, while the values, thoughts and worldviews of these children may possibly be influenced by people with whom they get in touch. Parenting approaches used in online environments for adolescents are shown in Figure 3.

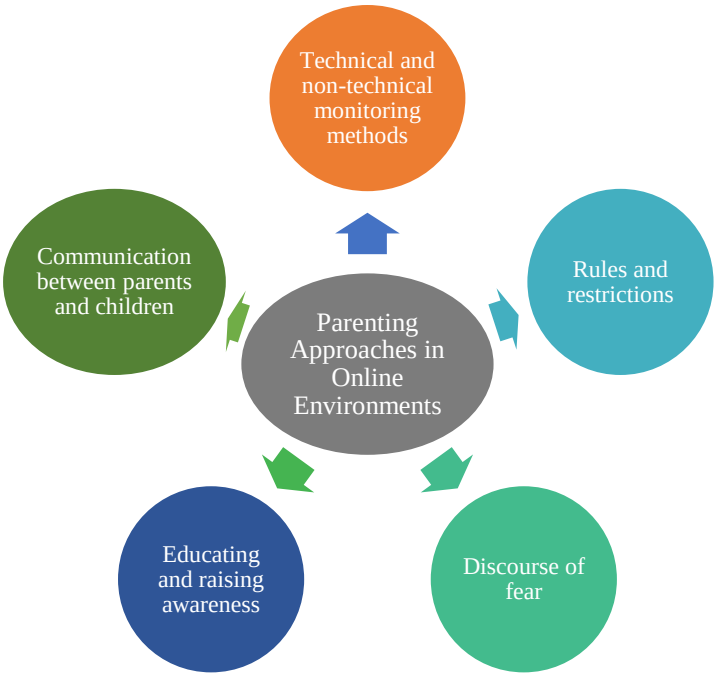


Figure 3. Parenting approaches used in online environments for adolescents

The Ways in Which Parents Cope with the Difficulties They Face in Digital Environments

The third research question of this study was "*What are the ways in which parents cope with the difficulties they face in digital environments?*" To find answers to this question, an attempt was made to determine the methods that were implemented in the literature as solutions when problems were encountered.

Factors such as parents' values, life and working conditions, socioeconomic levels, technology literacy levels and digital media uses differentiate the approaches adopted in digital parenting (Cabello-Hutt, Cabello, & Claro, 2018; Lim, 2016). For this reason, various research reveals that different approaches are adopted in digital parenting. Livingstone and Helsper (2008) described these approaches as "active mediation, restrictive mediation and using together" in the use of digital media. Active mediation is based on parents' instructive or critical conversation with their children about digital media when their children use any digital media. Unlike active mediation, restrictive mediation is the restriction of the media used, the time spent or the content used directly, without having to talk to the child about the digital media used, and the establishment of a number of rules regarding these. Using together is described as parents' being around when their children interacts with digital media. Monitoring their children about how they need to interact with media and sharing their experiences with them, but not commenting on that environment or its effects is another approach. Similarly, Wu et al. (2014) have mentioned three types of parenting approaches in the use of digital media. These are the "restrictive approach,

instructive approach and using together." The restrictive approach includes behaviours such as monitoring and managing a child's use of digital media and establishing rules. The instructive approach involves guiding the child on the use of digital media, communicating with the child and raising awareness about the use of digital media. Using together is described as the act of the parent and the child to use and experience digital media together. This strategy, also referred to as "participatory learning," is a new parenting approach, which has emerged based on the idea that restrictive and instructive approaches are insufficient, and is expressed as the act of parents and children to gain digital skills by interacting jointly in digital environments (Rodríguez-de-Dios, van Oosten, & Igartua, 2018).

It is understood from the review of the relevant literature that new methods are used in parenting approaches, or new strategies have been developed in addition to the methods mentioned above. For example, Livingstone et al. (2018) have aimed to determine the attitudes, skills and values of parents to use digital media in their own lives. They have also aimed to determine the effect of these attributes on children's management of use of digital media in the children's own lives and expectations. They have determined that the parents often used strategies such as restrictive strategies (establishing rules and prohibitions) and strengthening strategies (enabling/active speaking). The restrictive strategies include restrictions and prohibitions, such as limiting the duration of children's media use to several hours, and prohibiting from entering certain web pages or games. The strengthening strategies involve encouraging the child to use the Internet in a safe way, as well as the use of a variety of technical constraints, in which the parent–child interaction is promoted (Livingstone et al., 2017).

Rode (2009) conducted a study on parents with children aged 7 years and older and explained the rules that parents establish in order to keep their children safe under five different categories. The first one of these is to restrict access to the computer to keep children away from potential threats. The second category is described as establishing rules based on social norms or making sure that one's child understands that one has trust in his or her child. The third category covers rules such as to establish rules to protect the computer from threats such as viruses, delete anonymous emails, block pop-up menus, require the child to get permission to enter a new Web page, and not allow the computer to be used by the friends of the child. The fourth category is described as preventing potentially risky activities. The fifth category includes rules such as the prevention of dangerous-looking events and stating that chat programs or interactive games should not be used.

According to the results of a survey study on 6400 parents with children in the age range of 6–14, parents take more precautions (restrictions) on the use of the Internet for girls compared to those for kids and boys in the younger age group (Livingstone et al., 2017). When parents found themselves or their children inadequate in terms of their digital skills, they were found to be more restrictive. Moreover, parents who were talented in digital skills emphasized that their children should be free to assess online opportunities and face online risks. Thus, it is thought that children will become aware of possible damages and develop strength against such damages.

Difficulties Faced by Parents

The fourth research question of this study was "*What are the obstacles parents face in their interventions in situations that they face in digital environments?*" To find answers to this question, an attempt was made to determine the problems faced by parents during their interventions in the literature.

Today, due to the diversity of applications available on the Internet, it seems almost impossible that parents have full knowledge of the things that need to be known about such applications or about the use of the Internet. Children overall are highly skilled to use the Internet. Children also are more knowledgeable about the applications on the Internet and the use of these applications than their parents. In short, there is a yawning gap between parents and children about the use of online media in terms of knowledge and technical skills (Durak & Kaygın, 2019; O'Keeffe & Clarke-Pearson, & Council on Communications and Media, 2011). Some parents, on the other hand, have sufficient knowledge of the technical functioning of online media use. Even so, it has been stated that, setting up device filters, using tracking software that tracks web histories and deleted messages violates the child's privacy, increases privacy concerns, and harms the trust relationship between parents and their children (Lim,

2016; Marsh et al., 2017). It is thought that it will be helpful to give detailed information for these technical situations to be understood.

Violation of Privacy

Violation of privacy is an important issue that makes it harder to achieve digital parenting for adolescent children. Children in this age group think that parental intervention is a violation of their privacy. With the fact that children use these technologies effectively, they develop various strategies such as "clearing browsing data, deleting instant messages, and so forth" to hide their own experiences from parental control. Therefore, it is getting increasingly difficult for parents to supervise their children's use of the Internet or raise their awareness about the risks and threats (Livingstone, Blum-Ross, & Zhang, 2018; Shin & Khang, 2016).

Studies conducted with adolescent children often reveal that restrictive strategies increase the privacy concerns of adolescents compared to that in other parenting approaches, and harm the relationship between parents and children (Livingstone et al., 2017; Rodríguez-de-Dios, van Oosten, & Igartua, 2018; Shin & Khang, 2016). On the other hand, studies have suggested that restrictive strategies reduce potential online risks, but also reduce opportunities and prevent children from improving their skills of using digital media due to the fact that they prevent them from taking advantage of possible opportunities (Cabello Hutt, Cabello, & Claro, 2018; Livingstone et al., 2018).

Parental Indifference

Parental indifference is described as a parental characteristic that prevents digital parenting interventions. This situation can happen in various ways. Parents' being unaware of their children's online activities or the existing technologies they use, working parents' not having enough time to deal with their children or lack of basic technology literacy (Marsh et al., 2017) can be given as examples.

The parent–child relationship has an important role in preventing online risks. This relationship is thought to ensure that children are able to communicate directly with their parents when they make mistakes in online environments and not hesitate to tell what they have experienced (Paul, 2015). It has been stated that the more powerful the parent–child relationship is, the less likely it is that children will be affected by events such as cyberbullying and Internet addiction (Chang et al., 2015). It is also believed that a strong parent–child relationship can play a significant role in preventing Internet gaming addiction (Kim & Kim, 2015). However, less parental control has been stated to cause higher aggression behaviours. That is, children's having computers in their own rooms, for example, leads to less supervision, which in return leads to more aggression (Law, Shapka, & Olson, 2010).

In their study Yaman et al. (2019) determined that the parents' education levels and internet usage experiences do not have a significant effect on digital parenting levels. On the other hand, it is stated that parents who are aware of online risks prefer restrictive strategies to protect their children from these environments (Yaman, 2018). In addition, it is thought that there are differences between one's basic technology literacy level and parenting strategies that are used. In this context, it has been found that parents with low technology literacy, for example, gravitate towards more restrictive strategies. In their study Cabello Hutt, Cabello and Claro (2018) have indicated that parents who use the Internet frequently in their daily lives tend to adopt the approaches of co-use and active mediation and avoid restricting their children's use of the Internet. However, Kokkinos et al. (2016) have stated that children of parents with inhibitory and obedient attitudes experience more cyberbullying or cyber victimization because they use the Internet more often and less securely. It has been determined that parents with less education on computer games more commonly restrict video games, and parents with high education are in favour of active mediation (Nikken & Jansz, 2008). However, it is believed that restrictive strategies are not very beneficial in preventing online risks. Therefore, it has been stated that parents' establishing strict rules or interfering with their children's behaviours on the Internet would not prevent their children from being targeted in online environments (Leung & Lee, 2011). In addition, in their study Lau and Yuen (2013) found that none of the parenting approaches were effective in reducing or preventing online risky behaviours. On the other hand, it was

suggested that the restrictive approach would cause children not to share their experiences with their parents in fear of losing digital media access (Yaman, 2018).

Conclusion and Recommendations

The purposes of this study were to reveal (a) online risks and threats that await children in the digital age, (b) the strategies that parents use as methods of dealing with these risks, and (c) the difficulties they encounter while using these strategies. With the widespread use of mobile devices, as stated in the literature, access to the Internet has become possible anytime and everywhere. The proliferation of Internet use among children has brought about various online risks. The responsibility for protecting and keeping children safe from these risks falls on parents' shoulders. This new responsibility is called 'digital parenting' in the literature.

In the context of the studies accessed within the scope of this study, the concept of digital parenting is described as a parent who is monitoring, managing, restricting children's online and offline behaviour without violating their privacy, as well as not preventing them from taking advantage of the opportunities offered by online environments and use the Internet and other technologies together when necessary. The online risks and threats faced by children and the ways parents can cope with these risks and threats are summarized in Table 2.

Table 2. Online Risks and the Ways Parents Can Cope with These Risks

Online Risks and Threats	**Coping Methods**
Disclosure of personal information	Putting various bans and rules
Cyberbullying	Using media together with their children
Meeting and talking with sinister strangers	Guidance and awareness raising on the use of digital media
Sharing their photos, videos, etc. with the strangers without worrying about privacy	Monitoring their children's online behavior
Internet gaming disorder	Raising their children's awareness of online risks, guiding their children
Game addiction	Restricting the duration of use

The risks that are likely to be faced by children in online environments and that parents should be aware of can be listed as follows: "disclosure of children's personal information, children's sharing unconscious posts, and as a result, their being exposed to various attacks or their themselves bullying their peers; children's meeting and talking with sinister strangers in online environments and sharing with the strangers their photos, videos, etc. without worrying about privacy; and clinical and psychological disorders caused by online games (Internet gaming disorder) and game addiction." The methods that parents use to cope with these risks are "limiting their children's use of digital media, putting various bans and rules, monitoring their children's online behaviour by using various software, raising their children's awareness of online risks, guiding their children, and using media together with their children."

Parents mostly adopt the restrictive approach in terms of using digital media. The main reason for this situation is that they see themselves inadequate comparing to their children in terms of using digital media. Other reasons can be listed as: "parents' failure to communicate with their children, their failure to take time to use digital media together with their children, their inability to allocate time for their children, and their avoiding learning about online media." Directly imposing bans or restricting the duration of use have emerged as the most preferred methods because they are easy for parents, instead of following things, talking, or discussing.

Parents have a little difficulty in this regard, because today children have more knowledge and higher competence than their parents about the use of digital media. Parents need to be knowledgeable about online environments and how they are going to track what their children do in online environments, as well as how they should guide their children. However, it is clear that, in that case, they will face the problem of violating their

children's privacy. Consequently, the parent–child relationship will be disrupted, the child's trust in his or her parent will be shaken, and the child will use online environments more secretly. On the other hand, there are also various difficulties that parents face when they make interventions. The most common of these is the fact that parents fail to be familiar with all online environments, and they fail to be able to have a command of all online environments. Interventions made by parents who have technical knowledge and skills to monitor and manage their children's online behaviours lead to the problem of the violation of their children's privacy. Other than that, a problem that is called parental indifference also arises. This problem can be expressed as the parents' lack of familiarity with the online environments used by their children, their lack of effort to be familiar with the environments, their ignorance of online risks, and their failure to take care of their children as they do not allocate enough time for their children. Therefore, based on the literature review, it is recommended that parents in the digital age should do the following:

- They should establish a healthy communication with their child.
- They should be aware that prohibitions and limitations would not be sufficient to eliminate online risks or protect the child in online environments.
- They should be a good role model for the child, with their own use of digital media and online behaviours.
- They should be more knowledgeable about online environments, and to do that, they should participate in various training sessions on the topic.
- They should ensure a strong trust relationship with their child, and thus, to ensure a relationship environment in which the child is able to comfortably come and tell the parent what s/he experiences.
- They should avoid behaviours that violate the privacy of their child.
- They need to allocate enough time for their children and use online environments together if needed.
- They should know that their child is more competent than themselves and take precautions accordingly.

Statement of Publication Ethics

During the writing process of this study titled "Online Environments and Digital Parenting: An Investigation on Approaches, Problems and Recommended Solutions", scientific, ethical and citation rules were followed; No falsification was made on the collected data and the study was not sent to any other academic media for evaluation.

Conflict of Interest

There is no conflict of interest among the authors regarding the publication of this article.

Researchers' Contribution Rate

Authors	Conceptualization	Method	Original draft preparation	Writing	Visualization	Supervision & Investigation	Reviewing & Editing
Ayça FİDAN	☒	☒	☒	☒	☒	☐	☐
Süleyman Sadi SEFEROĞLU	☐	☐	☐	☒	☐	☒	☒

References

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* Arlington, VA: Author.

Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D. J., & Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Current Addiction Reports, 2*(2), 156-162.

Cabello-Hutt, T., Cabello, P., & Claro, M. (2018). Online opportunities and risks for children and adolescents: The role of digital skills, age, gender and parental mediation in Brazil. *New Media & Society*, *20*(7), 2411-2431.

Chang, F. C., Chiu, C. H., Miao, N. F., Chen, P. H., Lee, C. M., Chiang, J. T., & Pan, Y. C. (2015). The relationship between parental mediation and Internet addiction among adolescents, and the association with cyberbullying and depression. *Comprehensive Psychiatry*, 57, 21-28.

Çelik, A., Çelen, F. K., & Seferoğlu, S. S. (2015). *Ortaokul öğrencilerinin sanal zorbalık ve sanal mağduriyet durumlarının incelenmesi. [Investigation of cyber bullying and virtual victimization of secondary school students*]. Akademik Bilişim Konferansı (AB15)'nda sunulan bildiri. Anadolu Üniversitesi, Eskişehir.

Demir, Ö., & Seferoğlu, S. S. (2016). The investigation of the relationship of cyber bullying with cyber loafing, internet addiction, information literacy and various other variables. *Online Journal of Technology Addiction & Cyberbullying, 2*(4), 1-17.

Durak, A., & Kaygin, H. (2019). Parental mediation of young children's internet use: Adaptation of parental mediation scale and review of parental mediation based on the demographic variables and digital data security awareness. *Education and Information Technologies.* https://doi.org/10.1007/s10639-019-10079-1.

Durak, H., & Seferoğlu, S. S. (2016). Siber zorbalık: Eski bir toplumsal sorunla ilgili yeni tanımlamalar, bakışlar, değerlendirmeler. [Cyberbullying: New definitions, opinions and evaluations of an old social problem] A. G. Baran & M. Çakır (Ed.), içinde *İnter-disipliner yaklaşımla gençliğin umudu toplumun beklentileri [Interdisciplinary approach to hope of youth's and expectations of society]* (ss. 167-187). Hacettepe Üniversitesi Yayınları, Ankara.

Elsaesser, C., Russell, B., Ohannessian, C. M., & Patton, D. (2017). Parenting in a digital age: A review of parents' role in preventing adolescent cyberbullying. *Aggression and Violent Behavior*, 35, 62-72.

Erdur-Baker, Ö., & Kavşut, F. (2007). Cyberbullying: A new face of peer bullying. *Eurasian Journal of Educational Research,* 27, 31-42.

Gölpek-Sarı, F., & Seferoğlu, S. S. (2019*).* Investigation of cyberbullying awareness, cyberbullying and cyber victim status of middle school students. *Online Journal of Technology Addiction & Cyberbullying, 6*(1), 54-77.

Ho, S. S., Chen, L., & Ng, A. P. Y. (2017). Comparing cyberbullying perpetration on social media between primary and secondary school students. *Computers & Education,* 109, 74-84. doi:10.1016/j.compedu.2017.02.004

Holloway, D., Green, L., & Livingstone, S. (2013). *Zero to eight. Young children and their internet use.* LSE, London: EU Kids Online.

Horner, S., Asher, Y., & Fireman, G.D. (2015). The impact and response to electronic bullying and traditional bullying among adolescents. *Computers in Human Behavior, 49,*288-295. doi: 10.1016/j.chb.2015.03.007

Horzum, M. B., & Ayas, T. (2011). The examination of cyberbullying and victim levels of high school students according to school type and gender. *Journal of Educational Sciences & Practices, 10*(20), 139-159.

Huang, G., Li, X., Chen, W., & Straubhaar, J. D. (2018). Fall-behind parents? The influential factors on digital parenting self-efficacy in disadvantaged communities. *American Behavioral Scientist, 62*(9), 1186-1206. doi:10.1177/0002764218773820

İnan Kaya, G., Mutlu Bayraktar, D., & Yılmaz, Ö. (2018). Dijital ebeveynlik tutum ölçeği: Geçerlik ve güvenirlik çalışması. [Digital parenting attitude scale: Validity and reliability study] *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,* 46, 149-173. doi:10.21764/

Kabakçı-Yurdakul, I., Dönmez, O., Yaman, F., & Odabaşı, H. F. (2013). Digital parenting and changing roles. *Gaziantep University Journal of Social Sciences, 12*(4), 883-896.

Kabakçı-Yurdakul, I. & Yaman, F. (2018). *İnternetin bilinçli ve güvenli kullanımı saha çalışması raporu. [Conscious and safe use of the Internet field work report.]* [Available online at: https://www.guvenliweb.org.tr/dosya/oZPyg.pdf, Retrieved on 17.02.2019].

Kavuk, M., & Keser, H. (2015). İlköğretim okullarında siber zorbalık. [Cyberbullying at primary schools] *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 31*(3), 520-535.

Keith, S., & Martin, M. E. (2005). Cyber-bullying: Creating a culture of respect in a cyber world. *Reclaiming Children and Youth, 13*(4), 224-228.

Kemp, S. (2018). Digital in 2018*: World's internet users pass the 4 billion mark.* [Available online at: https://wearesocial.com/blog/2018/01/global-digital-report-2018, Retrieved on 24.12.2018.]

Kim, K., & Kim, K. (2015). Internet game addiction, parental attachment, and parenting of adolescents in South Korea. *Journal of Child & Adolescent Substance Abuse, 24*(6), 366-371, doı:10.1080/1067828X.2013.872063

Kokkinos, C. M., Antoniadou, N., Asdre, A., & Voulgaridou, K. (2016). Parenting and Internet behavior predictors of cyber-bullying and cyber-victimization among preadolescents. *Deviant Behavior, 37*(4), 439-455.

Kowalski, R. M., Giumetti, G. W., Schroeder, A. N., & Lattanner, M. R. (2014). Bullying in the digital age: A critical review and meta-analysis of cyberbullying research among youth. *Psychological Bulletin, 140*, 1073–1137. doi:10.1037/a0035618.

Kowalski, R. M., & Limber, S. P. (2007). Electronic bullying among middle school students. *Journal of Adolescent Health,* 41, 22–30.

Květon, P., & Jelínek, M. (2016). Parenting styles and their relation to videogame addiction. *International Journal of Psychological and Behavioral Sciences, 10*(6), 1961-1964.

Lau, W. W., & Yuen, A. H. (2013). Adolescents' risky online behaviours: The influence of gender, religion, and parenting style. *Computers in Human Behavior*, *29*(6), 2690-2696.

Law, D. M., Shapka, J. D., & Olson, B. F. (2010). To control or not to control? Parenting behaviours and adolescent online aggression. *Computers in Human Behavior, 26*(6), 1651-1656.

Levy, E. (2017). *Parenting in the digital age: How are we doing?* [Available online at: https://parentzone.org.uk/sites/default/files/Parenting%20in%20the%20Digital%20Age%20conference%20report.pdf, Retrieved on 24.12.2018.]

Leung, L., & Lee, P. S. (2012). The influences of information literacy, internet addiction and parenting styles on internet risks. *New Media & Society, 14*(1), 117-136.

Lim, S. S. (2016). Through the tablet glass: Transcendent parenting in an era of mobile media and cloud computing. *Journal of Children and Media, 10*(1), 21-29. doi:10.1080/17482798.2015.1121896

Livingstone, S., Blum-Ross, A. & Zhang, D. (2018). *What do parents think, and do, about their children's online privacy?* [Available online at: http://www.lse.ac.uk/media-and-communications/assets/documents/research/preparing-for-a-digital-future/P4DF-Report-3.pdf, Retrieved on 16.03.2019.]

Livingstone, S., & Helsper, E. J. (2008). Parental mediation of children's internet use. *Journal of Broadcasting & Electronic Media, 52*(4), 581-599.

Livingstone, S., Ólafsson, K., Helsper, E. J., Lupiáñez-Villanueva, F., Veltri, G. A., & Folkvord, F. (2017). Maximizing opportunities and minimizing risks for children online: The role of digital skills in emerging strategies of parental mediation. *Journal of Communication, 67,* 82–105.

Livingstone, S., Blum-Ross, A., Pavlick, J., & Ólafsson, K. (2018). *In the digital home, how do parents support their children and who supports them?* [Available online at: http://www.lse.ac.uk/media-and-communications/assets/documents/research/preparing-for-a-digital-future/P4DF-Survey-Report-1-In-the-digital-home.pdf, Retrieved on 24.12.2018.]

Leung, L. & Lee, P. S. N. (2011). The influences of information literacy, internet addiction and parenting styles on internet risks. *New Media & Society, 14*(1) 117–136.

Lupton, D., Pedersen, S., & Thomas, G. M. (2016). Parenting and digital media: From the early web to contemporary digital society. *Sociology Compass, 10*(8), 730-743.

Marsh, A., Downs, J. S., & Cranor, L. F. (2017). *Experts' views on digital parenting strategies.* Technical Report CMU-CyLab-17-002, Carnegie Mellon University.

Martins, N., Matthews, N. L., & Ratan, R. A. (2017). Playing by the rules: Parental mediation of video game play. *Journal of Family Issues*, *38*(9), 1215-1238.

Mascheroni, G., Ponte, C. & Jorge, A. (Eds) (2018). *Digital Parenting. The Challenges for Families in the Digital Age.* Göteborg: Nordicom.

Mesch, G. S. (2009). Parental mediation, online activities and cyberbullying. *CyberPsychology & Behavior, 12*(4), 387-393.

Mesch, G. S. (2018). Parent–child connections on social networking sites and cyberbullying. *Youth & Society, 50*(8), 1145-1162.

Mishna, F., Khoury-Kassabri, M., Gadalla, T., & Daciuk, J. (2012). Risk factors for involvement in cyber bullying: Victims, bullies and bully–victims. *Children and Youth Services Review, 34*(1), 63-70.

Nikken, P., & Jansz, J. (2006). Parental mediation of children's video game playing: A comparison of the reports by parents and children. *Learning, Media & Technology*, 31, 181-202.

O'Keeffe, G. S., Clarke-Pearson, K., & Council on Communications and Media (2011). The impact of social media on children, adolescents, and families. *Pediatrics, 127*(4), 800-804.

Parkside Academy (2018). *Handbook of information and guidance for parents.* Parkside Academy, UK. [Available online at: http://parksideacademy.org.uk/wp-content/uploads/2018/04/Parents-Handbook.pdf, Retrieved on: 16.03.2019].

Paul, H. A. (2015). Book review of "Screen smart parenting: How to find balance and benefit in your child's use of social media, apps and digital devices" by J. Gold. *Child & Family Behavior Therapy, 37*(2), 163-173. doi:10.1080/07317107.2015.1035994

Rode, J. A. (2009). *Digital parenting: Designing children's safety.* 23rd British HCI Group Annual Conference on People and Computers: Celebrating People and Technology. Cambridge, United Kingdom, September 01-05, 2009.

Rodríguez-de-Dios, I., van Oosten, J. M., & Igartua, J. J. (2018). A study of the relationship between parental mediation and adolescents' digital skills, online risks and online opportunities. *Computers in Human Behavior,* 82, 186-198.

Russell, L. L. H., & Johnson, E. I. (2017). Parenting emerging adults who game excessively: Parents' lived experiences. *Issues in Mental Health Nursing, 38*(1), 66-74. DOI: 10.1080/01612840.2016.1253808.

Sasson, H., & Mesch, G. (2017). The role of parental mediation and peer norms on the likelihood of cyberbullying. *The Journal of Genetic Psychology, 178*(1), 15-27. doi:10.1080/00221325.2016.1195330

Shin, W., & Kang, H. (2016). Adolescents' privacy concerns and information disclosure online: The role of parents and the Internet. *Computers in Human Behavior,* 54, 114-123.

Surmelioglu, Y., & Seferoglu, S. S. (2019). An examination of digital footprint awareness and digital experiences of higher education students. *World Journal on Educational Technology: Current Issues, 11*(1), 048–064.

Vazsonyi, A. T., Ksinan Jiskrova, G., Özdemir, Y., & Bell, M. M. (2017). Bullying and cyberbullying in Turkish adolescents: Direct and indirect effects of parenting processes. *Journal of Cross-Cultural Psychology, 48*(8), 1153-1171.

Yaman, F. (2018). *An empirical investigation of digital parenting self-efficacy among Turkish parents.* (Unpublished doctoral dissertation). Anadolu University, Eskişehir.

Yaman, F., Dönmez, O., Akbulut, Y., Yurdakul, I. K., Çoklar, A. N., & Guyer, T. (2019). Exploration of parents' digital parenting efficacy through several demographic variables. *Education & Science, 44*(199), 149-172.

Yenilmez, Y., & Seferoglu, S. S. (2013). An overview of teachers' awareness on cyberbullying. *Education and Science, 38*(169), 420-432.

Yiğit, M. F., & Seferoğlu, S. S. (2017). A review of cyberbullying related factors and possible solutions suggested. *Online Journal of Technology Addiction & Cyberbullying (OJTAC), 4*(2), 13-49.

Yiğit, M. F., Keskin, S., & Yurdugül, H. (2018). Investigating the relationship between cyberbullying and perceived family support in middle-school students in relation to gender, frequency of internet use, and grade. *Addicta: The Turkish Journal on Addictions, 5*(2), 1-36. doi:10.15805/addicta.2018.5.2.0050

Wang, J., Iannotti, R. J., & Nansel, T. R. (2009). School bullying among adolescents in the United States: Physical, verbal, relational, and cyber. *Journal of Adolescent Health,* 45, 368–375.

Weaver, S. D., & Gahegan, M. (2007). Constructing, visualizing, and analyzing: A digital footprint. *Geographical Review, 97*(3), 324-350.

Willett, R. (2015). The discursive construction of 'good parenting' and digital media – the case of children's virtual world games. *Media, Culture & Society, 37*(7), 1060-1075. doi:10.1177/0163443715591666

Willett, R. (2016). Domesticating online games for preteens – discursive fields, everyday gaming, and family life. *Children's Geographies, 15*(2), 146-159. doi:10.1080/14733285.2016.1206194

Wright, M. (2018). Cyberbullying victimization through social networking sites and adjustment difficulties: The role of parental mediation. *Journal of the Association for Information Systems, 19*(2), 113-123. doi:10.17705/1jais.00486

Wright, M. F. (2017). Parental mediation, cyberbullying, and cybertrolling: The role of gender. *Computers in Human Behavior, 71,* 189-195. doi:10.1016/j.chb.2017.01.059

Wu, C. S. T., Fowler, C., Lam, W. Y. Y., Wong, H. T., Wong, C. H. M., & Loke, A. Y. (2014). Parenting approaches and digital technology use of preschool age children in a Chinese community. *Italian Journal of Pediatrics, 40*(44), 1-8.

Appendix 1 Studies Examined in the Scope of Literature Review

1. Cabello-Hutt, T., Cabello, P., & Claro, M. (2018). Online opportunities and risks for children and adolescents: The role of digital skills, age, gender and parental mediation in Brazil. *New Media & Society*, *20*(7), 2411-2431.
2. Chang, F. C., Chiu, C. H., Miao, N. F., Chen, P. H., Lee, C. M., Chiang, J. T., & Pan, Y. C. (2015). The relationship between parental mediation and Internet addiction among adolescents, and the association with cyberbullying and depression. *Comprehensive Psychiatry*, 57, 21-28.
3. Elsaesser, C., Russell, B., Ohannessian, C. M., & Patton, D. (2017). Parenting in a digital age: A review of parents' role in preventing adolescent cyberbullying. *Aggression and Violent Behavior*, 35, 62-72.
4. Ho, S. S., Chen, L., & Ng, A. P. Y. (2017). Comparing cyberbullying perpetration on social media between primary and secondary school students. *Computers & Education*, 109, 74-84. doi:10.1016/j.compedu.2017.02.004.
5. Huang, G., Li, X., Chen, W., & Straubhaar, J. D. (2018). Fall-behind parents? The influential factors on digital parenting self-efficacy in disadvantaged communities. *American Behavioral Scientist, 62*(9), 1186-1206. doi:10.1177/0002764218773820
6. Kim, K., & Kim, K. (2015). Internet game addiction, parental attachment, and parenting of adolescents in South Korea. *Journal of Child & Adolescent Substance Abuse, 24*(6), 366-371, doı:10.1080/1067828X.2013.872063
7. Kokkinos, C. M., Antoniadou, N., Asdre, A., & Voulgaridou, K. (2016). Parenting and Internet behavior predictors of cyber-bullying and cyber-victimization among preadolescents. *Deviant Behavior*, *37*(4), 439-455.
8. Květon, P., & Jelínek, M. (2016). Parenting styles and their relation to videogame addiction. *International Journal of Psychological and Behavioral Sciences, 10*(6), 1961-1964.
9. Lau, W. W., & Yuen, A. H. (2013). Adolescents' risky online behaviours: The influence of gender, religion, and parenting style. *Computers in Human Behavior*, *29*(6), 2690-2696.
10. Law, D. M., Shapka, J. D., & Olson, B. F. (2010). To control or not to control? Parenting behaviours and adolescent online aggression. *Computers in Human Behavior, 26*(6), 1651-1656.
11. Lim, S. S. (2016). Through the tablet glass: Transcendent parenting in an era of mobile media and cloud computing. *Journal of Children and Media*, *10*(1), 21-29. doi:10.1080/17482798.2015.1121896
12. Livingstone, S., Blum-Ross, A., & Zhang, D. (2018). *What do parents think, and do, about their children's online privacy?* [Available online at: http://www.lse.ac.uk/media-and-communications/assets/documents/research/preparing-for-a-digital-future/P4DF-Report-3.pdf, Retrieved on 16.03.2019.]
13. Livingstone, S., & Helsper, E. J. (2008). Parental mediation of children's internet use. *Journal of Broadcasting & Electronic Media, 52*(4), 581-599.
14. Livingstone, S., Ólafsson, K., Helsper, E. J., Lupiáñez-Villanueva, F., Veltri, G. A., & Folkvord, F. (2017). Maximizing opportunities and minimizing risks for children online: The role of digital skills in emerging strategies of parental mediation. *Journal of Communication,* 67, 82–105.
15. Livingstone, S., Blum-Ross, A., Pavlick, J., & Ólafsson, K. (2018). *In the digital home, how do parents support their children and who supports them?* [Available online at: http://www.lse.ac.uk/media-and-communications/assets/documents/research/preparing-for-a-digital-future/P4DF-Survey-Report-1-In-the-digital-home.pdf, Retrieved on 24.12.2018.]
16. Leung, L., & Lee, P. S. N. (2011). The influences of information literacy, internet addiction and parenting styles on internet risks. *New Media & Society, 14*(1) 117–136.
17. Lupton, D., Pedersen, S., & Thomas, G. M. (2016). Parenting and digital media: From the early web to contemporary digital society. *Sociology Compass, 10*(8), 730-743.
18. Marsh, A., Downs, J. S., & Cranor, L. F. (2017). *Experts' views on digital parenting strategies.* Technical Report CMU-CyLab-17-002, Carnegie Mellon University.

19. Martins, N., Matthews, N. L., & Ratan, R. A. (2017). Playing by the rules: Parental mediation of video game play. *Journal of Family Issues*, *38*(9), 1215-1238.
20. Mesch, G. S. (2009). Parental mediation, online activities and cyberbullying. *CyberPsychology & Behavior, 12*(4), 387-393.
21. Mesch, G. S. (2018). Parent–child connections on social networking sites and cyberbullying. *Youth & Society, 50*(8), 1145-1162.
22. Nikken, P., & Jansz, J. (2006). Parental mediation of children's video game playing: A comparison of the reports by parents and children. *Learning, Media & Technology,* 31, 181-202.
23. O'Keeffe, G. S., Clarke-Pearson, K., & Council on Communications and Media (2011). The impact of social media on children, adolescents, and families. *Pediatrics, 127*(4), 800-804.
24. Rodríguez-de-Dios, I., van Oosten, J. M., & Igartua, J. J. (2018). A study of the relationship between parental mediation and adolescents' digital skills, online risks and online opportunities. *Computers in Human Behavior, 82*, 186-198.
25. Russell, L. L. H., & Johnson, E. I. (2017). Parenting emerging adults who game excessively: Parents' lived experiences. *Issues in Mental Health Nursing, 38*(1), 66-74, DOI: 10.1080/01612840.2016.1253808.
26. Sasson, H., & Mesch, G. (2017). The role of parental mediation and peer norms on the likelihood of cyberbullying. *The Journal of Genetic Psychology, 178*(1), 15-27. doi:10.1080/00221325.2016.1195330
27. Shin, W., & Kang, H. (2016). Adolescents' privacy concerns and information disclosure online: The role of parents and the Internet. *Computers in Human Behavior,* 54, 114-123.
28. Vazsonyi, A. T., Ksinan Jiskrova, G., Özdemir, Y., & Bell, M. M. (2017). Bullying and cyberbullying in Turkish adolescents: Direct and indirect effects of parenting processes. *Journal of Cross-Cultural Psychology, 48*(8), 1153-1171.
29. Yiğit, M. F., Keskin, S., & Yurdugül, H. (2018). Investigating the relationship between cyberbullying and perceived family support in middle-school students in relation to gender, frequency of internet use, and grade. *Addicta: The Turkish Journal on Addictions, 5*(2), 1-36. doi:10.15805/addicta.2018.5.2.0050
30. Willett, R. (2015). The discursive construction of 'good parenting' and digital media – the case of children's virtual world games. *Media, Culture & Society, 37*(7), 1060-1075. doi:10.1177/0163443715591666
31. Willett, R. (2016). Domesticating online games for preteens – discursive fields, everyday gaming, and family life. *Children's Geographies, 15*(2), 146-159. doi:10.1080/14733285.2016.1206194
32. Wright, M. (2018). Cyberbullying victimization through social networking sites and adjustment difficulties: The role of parental mediation. *Journal of the Association for Information Systems, 19*(2), 113-123. doi:10.17705/1jais.00486
33. Wright, M. F. (2017). Parental mediation, cyberbullying, and cybertrolling: The role of gender. *Computers in Human Behavior, 71*, 189-195. doi:10.1016/j.chb.2017.01.059
34. Wu, C. S. T., Fowler, C., Lam, W. Y. Y., Wong, H. T., Wong, C. H. M., & Loke, A. Y. (2014). Parenting approaches and digital technology use of preschool age children in a Chinese community. *Italian Journal of Pediatrics, 40*(44), 1-8.

Appendix 2

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Online Environments and Digital Parenting: An Investigation of Approaches, Problems, and Recommended Solutions
Discipline	...
Type of Article	Literature Review
Year of Data Collection	...

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that article is a literature review.

Date 07/05/2020

Authors' Info and Signatures

Authors	*Institute*	*Title*	*Name*	*Signature*
1.	Ege University	Lecturer	Ayça FİDAN	
2.	Hacettepe University	Prof. Dr.	Süleyman Sadi SEFEROĞLU	
3.				

Correspondent Author's Info

Institute	Ege University
Postal address	Ege University Distance Education Application and Research Center 35100 Bornova/İZMİR
E-mail	ayca.fidan@ege.edu.tr
Phone	0530 937 23 06

Önalan, O., & Gürsoy, E. (2020). EFL teachers' views and needs on in-service training as a part of professional development: A case study in Turkish context. *Bartın University Journal of Faculty of Education*, 9(2), 373-387.

Bartın University Journal of Faculty of Education, 9(2), 373-387

buefad.bartin.edu.tr

EFL Teachers' Views and Needs on In-service Training as a Part of Professional Development: A Case Study in Turkish Context

Okan ÖNALAN*[a], Esim GÜRSOY[b]

Article Info

DOI: 10.14686/buefad.713100

Article History:
Received: 05.01.2020
Accepted: 29.04.2020
Published: 05.06.2020

Keywords:
EFL Teachers,
In-Service Training,
INSET Needs.

Article Type:
Research Article

Abstract

In-service training (INSET), as one of CPD activities, is an indispensable part of any organized effort to enhance language teachers' field knowledge as well as their practical skills. However, there are still concerns regarding the effectiveness and sufficiency of INSET programs in Turkey. One of the reasons for any possible inefficiency might be the abundance rather than scarcity in quantity, where content has long been repetitive around similar and currently monotonous topics with limited quality. Therefore, more data-driven research that investigates language teachers' actual needs and views on in-service training should be conducted in different contexts. Thus, the present study aims to investigate INSET needs and views of 249 private school teachers working at different campuses of the same institution. Designed as a mixed methods research, quantitative data was collected via a questionnaire developed by the researchers which is then followed by focus group interviews of 20 head teachers and team leaders from the same institution. The findings suggest characteristics of a good INSET by underlining teachers' needs in a training program with implications for teacher trainers and policy makers.

İngilizce Öğretmenlerinin Hizmet İçi Eğitimlere Yönelik Görüşleri ve İhtiyaçları: Türkiye Bağlamında Bir Durum Çalışması

Makale Bilgisi

DOI: 10.14686/buefad.713100

Makale Geçmişi:
Geliş: 05.01.2020
Kabul: 29.04.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
İngilizce Öğretmenleri,
Hizmet İçi Eğitim,
HİE İhtiyaçları.

Makale Türü:
Araştırma Makalesi

Öz

Sürekli mesleki gelişim çalışmaları kapsamındaki hizmet içi eğitimler, öğretmenlerin hem alan bilgilerini geliştirmede hem de pratik becerilerini ilerletmede vazgeçilmezdir. Ancak, Türkiye'de yürütülen hizmet içi eğitimlerin etkinliği ve yeterliliği ile ilgili çeşitli kaygılar dile getirilmektedir. Bu düşüncelerin temelinde hizmet içi eğitimlerin sayıca azlığı değil, aksine benzer ve sıkıcı konular üzerinde çokça ve tekrar tekrar yapılan düşük kalitedeki eğitimler yatmaktadır. Bu nedenle, farklı bağlamlarda öğretmenlerin hizmet içi eğitimlere yönelik görüşlerini ve ihtiyaçlarını araştıran veriye dayalı daha fazla çalışmanın yürütülmesine ihtiyaç vardır. Bu kapsamda mevcut çalışma, Türkiye'de bir özel okul zincirinin farklı kampüslerinde çalışan 249 İngilizce öğretmeninin hizmet içi eğitimlere yönelik görüş ve ihtiyaçlarını araştırmaktadır. Karma yöntem çalışması olarak tasarlanmış bu çalışmada, nicel veriler araştırmacılar tarafından geliştirilen bir anket yoluyla toplanmıştır. Bu veriler, aynı okul zincirinde görev yapan 20 zümre başkanı ile yürütülen odak grup görüşmeleri vasıtasıyla toplanan nitel verilerle desteklenmiştir. Bulgular, İngilizce öğretmenlerinin iyi planlanmış hizmet içi eğitimlerin taşıdığı özellikler hakkındaki görüşlerini ve hizmet içi eğitimlere yönelik ihtiyaçlarını ortaya koymakla beraber hem planlayıcılar hem de öğretmen eğiticilerine yönelik sonuç ve öneriler sunmaktadır.

***Corresponding Author:** okanonalan@gmail.com
[a] Dr., Independent Researcher, https://orcid.org/0000-0003-4015-0903
[b] Prof. Dr., Bursa Uludağ University, Faculty of Education, ELT Dept., Bursa, https://orcid.org/0000-0003-3715-4583

Introduction

The broad concept of professional development for teachers connotes a continuous process that begins with pre-service education at the educational faculties and extends primarily into novice years and subsequently to more experienced phases of teaching careers. From this perspective, continuing professional development (CPD) for teachers is an endeavor that emphasizes a career-long development and improvement. Especially upon graduation, CPD can be perceived as a paradigm where teachers play an active role in improving their instruction not only through learning from their own experiences by means of reflective practice, but also through attending further training activities according to their perceived needs and challenges. In this respect, the latter, namely in-service training (INSET), is theoretically an invaluable asset for teachers in CPD efforts. INSET is essential mostly because theory-based courses in the pre-service period usually fall short in reflecting the complicated nature of instruction that awaits the teachers in actual classrooms. Naturally, teachers become more aware of their own context-specific professional needs during the in-service period. Therefore, as an indispensable part of CPD, INSET contributes to teachers' professional development attempts not only in improving their instructional skills, but also in keeping them up-to-date in terms of field and methodological knowledge (Çimer, Çakır & Çimer, 2010; Saiti & Saitis, 2006; Sokel, 2019).

INSET programs aim to serve multiple significant purposes under CPD framework. One of the primary goals of INSET is to increase the quality of instruction by improving teachers' knowledge, sharpening their skills (Hustler, McNamara, Jarvis, Londra & Campbell, 2003), developing positive attitudes (Bolam, 1982; Joyce & Showers, 2002) and increasing their ability to change (Fullan, 2001). By participating in INSET programs, teachers may enrich their instructional repertoire, which is then expected to transform into enduring educational and professional advantages (Hayes, 1995; Richards & Farrell, 2005). Other targeted benefits of INSET might include establishing a reflective mindset, engaging in collaborative learning with other colleagues and refreshing professional motivation. Eventually, majority of INSET efforts aim at accomplishing improved instructional performance with an ultimate purpose of achieving better education.

The perception that INSET should play numerous crucial roles in the educational realm has caused researchers to verify this notion through empirical studies. Although many studies have reported positive impact of INSET both on teachers and eventually on students (Gibbs & Coffey 2004; Grieve & McGinley 2010; Rajabi, Kiany & Maftoon, 2012), some researchers have concluded that INSET programs can demonstrate ineffectiveness, which may hamper their potential to produce intended outcomes (Atay 2008, Emery, 2012; Hamid 2010; Kennedy 2016). In other words, some INSET activities prove to be inefficient due to certain reasons. One of the reasons might be the narrow approach in the preparation phase of trainings, during which teachers' views and actual needs are neglected. This may cause a serious inconsistency between teachers' expectations from INSET and program objectives (Emery, 2012; Yan, 2005). Therefore, more data-driven research that investigates language teachers' actual needs and views on in-service training should be conducted in different contexts. The present study takes this necessity as its primary motive with the premise that exploring language teachers' stated views and needs towards INSET will facilitate the efforts to develop more effective programs for teachers.

Literature Review

Factors that increase the effectiveness of INSET programs have long been discussed in CPD literature for teachers. In one of the earlier studies, for example, Vukelich and Wrenn (1999) assert that INSET programs can achieve effectivity as long as they are continuous, subject-specific and responsive to teacher needs. Similarly, Burns and Richards (2009) argue that the efficiency of INSETs increase when such programs present collaborative and reflective opportunities to their participants through meaningful and practical content. Sokel (2019) correspondingly maintains that coherence, active participation and collaboration are significant elements that INSET designers should take into consideration in achieving efficient outcomes. In general, one of the common points raised by studies on the issue in teacher professional development literature is that there is a strong necessity to place teachers' views and needs as well as their specific contexts and realities at the center of the INSET design and implementation (Atay, 2008; Bax, 1997; Fullan, 1995; Hayes, 2000; Mede & Işık, 2016; Sandholtz, 2002; Uysal, 2012; Wolter, 2000).

In spite of the efforts to sustain positive impact, there is still considerable criticism regarding ineffectiveness and insufficiency of INSET programs. The first point of concern echoed by literature is related to the content of trainings. Although studies show that practical trainings are more effective than theory-based ones (Elyas & Al Grigri, 2014; Hockly, 2000), research shows that most INSET activities prove to be too theoretical and superficial

with limited reference to practical challenges faced by teachers in actual classrooms (Kiely & Davis, 2010; Paine & Fang, 2006; Wedell, 2011). In other words, although one of the main expectations of participant teachers from trainings might be to refresh on content-field knowledge and methodological theory, the efficiency of INSETs tends to decrease when sessions are given via traditional techniques where theory-based knowledge is conveyed through mere lecturing (Gökmenoğlu, 2012; Koç, 2016).

Additionally, it has been asserted that the organization of INSET sessions is another cause of inefficiency when lecture-based delivery is at the center with limited opportunities for collaboration and collective work (John & Gravani, 2005). To put it in another way, it can be argued that INSETs that encourage pair/group work in a comfortable and open atmosphere where participants share ideas freely prove to be more effective for teachers (Garet, Porter, Desimone, Birman & Yoon, 2001; Guskey, 2003; Guskey & Yoon, 2009). What is more, successful INSET programs are recognized to include trainees in the learning process via active participation opportunities using a variety of methods such as kinesthetic practice and reflection (Joyce & Showers 1980; Sandholtz, 2002). Some studies have shown that the quality and specificity of training materials as a part of INSET organization play a crucial role, as well (Bayrakçı, 2009; Hayes, 2000). Therefore, should designers aim to achieve higher effectivity levels and more positive impact, it can be concluded that organizational choices while designing and implementing INSETs are a significant factor to take into consideration, and teachers' views and context-specific needs are essential here, too.

As a third point, trainers play a significant role on the efficiency of INSET programs. Studies show that not only overly theory-oriented INSET trainers, but also ill-prepared or incompetent teacher educators have a negative impact on the effectiveness of trainings (Öztürk & Aydın, 2019). Focusing on the trainer qualities that will bring positive outcomes, Wallace (1991) maintained much earlier that successful teacher trainers should assume a number of roles, among which are transmitting information, awareness-raising, facilitating, and mentoring. In terms of bridging the gap between theory and practice, Ellis (2010) has put forward that trainers should be able to find ways to mediate between their own methodological expertise and teachers' practical knowledge. Furthermore, Concannon-Gibney and McCarthy (2012) assert that trainers should be able to create plenty of opportunities for discussion and reflection during INSET sessions. Additionally, recognizing teachers' actual needs (Hayes, 2000; Howell & Buck, 2012; John & Gravani, 2005) and providing meaningful and constructive feedback (Waters & Vilchez, 2000; Waters, 2006) are important trainer skills in conducting effective INSETs.

INSET activities in the Turkish context reportedly have similar points yet to be improved if planners aim to achieve sustainable efficiency. According to Bayrakçı (2009), for example, in-service training in Turkey usually lacks collaborative aspect, technology use, appropriate evaluation or sufficient practical elements. Similarly, Altun (2011) asserts that state-held INSET programs tend to overwhelm participant teachers because trainers merely transfer theoretical information without necessary emphasis on practical aspect of teaching. Correspondingly, a recent study conducted in Turkish non-formal education settings has shown that Turkish language teachers prefer INSET programs that address instructional challenges using practical ideas in an environment where participants reflectively share experiences through need-oriented, authentic instructional activities (Arslan, Mirici, & Öz, 2019). However, INSET programs for Turkish EFL teachers in particular receive criticisms on the grounds that they neglect teachers' needs, opinions and specific challenges (Balbay, Pamuk, Temir & Doğan, 2018; Daloğlu, 2004; Küçüksüleymanoğlu, 2006; Uysal, 2012; Uztosun, 2018). Therefore, the current study aims to investigate Turkish EFL teachers' views and needs on INSET programs with the motivation that the findings might help design more effective INSETs for language teachers in the coming years.

Method

Research Design

This is a case study designed as a sequential mixed-method research (quan-qual). Both quantitative and qualitative data have been collected to answer the following research questions:

1. What types of professional development activities are the EFL teachers involved in?
2. What are the EFL teachers' perceptions on INSET?
3. What are the views of EFL teachers on characteristics of an INSET program?
4. What are the EFL teachers' views regarding the content of an INSET?
5. How do EFL teachers determine their INSET need(s)?

6. What are the EFL teachers' perceptions regarding their assessment during INSET and the assessment of the INSET?

Participants

Purposive sampling is used in the selection of the school for the case study. 249 EFL teachers working at different campuses of a relatively big private school contributed to the study. The reason for the selection of this specific private school is due to their high reputation in EFL teaching in Turkey as well as the intense importance they give to in-service training of their teachers. Thus, except for one teacher, all the teachers that participated in the study had a previous INSET experience. Having an experienced group of participant teachers, the researchers hoped that the findings regarding the characteristics of an INSET would make the data more reliable. Moreover, the informed knowledge and information they will provide might prove to be relatively more helpful in terms of implications when compared to a group of teachers who do not have any expectations from such a program. These 249 teachers answered a questionnaire to communicate their views and needs. Later on, after a custom-made INSET prepared for the 20 head teachers of the participant group, focused-group interviews were conducted for a deeper understanding of their views. Thus, a within-case sampling strategy is used for the interviewees.

As this is a case study that involved all the available teachers, an equal distribution of genders was not possible. Considering the female dominance in the field of ELT, the majority of the participants (n= 240) were females and only nine were males. The participants were also divided into three groups according to their teaching experience. Accordingly, 122 participants (49%) were considered as novice teachers (0-5 years of experience); 93 teachers (37,3 %) had 6-11 years of teaching experience, and 34 of them (13,7 %) had 12 years or more experience.

Data Collection and Tools

Quantitative data is collected via a questionnaire developed by the researchers. The statements required responses regarding teachers' perceptions on INSET (1, 17, 18, 19, 20, 21), content of INSET (2, 3, 4, 5, 6, 7, 13, 14, 15, 16) and assessment in INSET (8, 9, 10, 11, 12). For content validity, the questionnaire is given to five expert teacher trainers and content validity ratio (CVR) for each item was taken. Four items having lower CVR values from 0,99 were discarded and thus the final instrument constituted 21 items. The same experts also evaluated the questionnaire for face validity and necessary changes were made accordingly. As a next step, the questionnaire was piloted on 35 EFL teachers working at state and private institutions. The reliability of the pilot study was found to be ,80. Finally, the online instrument was shared with the participants. The Cronbach alpha value of the main study was found ,82 and the measurement was considered reliable.

As a last step of the data collection process, 20 head teachers of the same institution were invited for focus group interviews after a teacher training session conducted by the researchers. The first focus group had 11 and the second focus group had nine participants. All the answers were recorded and transcribed. The interviewees were asked the following nine questions relevant with the items in the questionnaire:

1. What are some activities that you're engaged in for your Professional development?
2. How do you determine your INSET need(s)?
3. What should be the general characteristics of an IST? (How would you define a good INSET?)
4. What are your expectations from an INSET?
5. Do you reflect on what you have learnt in INSET?
6. What are your criteria when evaluating the training?
7. Do you ask for feedback from your fellow colleagues?
8. How should the content of an INSET organized?
9. What is your expectation regarding the content of a training?

In terms of the duration of the data collection process, the questionnaire phase took place between October 2018 and June 2019 whereas the INSET session and focus group interviews were conducted in August 2019.

Data Analysis

Descriptive statistics were used in the analysis of the questionnaire data. Normality values were determined by checking the Skewness and Kurtosis values. As a result, 15 items (2, 3, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, and 21) were found to be normally distributed; thus, parametric tests were used for these items. For those that were not normally distributed (1, 4, 5, 6, 8, 18), non-parametric tests were used. However, as the gender distribution and the distribution of those who took an INSET before were not equal or similar, dual comparisons (independent samples t-test for parametric and Mann-Whitney U test for non-parametric) did not reveal statistically significant results. Thus, means, standard deviations were taken and frequency analyses were made on the items.

For the verbal data gathered during the focus group interviews, content analysis was conducted. Categories and sub-groups were formed. To provide inter-rater reliability, each researcher first did the categorization individually, and then they compared it with each other. The categories were formed upon agreement of both researchers.

Ethical Considerations

To collect data from this specific group, the researchers contacted the school's head office for their consent. After the approval of the head office, the head of the ELT department was contacted and necessary permissions were received for the distribution of the questionnaire. For the focus group interviews, written consent of the participants was asked. All of the head teachers agreed to participate in the interviews. Moreover, the name and location of the school and its campuses as well as the participants' identities were kept anonymous.

Findings

The quantitative and qualitative results are reported together when they provide an answer to a research question to facilitate comparison. Other questions posed as part of the focus group interview and aimed to delve more into the answers are reported separately in this section. The first research question (RQ) inquired about the participants professional development (PD) activities. The question was answered during focus group interviews. A total of 11 different activities were mentioned by the participants as shown in Table 1.

Table 1. Preferred PD activities

Activities	N
Attending ELT Conferences/Seminars	19
Attending INSETs	19
Sharing experiences with colleagues	16
Visiting ELT websites	11
Watching TED talks and YouTube	11
Reading resource books/articles	8
Attending courses with personal and professional benefit	6
Observing team leaders	5
Furthering education (M.A, Ph.D.)	3
Attending Webinars	2
Joining in EU projects	1

As seen from the table, the participant group has different experiences in terms of their PD, which justifies the reason for the selection of this specific school and its teachers for the investigation. Among their answers, INSET has been preferred by all participants except one. Participant group's previous experiences and involvement in INSET makes their views and perceptions on INSET worthwhile when compared to a group with no experience.

Next, the participants were asked to state the PD activities they found beneficial. Among the 11, they stated that they find six of these activities helpful: INSETs, talking and sharing experiences with colleagues, watching activity videos on YouTube, furthering education, visiting ELT websites and reading articles. Although not asked as a question, eight of the participants stated that they found resource books not beneficial as the information is too theoretical and not transferrable to the classroom. Moreover, without being asked, they also stated disadvantages of INSETs as follows:

- Too lecture-based
- Audience is mostly passive,

- Content is too theoretical,
- Sessions are over-crowded,
- Content is repetitive in nature,
- Usually given by the same trainers,
- Topics are the same
- Topics are sometimes irrelevant with the teachers' needs.

During the interviews the participants were asked to explain how they determine their INSET needs (RQ 4). Accordingly, they decide they need INSET;

- After identification of weaknesses and strengths via reflection
- Upon others' ideas, suggestions (colleagues, students, parents)
- After peer assessment/collaboration
- As a result of the need for practical ideas
- Due to the need for being up-to-date
- Because of the desire for perfection
- To meet the needs of the students
- In a random manner

The second RQ aimed at investigating the EFL teachers' perceptions on INSET. The answers to the items related to this question are provided in table 2 in terms of frequencies, means and SD.

Table 2. Perceptions on INSET

No	Item	Disagree %	No Idea %	Agree %	*M*	SD
1	I think in-service trainings help me renew my theoretical knowledge.	86,7	-	13,3	1,13	,33
17	I think the in-service trainings are essential for professional development.	8,8	24,5	66,6	3,86	,99
18	I enjoy attending in-service trainings.	2,1	11,6	86,3	4,32	,80
19	I think in-service training should be regular.	5,6	17,3	77,1	4,08	1,00
20	I think in-service training should be voluntary for all teachers.	11,6	25,7	62,6	3,79	1,13
21	I think the Ministry of National Education should provide regular in-service training for the teachers.	15,6	17,3	67,1	3,85	1,19

One striking finding related to the second RQ is that the majority of the participants (86,7 %) do not think that the INSETs help renew and refresh their theoretical knowledge which they learned at the faculty. Considering the fact that one of the aims of INSET is to help teachers refresh their knowledge and enrich it with practice, the answer requires significant attention. According to the participants' responses, only a little more than the half think the INSETs are essential for continuous professional development, but they still enjoy attending them. However, nearly ¼ of the participants are dubious regarding the issue. Although they seem to agree that the INSETs should be organized regularly, nearly ¼ of the teachers tend to question the voluntary participation.

The third RQ asked about the views of EFL teachers on characteristics of an INSET program. The participants' responses were taken during the interviews and the answers were first divided into categories then into groups.

Table 3. Characteristics of an INSET

	Category	Group
Characteristics of an INSET	Content	to the point informative transferable up-to-date relevant with the needs innovative practical concrete examples of how theory can be put into practice
	Organization	interactive fun in small groups lots of activities and materials
	Trainers	experienced providing feedback

Second group of items in the questionnaire (items 2, 3, 4, 5, 6, 7, 13, 14, 15, 16) and the eighth question of the interview aimed to learn about participants' views on INSET content. Table 4 below shows the participants' answers on related items:

Table 4. Views on the Content of an INSET

No	Item	Disagree %	No Idea %	Agree %	*M*	SD
2	I think practical information should be integrated in the content of the in-service trainings.	4,4	14,4	81,6	4,19	,88
3	I need to see examples of how theory can be implemented in the classroom.	1,2	11,2	87,5	4,39	,74
4	The instructors of the in-service trainings should be experts in their fields.	2,8	10,8	86,3	4,41	,82
5	I would like the instructors to share in-service trainings materials.	1,2	7,6	91,2	4,53	,72
6	I would like discussions on theoretical topics.	1,2	8	90,7	4,43	,74
7	I would like discussions on classroom implementations of suggested activities.	9,6	29,7	60,6	3,81	1,02
13	I prefer group work in the in-service trainings.	34,2	30,1	35,8	3,00	1,26
14	I prefer working alone in the in-service trainings.	13,6	16,1	**70,3**	3,83	1,07
15	I enjoy kinesthetic activities in-service trainings.	41,8	28,5	29,7	2,81	1,27
16	I like hands-on activities in the in-service trainings.	7,6	18,5	73,9	4,05	1,00

As the results demonstrate, the participants have agreed that they need practical content in the trainings. However, the literature in the Turkish context state that the INSETs highly rely on theoretical information and this has become one of the criticisms towards the content.

The interview results regarding the content of INSET was arranged under three categories. As seen in table 5, the participants mentioned about the organization of the content, physical environment and the time the INSET is given. Moreover, the interviewees were asked to give a percentage on theory-practice balance in the INSET content. The majority of the participants (n=15) suggested a 70% practice, 30% theory balance; four of the participants suggested 60% practice and 40% theory, and only one of the participants claimed that a 50-50%

distribution of theory and practice would be more beneficial. As seen from the frequencies the majority asked for practice-based and practice-integrated trainings.

Table 5. Content of an INSET

	Category	Group
Content of an INSET	Organization of content	ice-breakers/warm-up activities purpose/outline of the training theory/information presented interactively contain practical content (variety of ex. Activities)
	Organization of the physical environment	seating of the participants arrangement of the room spaciousness, lighting pair/group activities
	Time of INSET	on a separate day avoiding after-work hours

The final RQ inquired about participants' perceptions regarding their assessment during INSET and their assessment of the INSET. Teachers' perception of the INSET was determined according to their answers in the last part of the questionnaire (8, 9, 10, 11, 12) and their criteria for evaluating the training is identified as a result of the interviews.

Table 6. Views on Assessment during INSET

No	Item	Disagree %	No Idea %	Agree %	*M*	SD
8	I think there should be an evaluation of the training in the end.	1,2	8,4	90,4	4,36	,70
9	If there will be an evaluation, I would prefer self-evaluation.	10,8	25,3	63,8	3,84	1,09
10	If there will be an evaluation, I would prefer peer-evaluation.	9,2	29,3	61,4	3,78	,99
11	If there will be an evaluation, I would prefer whole class evaluation.	27,8	36,5	35,8	3,09	1,20
12	If there will be an evaluation, I would prefer pen and paper evaluation.	19,6	28,5	51,8	3,45	1,23

During the interviews, the participants were asked whether they are involved in self-evaluation as a form of reflection. The majority (n=18) said that they do, one participant reported doing it most of the time and only one replied negatively. Next, they were asked about their ways of reflection. Their answers and the frequencies are given in table 7.

Table 7. Methods of Reflection

Methods	N
Talking with colleagues	9
Talking with the self	8
Checking notes taken during the INSET	7
Conducting further study	7
Implementing the provided information in the classroom	4

Finally, the participants were asked about their criteria for evaluating the INSET they attended. Accordingly, their criteria for success are categorized under two points (table 8).

Table 8. Criteria for the Evaluation of an INSET

	Category	Group
Criteria for the Evaluation of an INSET	Content	functional/applicable
		informative
		containing new information
		having an interesting topic
		audience-friendly
	Trainers	presentation skills
		being open for interaction

Discussion

The present study aimed at identifying private school EFL teachers' views and needs towards INSET. The quantitative data looked for views and perceptions regarding the three issues embedded in the items of the instrument: views/perceptions on INSET, content of the INSET and assessment in INSET. The qualitative data gathered during focus group interviews enabled to explore participants' practices as well as thoughts and needs on INSETs. Thus, "why" and "how" questions related to the issue were answered.

There are several important findings that need to be discussed. It is found out that this specific group of teachers in the case study are engaged with a wide array of PD activities, yet the most preferred ones are seminars and INSETs. In addition, they also consider sharing experiences with colleagues as a PD activity. This finding is interesting as it indirectly suggests the importance and the effectiveness of collaboration they have within their institution, justifying our reason to select this school for the case study. It is also noteworthy that among the most frequently preferred PD activities, they claimed to find INSETs as beneficial. However, they also mentioned that the INSET might be ineffective and carry some disadvantages. Their complaints were mostly in line with the literature conducted in the Turkish context (Altun, 2011; Balbay, Pamuk, Temir & Doğan, 2018; Bayrakçı, 2009; Daloğlu, 2004; Küçüksüleymanoğlu, 2006; Uysal, 2012; Uztosun, 2018) and focus on the content of the training as well as the trainers. The primary concern was that the trainings are usually too theoretical, lecture-based and usually about the same topics. The participants were unhappy with the dull, repetitive, sometimes irrelevant content during which they are kept passive in overcrowded sessions. It seems that although they feel the need to attend INSETs, they don't feel satisfied as they view such training as transmission of knowledge rather than sharing ideas or classroom practices. The limited/lack of involvement of the participants in the learning process emphasized the traditional nature of the training.

The results from the interview also showed that these teachers are using multiple methods to decide whether they need INSET. Their answers point to the fact that they have increased awareness on their professional needs, they give importance to collaboration and ideas of others, they are reflecting on their job and teaching and finally they give precedence to their students' needs. None of the answers involved compulsory participation or institution

forced engagement in INSET activities. This might be due to the school climate that they are in and frequent support they receive from each other. This finding suggests a need towards creating a similar school atmosphere in state schools as well. The value given to cooperation and collaboration suggests the fact that professional development is not merely an individual activity, but rather brings mutual benefits for the administration and the teachers alike.

Another striking finding is that although the INSET organized in the Turkish context rely on theory, the majority of the participants claimed that trainings do not help renew their theoretical knowledge and they demand more practical content. This finding is in line with the previous research (see, Kiely & Davis, 2010; Paine & Fang, 2006; Wedell, 2011). This suggests that the INSETs they have attended so far do not reach their aim, which is the "transfer of knowledge", nor do they meet the needs of the participants as they have limited or no practical content. On the contrary to the negative perceptions toward the content, the participants claimed that they still enjoy attending INSETs, indicating a need for professional development. However, they have moderately high agreement on voluntary participation of INSET. This might be because they think training is necessary for PD, whether voluntary or not.

Regarding the characteristics of a good INSET, the teachers focused on three primary issues: the content of the training (see, (Elyas & Al Grigri, 2014; Hockly, 2000; Kiely & Davis, 2010; Paine & Fang, 2006; Wedell, 2011), the trainers (see, Öztürk & Aydın, 2019) and the organization (see, John & Gravani, 2005). of the training. As seen in their answers, they value practical, applicable, interactive trainings over theoretical and traditional ones. As opposed to the boring nature of traditional and theoretical content, they stated that they would like to enjoy and have fun, which could be provided by experienced trainers who are ready to give feedback.

Regarding the organization of the content of the INSET, teachers stated that they do not want group activities although they claimed just the opposite during the interviews. The interview findings suggested the value they give to collaboration that requires group work (see, Garet, et al., 2001; Guskey, 2003; Guskey & Yoon, 2009). One explanation of this finding might be that the interviews were only conducted by department heads, but the questionnaire was answered by all teachers. Thus, it can be argued that the head of the departments may be more inclined towards cooperation than the rest of the teacher group. Similarly, 2/3rd of the participants stated that they do not prefer kinesthetic activities during the training sessions. The result is contradictory to what the literature suggests (see, Joyce & Showers 1980; Sandholtz, 2002). This claim also contradicts with the fact that they like practical ideas that are transferable to the classroom presented in an interactive way. Since current techniques for teaching languages require a lot of physical activities such as drama, games, TPR, songs, etc., practical information that they claimed as necessary in INSETs would also involve different uses of such activities. Their reluctance to participate in kinesthetic activities during INSETs is definitely a reflection of their hesitance to use them in their own classes. This conflict might also be due to their former learning experiences. It is highly likely that, being in the Turkish context, they were exposed to traditional language learning, which may have them end up with the belief (conscious/unconscious) to refrain from such kinesthetic activities due to classroom management issues, focus on form etc. Therefore, there seems to be a need to delve more into teachers' cognition to learn about why they do what they are doing.

In relation with the assessment in INSET, although they claimed that there should be an assessment at the end, they only moderately agreed that they prefer self and peer-evaluation but not whole class evaluation. This finding suggests that they value individualized feedback. Moreover, only half of the participants stated they would like pen and paper evaluation, which can be interpreted that they are open to other types of evaluation. However, this finding also suggests that, though the participants claimed to prefer practical content, half of them is in favor of traditional assessment. Again, this point also requires a deeper understanding of their ideas by focusing on their cognition.

Finally, when the participants were asked about their criteria to evaluate the quality of an INSET they focused solely on the training content and the trainer although they mentioned about the organization of the physical environment and timing as two of the criteria necessary to be considered when setting up INSETs.

Conclusion and Implications

Aiming to focus on private school EFL teachers' views on and needs regarding INSETs, the study displayed some thought-provoking findings. First of all, teachers' previous experiences and concerns fell in line with the previous literature in the same context. Accordingly, the results showed that the participants' former experiences describe INSETs as traditional, theory-oriented that aims at information transfer. It is apparent from the answers that the teachers require practical content with suggestions for classroom implementations. Thus, when organizing such PD activities content should be prepared according to teachers needs in specific and they should contain activities that could be transferred to real classroom. Moreover, the organization of the content should encourage active and cognitive participation of the teachers to help them engage with the process and to facilitate the internalization of the information. Features of experiential learning can also be implemented during the process.

Another conclusion is that a collaborative school climate can have positive impact on teachers' professional development. Thus, support from the colleagues and the institution is necessary to create a cooperative environment. However, a comparison of the questionnaire and interview findings implies that the required collaborative climate is more in use with the department heads rather than the teachers in general. Therefore, in order to spread the benefits of cooperation and collaboration, head teachers' support and organization is necessary.

Finally, the contradiction between what teachers claimed to be necessary during the presentation of the content such as collaborative group activities and kinesthetic activities and their hesitance to be a part of such activities raises questions regarding the teacher cognition development. Thus, suggesting to solve this problem via furthering research in teacher cognition. It is no doubt that, unless the teachers start implementing what they think to be effective by being a part of it themselves, the transfer of these techniques to their classes will be more difficult or lefthanded.

The results of the study have implications for policy makers, institutional leaders, teachers and teacher trainers when organizing and conducting trainings. However, the limitations of the study should also be taken into consideration. Being a case study, the participants are teaching at different campuses of a private school. As reported by the ELT department head of the institution, the teachers receive INSETs once a month on a regular basis. Hence, this group of teachers is quite experienced with high awareness regarding the issue, which was also one of the reasons for the selection of this case. Due to this reason, the results cannot be generalized to other school types or teachers. However, with regards to the concerns on INSET, the answers fell in line with the literature proposing that INSETs prepared both by private organizations and the state suffer from similar disadvantages. Thus, the suggestions made by the teachers for the betterment of INSETs are worth considering.

Statement of Publication Ethics

The research has no unethical problems and research and publication ethics have been fully observed. No ethical committee approval information has been established since the quantitative data for the study were collected between the dates October 2018 – June 2019 and focus group interviews were conducted in August 2019.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Okan Önalan	☒	☒	☒	☒	☒	☒
Esim Gürsoy	☒	☒	☒	☒	☒	☒

References

Altun, T. (2011). INSET (In-service Education and Training) and professional development of teachers: A comparison of British and Turkish cases. *Online Submission. US-China Education Review A6*. 846-858.

Arslan, S., Mirici, İ. H., & Öz, H. (2019). In-service training needs of EFL teachers in non-formal education settings. *SEFAD, 42,* 223-244.

Atay, D. (2008). Teacher research for professional development. *ELT Journal, 62*(2), 139–147.

Balbay, S., Pamuk, İ., Temir, T., & Doğan, C. (2018). Issues in pre-service and in-service teacher training programs for university English instructors in Turkey. *Journal of Language and Linguistic Studies, 14*(2), 48-60.

Bayrakçı, M. (2009). In-service teacher training in Japan and Turkey: A comparative analysis of institutions and practices, *Australian Journal of Teacher Education, 34*, 10-22.

Bax, S. (1997). Roles for a teacher educator in context-sensitive teacher education. ELT Journal, 51(3), 232-241.

Burns, A., & Richards, J. C. (Eds.). (2009). *The Cambridge guide to second language teacher education*. NY: Cambridge University Press.

Concannon-Gibney, T. & McCarthy, M. J. (2012). The explicit teaching of reading comprehension in science class: a pilot professional development program. *Improving schools, 15*(1), 73–88.

Çimer, S. O., Çakır, I., & Çimer, A. (2010). Teachers' views on the effectiveness of in-service courses on the new curriculum in Turkey. *European Journal of Teacher Education, 33*(1), 31–41.

Daloğlu, A. (2004). A professional development program for primary school English language teachers in Turkey: Designing a materials bank. *International Journal of Educational Development, 24*, 677-690.

Ellis, R. (2010). Second language acquisition, teacher education and language pedagogy. *Language teaching, 43*(2), 182–201.

Elyas, T., & Al Grigri, W. H. (2014). Obstacles to teaching English in Saudi Arabia public schools: Teachers' and supervisors' perceptions. *International Journal of Language Teaching, 2*(3), 74-89.

Emery, H. (2012). A global study of primary English teachers' qualifications, training and career development. (ELT Research Paper No.12-08). British Council. Retrieved from https://www.teachingenglish.org.uk/sites/teacheng/files/B487_ELTRP_Emery_ResearchPaper_FINAL_web_V2.pdf

Fullan, M. (1995). The limits and the potential of professional development in education. In T. R. Guskey & M. Huberman (Eds.). *Professional development in education: New paradigms & practices* (pp. 253-268). New York: Teachers College Press.

Fullan, M. (2001). *The new meaning of educational change.* NY: Teachers College Press.

Garet, M., Porter, A. C., Desimone, L., Birman B. F., & Yoon K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, (38)*4, 915–45.

Gibbs, G., & Coffey, M. (2004). The impact of training of university teachers on their teaching skills, their approach to teaching and the approach to learning of their students. *Active Learning in Higher Education, 5*(1), 87–100.

Gökmenoğlu, T. K. (2012). *Teachers' reports of their in-service training needs and design preferences*. (Unpublished doctoral dissertation). Middle East Technical University, Ankara, Turkey.

Grieve, A. M., & McGinley, B.P. (2010). Enhancing professionalism? Teachers' voices on continuing professional development in Scotland. *Teaching Education, 21*(2), 171–184.

Guskey, T. R. (2003). What makes professional development effective? *Phi Delta Kappan, (84)*10, 748–50.

Guskey, T. R., & Yoon, K. S. (2009). What works in professional development? *Phi Delta Kappan, (90)*7, 495–500.

Hamid, O. (2010). Globalization, English for everyone and English teacher capacity: language policy discourses and realities in Bangladesh. *Current Issues in Language Planning, 11*(4), 289–310.

Hayes, D. (1995). In-service teacher development: Some basic principles. *ELT Journal, 49(*3), 252–61.

Hayes, D. (2000). Cascade training and teachers' professional development. *ELT Journal, 54*(2), 135–45.

Howell, G. F. & Buck, J. M. (2012). The adult student and course satisfaction: What matters most? *Innovative higher education, 37*(3), 215–226.

Hustler, D., McNamara, O., Jarvis, J., Londra, M., & Campbell, A. (2003). Teachers' perceptions of continuing professional development (Department of Education and Skills, Research Report No. 429). Retrieved from http://dera.ioe.ac.uk/4754/1/16385164-58c6-4f97-b85b-2186b83ede8c.pdf

Hockly, N. (2000). Modeling and 'cognitive apprenticeship' in teacher education. *ELT Journal, 54*(2), 118-125.

John, P. D. & Gravani, M. N. (2005). Evaluating a 'new' in-service professional development programme in Greece: The experiences of tutors and teachers. *Journal of In-service Education, 31*(1), 105-125.

Joyce, B. R., & Showers, B. (1980). Improving in-service training. *Educational leadership, 37*(5), 379–385.

Joyce, B. R., & Showers, B. (2002). *Designing training and peer coaching: Our needs for learning*. VA, USA: ASCD.

Kiely, R. & Davis, M. (2010). From transmission to transformation: Teacher learning in English for speakers of other languages. *Language teaching research, 14*(3), 277–295.

Kennedy, M. (2016). How does professional development improve teaching? *Review of Educational Research, 86*(4), 945–80.

Koç, E. M. (2016). A general investigation of the in-service training of English language teachers at elementary schools in Turkey. *International Electronic Journal of Elementary Education*, *8*(3), 455–466. Retrieved from https://files.eric.ed.gov/fulltext/EJ1096582.pdf

Küçüksüleymanoğlu, R. (2006). In service training of ELT teachers in Turkey between 1998-2005. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 19*(2), 359-369.

Mede, E., & Işık, M. (2016). The needs of primary English teachers for an in- service teacher training program. *Turkish Online Journal of Qualitative Inquiry (TOJQI), 7*(2), 1-30.

Öztürk, G., & Aydın, B. (2019). English Language Teacher Education in Turkey: Why Do We Fail and What Policy Reforms Are Needed? *Anadolu Journal of Educational Sciences International, 9*(1), 181-213.

Paine, L. W. & Fang, Y. P. (2006). Reform as hybrid model of teaching and teacher development in China. *International journal of educational research, 45*(4–5), 279–289.

Rajabi, P., Kiany, G. R., & Maftoon, P. (2012). ESP in-service teacher training programs: Do they change Iranian teachers' beliefs, classroom practices and students' achievements? *Ibérica, 24*, 261-282.

Richards, J. C., & Farrell, T. S. C. (2005). *Professional development for language teachers.* New York, NY: Cambridge University Press.

Saiti, A., & Saitis, C. (2006). In-service training for teachers who work in full-day schools –evidence from Greece. *European Journal of Teacher Education, 29*(4), 455–470.

Sandholtz, J. H. (2002). In-service training or professional development: Contrasting opportunities in a school /university partnership. *Teaching and Teacher Education, 18*, 815-830.

Sokel, F. (2019). The effectiveness of a professional development course: teachers' perceptions. *ELT Journal, 73(*4), 409–418.

Uysal, H. H. (2012). Evaluation of an in-service training program for primary-school language teachers in Turkey. *Australian Journal of Teacher Education, 37*(7). Retrieved from http://ro.ecu.edu.au/ajte/vol37/iss7/2

Uztosun, M. S. (2018). In-service teacher education in Turkey: English language teachers' perspectives. *Professional Development in Education, 44*(4), 557-569, Doi: 10.1080/19415257.2017.1374989

Vukelich, C., & Wrenn, L. C. (1999). Quality professional development: What do we think we know? Childhood Education, 75(3), 153-160.

Wallace, M. (1991). *Training foreign language teachers: A reflective Approach*. Cambridge: Cambridge University Press.

Waters, A. (2006). Facilitating follow-up in ELT INSET. *Language Teaching Research, 10*(1), 32-52.

Waters, A. & Vilches, M. L. C. (2000). Integrating teacher learning: the school-based follow up development activity. *ELT Journal, 54*(2), 126-134.

Wedell, M. (2011). More than just 'technology': English language teaching initiatives as complex educational changes. In H. Coleman (Ed). *Dreams and realities: Developing countries and the English language*. London: British Council, 213–234.

Wolter, B. (2000). A participant-centered approach to INSET course design. *ELT Journal, 54*(4), 311-318.

Yan, C. (2005). INSET participation and certification: A case study from China. *Journal of In-Service Education, 31*(3), 471-484.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	EFL Teachers' Views and Needs on In-service Training as a Part of Professional Development: A Case Study in Turkish Context
Discipline	English Language Teaching
Type of Article	Research Article
Year of Data Collection	October 2018 – August 2019

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that **the quantitative data was collected between the dates October 2018 – June 2019, and focus group interviews were conducted in August 2019**.

Date: 07 May 2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Independent Researcher	Dr.	Okan ÖNALAN	
2.	Bursa Uludağ University	Prof.Dr.	Esim GÜRSOY	
3.				

Correspondent Author's Info

Institute	Independent Researcher (Dr. Okan ÖNALAN)
Postal address	Aşağı Dikmen Mah.588. Sokak No:8/5 Çankaya - ANKARA
E-mail	okanonalan@gmail.com
Phone	00905326777909

Güler, E. (2020). Visual culture-based workshop: visual diaries. *Bartın University Journal of Faculty of Education*, 9(2), 388-406.

Bartın University Journal of Faculty of Education, 9(2), 388-406

buefad.bartin.edu.tr

Visual Culture-Based Workshop: Visual Diaries

Ebru GÜLER*[a]

Article Info

DOI: 10.14686/buefad.624538

Article History:
Received: 25.09.2019
Accepted: 23.05.2020
Published: 05.06.2020

Keywords:
Visual culture,
Visual diary,
Workshop studies.

Article Type:
Research Article

Abstract

Images have become popular via advertisements, video games, fine arts, television, series, movies and other types of images. These images that we see around us our for whole life comprise a great proportion of visual culture. With a visual culture-based workshop, the students would acquire skills to make sense of and interpret what they see with artistic and aesthetic concerns in the workshop studies. In this respect, the students created visual diaries, in which they could reflect/question the experiences they acquire about their daily lives, and with which they could express themselves. The study adopted an art-based qualitative research approach. The study had been conducted in the fall and spring semesters of 2016-2017 academic year in the art drawing workshop course. The participants of the study were comprised of 7 students. The data of this study were collected using semi-structured interviews, document review (on visual diaries) and the art works of the student1s. The data of the study were analyzed using descriptive analysis. When the findings of the study are considered, it is seen that questionings about daily life, course notes, visual and textual interpretations, sense-making processes, and expression styles (sketch, drawing etc.) about their artistic work were included in students' visual diary experiences in the workshop course. They visually reflected many things they notice around themselves and supported this with texts.

Görsel Kültür Temelli Atölye Uygulaması: Görsel Günlükler

Makale Bilgisi

DOI: 10.14686/buefad.624538

Makale Geçmişi:
Geliş: 25.09.2019
Kabul: 23.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Görsel kültür,
Görsel günlük,
Atölye uygulamaları.

Makale Türü:
Araştırma Makalesi

Öz

İmgeler reklam, video oyunları, güzel sanatlar, televizyon, dizi, filmler ve diğer görüntü türleri aracılığıyla giderek yaygınlaşmaktadır. Yaşamımız boyunca etrafımızda gördüğümüz bu görüntüler görsel kültürün çoğunu oluşturmaktadır. Görsel kültür temelli bir atölye uygulaması ile öğrenciler atölye çalışmalarında sanat ve estetik kaygısı ile gördüklerini anlamlandırma, yorumlama becerileri de kazanmış olacaklardır. Bu bağlamda araştırmada, öğrenciler günlük hayatlarına ilişkin edindikleri deneyimleri yansıtabilecekleri/sorgulayabilecekleri ve kendilerini ifade edebilecekleri görsel günlükler oluşturmuşlardır. Araştırmada sanat temelli nitel araştırma yaklaşımı benimsenmiştir. Araştırma süreci, 2016-2017 güz ve bahar döneminde resim anasanat atölye dersinde uygulanmıştır. Araştırma katılımcılarını 7 öğrenci oluşturmaktadır. Araştırmada veri toplama aracı olarak, yarı-yapılandırılmış görüşme, doküman inceleme (Görsel Günlükler) ve öğrencilerin sanatsal çalışmaları kullanılmıştır. Araştırmada veriler betimsel analiz ile çözümlenmiştir. Araştırma bulgularına bakıldığında, öğrencilerin atölye uygulaması dersinde görsel günlük deneyimlerinde günlük hayata dair sorgulamaları, ders notları, görsel ve metinsel yorumlamaları, anlam yaratım süreçleri, sanatsal çalışmaları ile ilgili ifade biçimleri (eskizler, desenler, çizimler vb.) yer almıştır. Öğrenciler, çevrelerinde fark ettikleri birçok şeyi görsel olarak yansıtmışlar ve bunu ise metinlerle desteklemişlerdir.

***Corresponding Author:** ebru.guler@erzincan.edu.tr
[a] Dr. Lecturer, Erzincan Binali Yıldırım University, Erzincan/Turkey, https://orcid.org/0000-0003-1149-6489.

Introduction

In today's world, where rapid changes take place, developments in science and technology are so rapid that the existing body of knowledge are in a constant change and transformation. This necessitates change in numerous areas. These changes and developments increased individual's need for information and uncovered the importance of education. It became prominent that enabling students with synthesis skills while instructing them is more important than memorized knowledge. In this respect, visual arts training has an important place in education, which aims at raising generations that are creative, who could think, question, synthesize, transform the acquired information to skills. Performing different applications with teaching methods and techniques, and diversifying educational environment are required to keep learning experience vivid in fine arts training (Genç & Buyurgan, 2018, p. 691). In this context, visual culture applications become prominent in fine arts education workshops. Many studies show the necessity and importance to include visual culture practices in visual arts education (Anderson, 2004; Helser, 2004; Barker, 2010; Burger, 2011; Türkcan and Yaşar, 2011; Yükselgün and Türkcan, 2012; Mamur, 2015; Çığır, 2016; Shin, 2016; Gil-Glazer, 2017; Güler and Bedir Erişti, 2019; Yılmaz, Yılmaz and Demir Yılmaz, 2019). These studies reveal that visual art practices allow for a conscious and critical perspective on the visual perception of students, teach them how to analyse images, urge them to reflect on social and current issues, enable them to acquire visual communication skills and discrimination skills, improve their thinking skills and have a significant impact on their beliefs and identity perceptions.

Visual culture covers a vast area that includes television, sculpture, photographs, movies, oil paintings, gardens, buildings, artisan works, toys, advertisements, jewelry, maps, graphics, web sites, cityscapes and such. Thus, visual culture is a human experience that is increasingly visual and visualized than ever before and it is extremely comprehensive (Mirzoeff, 2002). According to Duncum (2002), meaning is produced, in today's world, in interaction with facts such as visual spaces, visual and popular objects, music, sound effects, pictures, etc. The active power of visual images has increased with the development of technology in addition to words and subsidiary elements (other pictures). While content, color, light, script and spatial elements are important in static images, scene, montage and sound elements are used in reinforcing the meaning of the image. In order to make sense of the image, it has to be given meaning culturally via certain codes. Post-modernism evaluates art and art education as one of the important instruments in development and diffusion of culture. Visual arts education, in which visual images are used greatly, is more advantageous than other disciplines for visual culture studies (Bolin & Blandy, 2003, p. 247; as cited in Mamur, 2012, 2152). Approaches have been proposed for especially arts lessons to take part in creating, spreading and adopting visual culture. Therefore, it becomes significant that arts education processes be structured as to include cultural context (Duncum, 2000). According to Freedman (2003), visual culture studies are required for the students to understand the world they live in. The students should be ensured to analyze visual culture and the media it presents via criticism.

The students should be trained towards being acquainted with visual culture, and knowing, evaluating and solving its effects on their cultural identities (Kırışoğlu, 2009, p. 46). Culture that is based on visuality has increased since modernization period and takes hold of all aspects of life, especially the daily life. Humans can communicate in written, spoken and visual ways and all these forms permeate into cultures and art. Thus, humans, who had subsisted in a communicative environment driven by oral culture only, has entered into a widespread visual culture with the invention of writing, and especially with the spread of drawings, pictures and visual expressions. In this way, the visual aspect of the communication process has increased and progressed down the ages (Çakır, 2014, p. 21). According to Rogoff (1998), the analytic and critical approach of visual culture studies could be constructed on the meaning of the thing that is visible, invisible or not permitted to be seen. In other words, the body of investigation could be constructed around the concept of "seeing". Critical, historical, political and reflexive performance of art and thinking of art have gained importance in arts education (Duncum, 1999). Activities are being planned related to visual images that we encounter constantly in daily life. Arts courses, on the other hand, include research and applications, in which daily images produced by today's corporate firms (Duncum, 2003).

Many images today have the power to change the perspective of individuals. An important part of art education is making sense of images and questioning the context they are in. In this way, students should be competent in using their visual images to create their own ideas and in questioning the visual images they see. Visual arts approach is a teaching area in art education offering students the necessary environment to prepare for the world of images. Memory and extensions appear to be significant in a visual cultural environment. As visual culture allows a critical inquiry based on a sociocultural perspective, it leads students through an active learning process

during the teaching process. In this sense, visual culture seeks to analyse interdisciplinary connections and complex processes regarding visuality through personal and cultural extensions (Freedman, 2015; as cited in Bedir Erişti, 2020). Thus, art students can examine visuals, reflect on their cultural or social meanings and analyse complex connections in everyday life thanks to visual diary practices in art education courses based on visual culture. According to Blighe (2008), visual diaries facilitate the management and organisation of images constructed, enable one to acquire the skill to organize numerous images easily, establish new connection between images and improve design skills. Moreover, image analysis is also instrumental for design applications and evaluation. In the relevant literature, Blighe & O'Connor (2008) aimed to design a visual diary that consists of personal image collections taken via a passive capture device. To perform setting detection, they developed an algorithm to visualize human experiences through the images taken at the same location in the real world (e.g. in the dining room, in front of the computer, in the park). Thus, they categorized the visuals of human experiences and offered a prototype of a visual diary scanner. Watson (2012) analysed visual diary as prosthetic practice based on the diary drawings of the performance artist Bobby Baker. In her study titled "My Visual Diary", Chaplin (2004), a visual sociologist, kept a diary to record 15 years of her life to explore different ideas. Chaplin argued that she examined her commitment to art practice, sociological understanding and feminism as a participant and as an outsider to some extent thanks to her visual diary project. She not only drew attention to important issues for social sciences, but also pioneered the theory of art, photography and social sciences. This visual diary gave Chaplin a "sociological perspective" in making sense of plastic arts and performing arts as well as visual art practices. In the context of art education, Noor (2004) investigated the use of visual diaries in secondary school art education and examined the relationship between the perception towards and use of visual diaries among teachers, and the perception towards and experiences on visual diaries among students. It was found that students had the opportunity to reflect many images in their everyday life and created a meaning pattern in their visual diaries. The study also revealed that the perception towards and use of visual diaries among teachers had an impact on the perception towards and experiences on visual diaries among students, but teachers failed to benefit from the full potential of visual diaries. Razıf (2015) utilized visual diaries to teach art history and culture about the Mah Meri tribe in arts course and demonstrated that art students understood and experienced art history in more easily thanks to visual diaries. The study used visual diaries as an effective tool for students to understand art history and culture in visual arts education. All these studies show that art education based on visual arts offers a visual space that helps students to reflect and question their everyday experiences and to express themselves. In this respect, the aim of this study is to reveal, with a visual culture-based workshop application, how students were influenced by the daily images they encountered in their daily lives, and what kind of a visual field they created from the images that influenced the students. For this purpose, visual diaries were used to equip the students with meaning making and interpretation skills on what they see with an artistic and aesthetic concern. Answers to the following questions were sought regarding the aim of the study:

1. What are the opinions of the students about their visual diary experiences in the context of visual culture?
2. For what purpose did the students use their visual diaries in the context of visual culture?
3. What did the students reflected in their visual diary experience, regarding visual culture?

Visual Culture and Visual Diaries

Most people keep diaries to help them remember the important aspects of their daily lives. Through diaries, people remember how they felt at a certain place and time. A typical diary is made up of a series of images such as visual images, digital photos, correspondence and texts. It offers a visual summary of an individual's life (Blighe & O'Connor, 2008, p. 195). A visual diary usually refers to a collection of visual references created and compiled by an artist or person interested in arts. Visual diaries consist of photographs and works that belong to artists (Chaplin, 1994). Visual diaries are an ensemble of visual references created or compiled by an artist or a person interested in arts. They may be comprised of notes, diagrams, collages, photos, images and drawings. A visual diary comprising of these images could contain any number of materials compiled either in a series of books or in a file. Visual diaries, along with other creative practitioners, could create an impressive form, when visual material is at stake. Physically, it can function as a sketchbook at times, a scratchpad or a blackboard to stick photos, postcards, brochure and other pieces and sticks attracting attention.

"Keeping diaries is an instrument for reminding/remembering many artists, researchers and teachers resort and a rich source for teaching/learning. The diary could help to reveal the organic nature of progress. Most of the research processes could be defined, drawn, reflected, analyzed in the diary and be used in courses" (Hobson,

1996; as cited in Güneş, 2018:46). The purpose of visual diaries is generally finding the inspiring examples of art and design practices, enhancing further the various visual forms, and defining things that attract interest of people as a reflecting instrument. We use visual images/signs in meaning making of and analyzing the thing we experience in our daily lives. We do not give up on looking at things and we comment on them. In this sense making process, we begin to develop many ideas, which we could not notice when we transfer them visually or textually, by collages or a series of images.

Visual diaries include a subjective projection. They can be used in projections about the observations and participations of the medium by the researchers, as they can be used in personal projections; in addition, they can be used to project the cultural understanding about the research and the cultural understanding of people other than the researcher (Mason & Cruickshank, 2017, p. 187). Keeping a visual diary helps to acquire, daily, the instantaneous visual experience via visual material and texts. Extracting something from a journal and pasting it onto the diary is a minor process; however, it can help making the visual knowledge consumption less passive. Creating a daily visual experience from the flow of information, to which we are exposed, and transferring a piece of visual communication speed up our sight and thought. Thus, it helps the decoding of the visual messages and noticing patterns and predispositions.

Image 1. Leonardo da Vinci, Sketchbook

When we consider history of art, we see that famous artists such as Leonardo da Vinci, Frida Kahlo, Vincent van Gogh, created detailed visual diaries for their thoughts and progress. Visual diaries are used today as they did in the past. Especially, implementations are being conducted in institutions delivering visual arts education. However, this is limited to drawings only. But, visual diaries have outcomes, from many respects, for students receiving visual arts education. We can list these outcomes as below:

- Visual diaries allow for the sustainability of creativity and the improvement of the creative process.
- Visual diaries elaborate on the thoughts and processes of art students. This is why a personal diary is of importance.
- Students can advance their creative skills by documenting their progress in a diary. Also, visual diaries play a great role in developing students' creative skills and self-expression.
- Ideas in a visual diary offer a catharsis to record personal observations.
- Visual diaries provide individuals with their own personal workplace.
- They enable individuals to talk to themselves regularly.
- The things reflected in the visual diaries by the students bear traces of visual culture era experienced by the students.
- Visual diaries enable students to make sense of every images around them and to make inferences.
- Visual diaries enable the knowledge acquired by the students to be permanent and help them to establish links between different disciplines (Kennedy, 2019).

Method

Research Model

The art-based qualitative research method is adopted in the study. Art-based research in education provide answer to the questions how the researchers would use art in the classroom, how participants would use art and how researchers in an education study would use a poem, a picture or artistic performances. Art-based research mentions many ways art enters into instruction, research and artistic realm (Cahnmann-Taylor & Siegesmund, 2008, p.12). In this context, in art-based research method, a systematic analysis of expression styles in different disciplines of art is conducted (Mcniff, 2007). In art-based research approach, a qualitative research method, the artistic products of the students are conducted and the perceptions in their internal worlds, life experiences and their opinion on these are revealed. Art-based research is a design that relates research with narratives realized by art or design processes in scientific research (Denzin & Lincoln, 2005 as cited in Erişti, 2012).

Participants

The participants of the study were 7 female students, who voluntarily took part in this study out of 29 second-year students attending the course of art workshop in the 2016-2017 fall and spring terms and who continued keeping a visual diary in the 2017-2018 academic year. In this study, each student was identified with a code.

Data collection tools

The data of this study were collected using semi-structured interviews, document review (on visual diaries) and the art works of the students.

Data collection

The semi-structured interview questions were first formed by the researcher and then reviewed by a field expert. The students were asked about their experiences of keeping a diary in the course of art workshop in the interviews. Each student was interviewed twice a week apart. The semi-structured interview questions were asked by the researcher. Each student was individually and face-to-face interviewed, with the average interview duration being 15 minutes. The interviews were audio-recorded.

The visual diaries kept by the students across the fall and spring terms were textually and visually analysed as part of the document review.

The projects performed by the students in the course of art workshop in the 2017-2018 academic year based on the visuals and texts in their visual diaries as well as the artistic works they created were also used as data source.

Data Analysis

Descriptive analysis is a qualitative analysis method that include the summarization of data, obtained via various data collection techniques according to previously determined themes. In this analysis method, the researcher uses direct quotations to reflect the opinions of the individuals dramatically, who participated in the interviews or were observed by the researchers. The main objective in this analysis type is the presentation of the findings in a summarized and interpreted fashion. Descriptive analysis is realized in four stages (Yıldırım and Şimşek, 2008, s.224). In the first stage, the participant code list was created with regard to the theoretical framework. The researcher and an expert in the discipline (art instructor) read and encoded the data independently. Later, these codes were compared and common codes were determined. The findings were interpreted by including direct quotations about the themes found. For the reliability of the study the Reliability = unanimity / unanimity + dissensus x 100 formula was used (Miles & Huberman, 2015, p.64). Accordingly, the interrater consistency was found 80%.

Research Ethics

The participants were all informed and signed voluntary participation forms prior to the study. This study was performed with only those who were willing to participate and presented their journals. The researcher conducted this study with the consent of the participants for the use of the images in their journals. In the data collection

process, the interviews were recorded and shared with the participants to ensure transparency. The participants were also identified with codes for confidentiality purposes.

Findings

The opinions on the visual diary experience under visual culture were classified into three categories as “Visual Document Creation in Visual Diary Experience”, “Meaning Creation Process in Visual Diary Experience”, and “Meaning Making in Visual Diary Experience”.

Finding about Visual Document Creation in Visual Diary Experience

In this section findings about the question “What are the opinions of the students about their visual diary experiences in the context of visual culture?”, the first sub-aim of the study, are discussed.

Table 1. Visual Document Creation in Visual Diary Experience

Documenting the image
Retroactive acquisition of knowledge
Creating an archive
Portfolio
Visual experience
Self-evaluation
Self-expression

Image 2. Gülten’s Visual D.

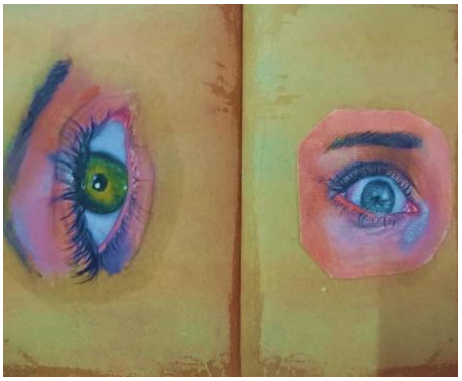


Image 3. Burcu’s Visual D.

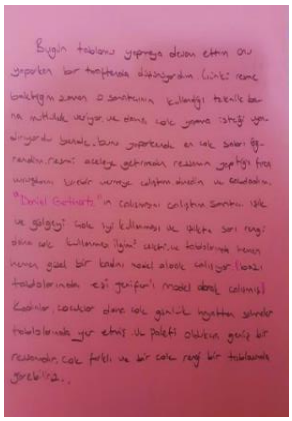


Image 4. Gülten’s Visual D.

The students projected all works they created in the art painting workshop as in seen in images in 2 to 7. They wrote texts by adding the reproductions they created, patterns, drawings, the artists they searched for and the image of the subjects.

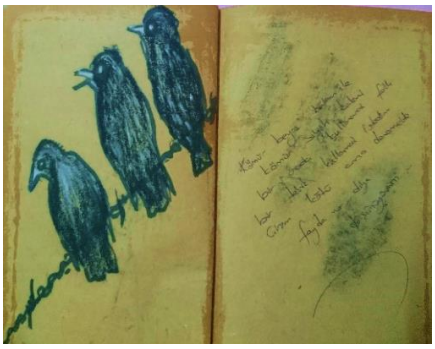


Image 5. Burcu's Visual D.

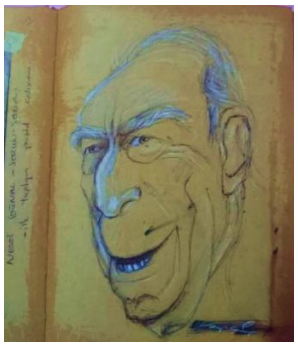


Image 6. Burcu's Visual D.

Image 7. Burcu's Visual D.

In the retroactive acquisition of knowledge theme, Gülten stated that *"I gained experience with visual diary. When I turn to past and look, it would provide knowledge about the pictures I painted and sketches I drew.".*

Gülten also mentioned, what she had learned, in her diary as follows: *"I continued my painting… I made a reproduction of Daniel Gertharz's work. It intrigued me how he used the light and shadow, and he used yellow more in painting the light. He generally prefers female models in his paintings. In some paintings he used his wife Jennifer as a model…"* (See. Image 3).

In the archive building sub-theme, Elif stated that *"Indeed, I have archived my painting studies by keeping visual diary …".*

In the portfolio sub-theme, Esra said that *"…In my opinion, visual diaries have the value of portfolios. Now, there is a new aspect that I could show to my students during teaching.".*

In visual experience sub-theme, Nur stated, *"It was a good experience, especially I gained a visual experience. It was not like the diaries we kept in high school".*

In self-expression sub-theme, Burcu stated *"I could project my thought easily by keeping a visual diary. I had lack of self-confidence. I had problems in making presentations in the class. I could express myself more by writing or drawing a visual diary."* In addition, Burcu created a voice of conscience by writing the following under a drawing in her diary: *"With the aim of emphasizing and progressing further."* (See. Image 6).

In self-evaluation sub-theme, Burcu said *"I had the chance to question myself and evaluate my works."* In addition, she evaluated her works by writing in her diary "*I wished to try a different technique by mixing charcoal and white pen. The drawing is not so good but it is worth trying*" (See. Image 4).

Findings Related to Meaning Creation Process in Visual Diary Experience

Table 2 contains the findings about the second and third sub-aim of the study "*For what purpose did the students use their visual diaries in the context of visual culture?* and *"What did the students projected in their visual diary experiences regarding visual culture?".*

Table 2. Meaning Creation Process in Visual Diary Experience

Creating visual field
Monitoring the creation process
Understanding terms and concepts.
Establishing linear and literary links
Establishing links with social life

Elif, in her view about creating visual field, stated "*I gained visual experience… keeping a diary in the visual field enabled me to visually record what I see".* (See Images 8-9). Nur, on the other hand, said that she could see

the chronologic progress of her work by saying *"I saw how my works improved".* Hilal mentioned that she could evaluate workshop practices with the view "*I could evaluate the workshop practices*".

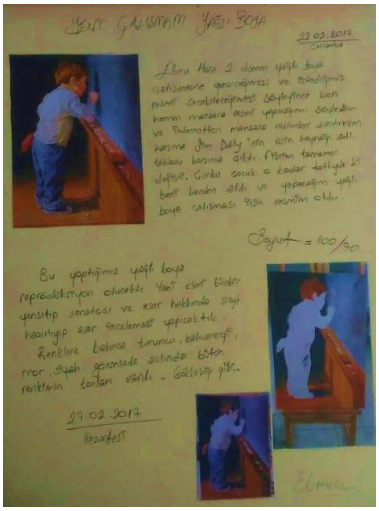


Image 8. Elif's Visual D.

Image 9. Elif's 's Visual D.

Elif mentioned, in her diary, how she started her work and what she thinks of her work.

"When I was searching for landscape paintings on the internet, I ran into Jim Daly's painting named inspiration. My thoughts completely changed. This would be an oil reproduction. In other words, we would project the work exactly and prepare a presentation about the artist and the work, and we would conduct an investigation. At the first semester of the second year, we were working with acrylic. The painting we would paint would be a photo we have taken. One day, when I was returning home from school, a dried leaf on the lawn attracted my attention. I bent down and took the photo and accidentally found leaf has become my acrylic work. I have drawn 10 sketches of this work in different color, and thus I analyzed my study…".

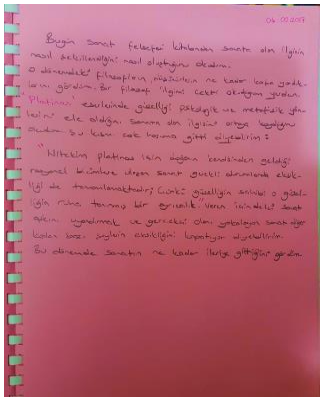


Image 10. Gülten's Visual D.

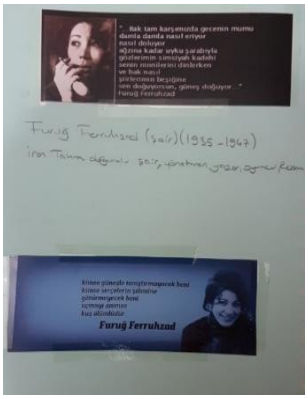


Image 11. Gülten's Visual D.

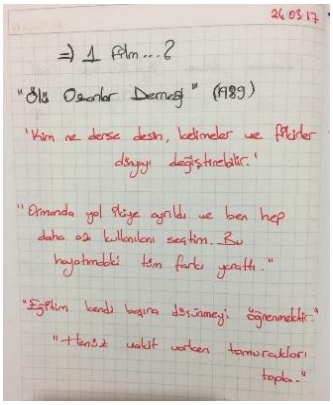


Image 12. Esra's Visual D.

In the creation process sub-theme, Esra transferred the words and images she encountered during the day and supporting the creation process by saying "*I could see my creation process… I created a free space for myself, in which I could express everything…",* Gülten, on the other hand, mentioned "*I explained my creation process… I projected what I thought that day…".*

Gülten wrote the following in her diary: *"Today, I read how the interest in art is formed, created in the Art Philosophy book… It tells that Plotinos touched upon the psychological and metaphysical aspects of beauty in his works, and revealed the interest in art… I liked the following part very much: Indeed the art, which has access to the rational forms, from which the nature comes, completes the defects of the beauty; because I could say that awakening the love for art inside and art that grasps what is real cover the defects of other things as it is a privileged bestowed upon the owner of the"(See. Image 10).*

In a similar fashion, Esra projected part of a movie she watched as follows: "*1989… Dead Poets' Society" … No matter what they say, words and ideas could change the world… The road in the forest splits into two and I have chosen the least used one. This has created all the difference in my life. Education is learning how to think on your own. Pick the buds when there is still time."* When we read the sentences Elif quoted in her diary we see that she is impressed by the movie and she wrote down sentences about change. Here we see the reflection of a movie recommended in the art painting department workshop in a student's diary (See. Image 12).

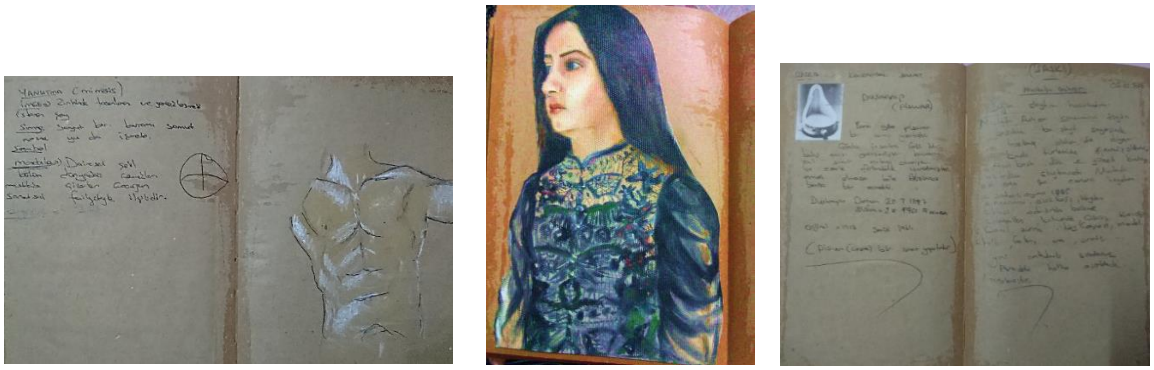


Image 13. Pages from Burcu's Diary

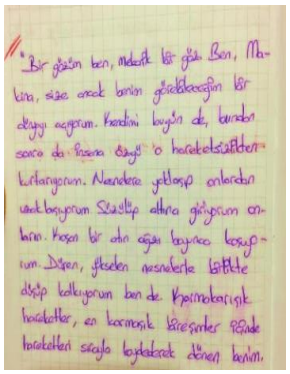


Image 14. Esra's Visual D.

In the understanding terms and concepts sub-theme, Esra wrote "*I wrote down the words and concepts I learned…"*. She also included in her diary a section of John Berger's "Ways of Seeing" book, which affected her in her own words. She projected the following in her diary: "*I am an eye, a mechanical eye. I, the machine, open to you only the world I could see. From now on, I free myself from the immobility specific to humans. I glide under those. I run along the mouth of a running horse. I fall and get up with the object falling down and rising. I am the one that turns losing the moves in the most complex moves, the most complex combinations, I, the machine."*.

Similarly, Burcu mentioned that she wrote the words and concepts she learned by saying "*I noted the words and concepts that are important for me…"*. She wrote in her diary "*Conceptual Art… In my opinion a urinal is a*

work of art, because it has brought a different perspective to humans. It revealed the conceptual art." She also wrote the words related to art she learned in the courses with their definitions. "*Projection (Mimesis), Image, Sign, Symbol, Mandala…"* (See Image 13). It is seen that students' use of visual diaries was not limited to the art painting workshop, and they used their diaries in other courses such as art philosophy, special teaching methods, and sculpture.

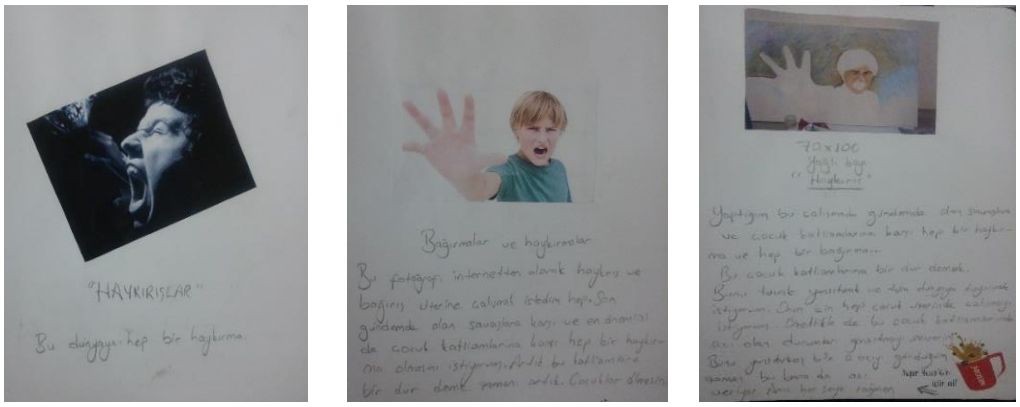


Image 15. Pages from Hilal's Visual Diary

In the establishing linear and literary links sub-theme Hilal wrote "*I established a link between what I drew and what I wrote… I combined visual with my poem notebook. I used words such as stop, scream in my drawings."* She frequently included the poems she quoted and the books she read in her visual diary. She also projected how she started a new work by getting affected by the images she encountered in daily life. The following expressions in Hilal's diary shows how visual diaries shape and support the creation processes of the students: "*This work I have completed is all a scream and shouting against the wars and child massacres that remained on the agenda… saying stop to these child massacres… I want to project this on the canvas and proclaim it to all the world. Thus, I think to work about children, all the time…".*

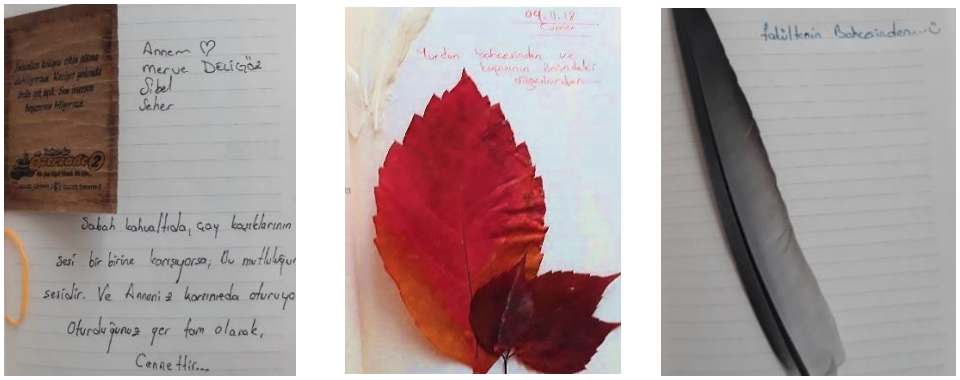


Image 16 (a, b, c). Pages from Nur's Visual Diary

In the establishing links with social life sub-theme Nur's views are as follows: "*I added the things I encountered in my daily life.*" Similarly, Ayşe wrote "*I could write my instant feelings during the day."* The students reflected their experiences and moments in their daily lives and they made their moments and instant emotions permanent. Elif wrote the following in her diary:

"My mother…Merve Deligöz, Sibel, Sugar…If the sound of the teaspoons jumbles into one at the breakfast, then it is the sound of happiness. And if your mother sits across you, it is exactly heaven where you sit…" (Image 16a), "From the garden of the dormitory and from the trees in front of the gate" (Image 16b), "From the Garden of the

Faculty…" (Image 16c). When we look at the objects Nur stuck in her diary, we see that these bear great meanings for her. A dry leaf, feather of a bird, a coffee reading from a fortune-teller café, all of these tells about the events she lived in a day and gives clues about her.

Findings about Meaning Making in Visual Diary Experience

Table 3 presents the findings about the question "What did the students reflected in their visual diary experience, regarding visual culture?", which is the third sub-aim of the study.

Table 3. Meaning Making in Visual Diary Experience

Intersemiosis
• Image-text relation
Reading images
• Interpreting images

Student views about the intersemiosis sub-theme are as follows:

Elif wrote: *"I established links between the books I read and the images I saw and I combined them."* Gülten commented "*I projected what I learned from the workshop in my drawings by writing notes from the movies I watched and book I read.".* Esra, on the other hand, wrote *"In the process, I did not confine myself to taking photos, but I wrote my opinions about these…".*

Image 17 (a, b). Pages from Esra's Visual Diary

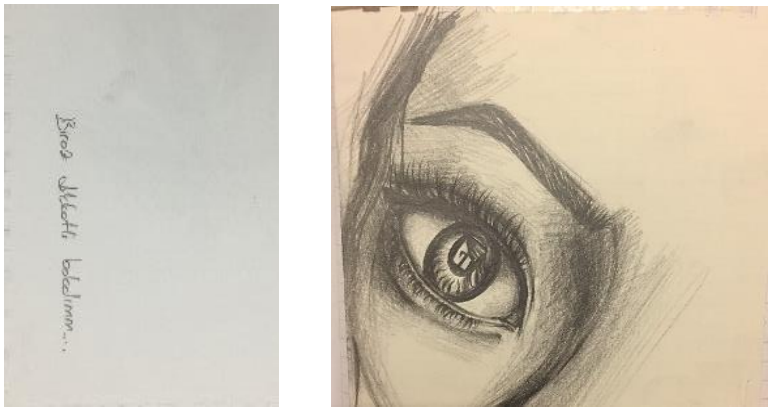


Image 18 (a, b). Pages from Esra's Visual Diary

In the four diary pages above by Esra, it is seen how she established links between images and texts. In image 17a, she wrote "*Why does the ideal woman image disrupt?"* below the woman figure she drew. In the second page (17b) she covered her drawing with a blank page and wrote "*Like loneliness originating from an alienation or like a man's figure becoming isolated in the eyes of the woman figure… a figure in the place of that eye… a loneliness that is noticed when paid attention… -Window."* In the third picture, the following is written on top of the image "*Let's look carefully…"* And finally in the fourth page (18b) she drew a window in the eye and she told about loneliness. Esra created her own construct in the art painting workshop, setting off from these sketches and thoughts, and created new meanings.

Image 19. Burcu's Visual Diary

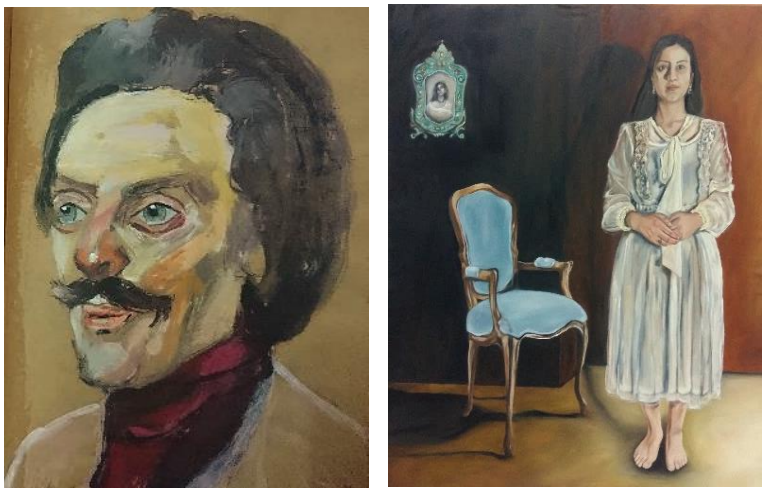


Image 20. A page from Burcu's Visual Diary and an Art Painting Workshop Study

Burcu mentions the artist she was influenced from by saying *"… I am impressed by Neşet Günal's paintings. I transferred the aspects I am impressed to my works, in color and in form."*. The effect of the artists she was influenced from is seen in the work she completed in the last year of her education.

Image 21 (a, b). Pages from Nur's Visual Diary

Image 22(c, d, e). Pages from Nur's Visual Diary

In the Reading images sub-theme students' views are as follows: Elif mentioned "*I tried to project my own works. For meaning making… I projected the difference between to look and to see in my diary."* Hilal wrote "*I was affected by the news, and I projected this."*. It is seen in the drawings and collages by the students that they were influenced by the images they saw around and they were not indifferent to these. Nur stated that she attributed meanings to images and created a story when she built the construct her painting by saying "*I transferred what I learned through the day. I did not look from the visual perspective only, I thought about the things I drew, I felt them."*.

When we look at the quotations in five pages of Nur's diary, we see that in 21a there is a collage she made from newspaper sheets. In the following page in 21b she added the news titled "*40 years of an artist"* into her diary. In image 22c, she explained how she interpreted a strand of hair that randomly fell on a sheet of paper during the course. *"I suppose art requires this or a person with an artistic soul is stuck to thing like this. I saw a stand of hair that fell on my notes, while I was studying for the art philosophy exam, as an abstract human figure and I drew it instantly page."* In other pages, there are sketches explaining how she created one of her constructs. Each of these sketches has explanations. In Image 22d, she wrote "*I have done the original of the sketch symbolizing fertility when I was in high school, but I couldn't find it. I wanted to work on this in the abstract human figure. It could be an oil painting; in which I would use opposite colors."* And in Image 22e, she wrote "*Let it be a gate to eternity…"* When we look at the visual diary of the student, it is seen how she created meanings from a tiny line, how she interpreted images and how she ended up in an artistic work starting from her thoughts (See Image 23).

Image 23. Nur's Art Painting Workshop Study

The student, starting from the sketch she wrote, noted and drew in the second year, arrived the above artistic work in the fourth year of the university. The student improved the woman and man image in her visual diary and combined these with the woman and man motifs used in the Anatolian Seljuks era after doing research. She created her work using contrasting colors as she had planned in her diary. The visual diary she had kept in the second year of her education became an artistic and intellectual area for the student. The student, who had made a questioning over images has found her own story. Nur's views about her work is as follows:

There was something I wanted to do first in my paintings, that is using figures. Of course, I needed images that would support the abstract figures. By combining these pieces, just like a puzzle, I continued, step by step. In addition to these, I wanted to touch upon the past in my paintings, and I received help from my professors. Primarily, the Seljuk rug motifs attracted my attention. Although, it was not easy to find, I started with the motifs representing woman and man that I found in my internet search. I started my first painting on hardboard; the abstract figure of man is on the right of the hardboard, which is divided into two, while the abstract figure of woman is on the left. In addition, I drew a largish roundness on the belly of the woman figure to make it understandable and I wished to explain fertility, and I drew an octagonal star inside this roundness to tell about the values a mother gives to her child. I drew the lines of the man figure more cornered and I used the Ramshorn (representing man) in his socks and waistband. For the colors, I was inspired by the colors used in the rugs of Seljuk era. I used mainly turquoise, the color of the Turks, and its tones in my paintings and I used red transparently to convey the message I want to deliver to the audience (See Image 23).

Discussion and Conclusion

The findings from the second research question of this study, which is "For what purposes did the students use their visual diaries regarding visual culture?", and the third research question, which is "What did the students reflect in their experiences pertaining to visual diaries regarding visual culture?", indicate that the students expressed their reflections on everyday life, passing grades, visual and textual interpretations, sense-making processes, artistic works in their visual diaries in the workshop. They also incorporate various images in their visual diaries. They visually included many things they noticed in their surroundings and integrated texts into visuals. It is also remarkable that visual diaries had a positive effect on the creativity processes of the students. There is a limited number of research on diary-keeping and the use of visual diaries in the field of visual arts education. Yet, studies on reflective diary writing skills and experiences on diary-keeping among students in faculties of education are abundant. One example is Noor's (2004) study titled "A Study of the Use of the Visual Diary and its Impact on Lower Secondary Art Education in Singapore" where the researcher determined that students reflected an array of images and formed a meaning pattern through visual diaries in secondary art education. Likewise, Güneş (2018) benefited from visual diaries in her PhD dissertation titled "An Alternative Method in Training Art Educators: A/r/tography in Studio Art Class" and concluded that practices of art making and writing in a/r/tography practices enriched one's perspective and inspired creative ideas. Through such

practices, students make art by making sense of their own personal lives, which creates awareness on their life; in other words, they become aware of their own experiences by reflecting them to art and feel a connection with their lives. Moreover, students can come up with unique ideas and subjects by searching for the small details of their lives for life-writing.

The findings from the first research question of the study, which is "What do the students think about their experiences on keeping a visual diary regarding visual culture?", demonstrate that with different ways of self-expression, the students created a personal space for themselves and freely expressed themselves. It is also remarkable that they kept their diaries not only in the course of workshop but also in other courses such as art philosophy and sculpture. They designed a space where they can realize and assess their artistic creation processes thanks to visual diaries. Similarly, Akkoyunlu et al. (2016), in their article titled "Pre-service Teachers' Opinions on the Use of Reflective Diaries in Teacher Training", report that the pre-service teachers had the chance to evaluate themselves in a holistic way, to track their progress, to develop a critical stance and to improve their writing skills. Razıf's (2015) study titled "The Use of Visual Diary in Understanding Art History and Culture" utilized visual diaries to teach art history and culture and determined that art students understood and experienced art history in more easily thanks to visual diaries. As is evident from Razıf's (2015) study, visual diaries are an effective tool to teach art history and culture to visual arts students. Also, Can and Altuntaş's (2016) article titled "Students Views Regarding of Reflective Journal Writing" advocated that visual diaries enhance permanent learning and concluded that reflective journal writing improved the writing skills of the students and increased the amount and permanence of the knowledge they learned.

In this study, the pre-service visual arts teachers stated that they will continue keeping a visual diary and use it in their professional lives. It was found out that visual diaries raised the awareness of the pre-service visual arts teachers on their artistic development and enabled them to evaluate it. Visual diaries appear to be important for all individuals pursuing their education in visual arts, as they offer a visual experience and allow for generation and consumption of visual information. Arslan's (2017) article titled "Awareness of Candidates on Teaching Practice in Their Reflective Diaries" reported that keeping a reflective diary is a practice that encourages the pre-service teachers to think creatively and critically and supports their self-awareness. Cengiz and Karataş's (2014) article titled "Developing Reflective Thinking: Effects of Keeping Reflective Journals with Pre-Service Science Teachers" found out that the pre-service teachers included poor-level reflections in their reflective journals considering the development of their reflective thinking skills and the feedbacks written for them. There are a great number of studies on keeping reflective journals in faculties of education in the literature; however, research on experiences pertaining to visual diaries, which assemble images and texts, in the field of visual arts education is rather limited.

The habit of keeping visual diaries would provide writing skills to the individuals, interested in visual arts field, in addition to providing a space to express themselves visually. Visual diaries are important in the development of written expression skills, which surface as a deficiency in students receiving visual arts training. In this respect, the number of workshop studies to be conducted or improved with the visual diary experience could be increased. Visual diary keeping skill could be provided to the students from the primary school to the university level in the fine arts courses and also in other courses.

Acknowledgments

This study was previously presented as an oral presentation at the 3rd International Art and Aesthetics Symposium, held in Gaziantep on 4-6 April 2019, Turkey.

Statement of Publication Ethics

The researcher followed the principles of publication ethics whilst conducting this study and submitted it with no ethical issue.

References

Akkoyunlu, B., Telli, E. Menzi Çetin, N., & Dağhan, G. (2016). Öğretmen eğitiminde yansıtıcı günlüklere ilişkin öğretmen adaylarının görüşleri [Views of prospective teachers about reflective journals on teacher education]. *Turkish Online Journal of Qualitative Inquiry, 7*(4),312-330.

Anderson, T. (2003). Roots, reasons, and structure: framing visual culture art education. *International Journal of Arts Education,* 1, 5-44.

Arslan, M. M. (2017). Adayların yansıtıcı günlüklerinde öğretmenlik uygulamasına yönelik farkındalıkları [Awareness of candidates on teaching practice in their reflective diaries]. *Bartın Üniversitesi Eğitim Fakültesi Dergisi [Bartın University Journal of Faculty of Education], 6*(3), 1017-1026.

Bedir, Erişti, S. D. (2020). Görsel kültür ve sanat eğitimi [Visual culture and art education], Serdar Tuna ve Ali Osman Alakuş (Ed.) *Görsel Sanatlar Öğretimi* içinde [Visual Arts Education in] (ss. 157-207). Ankara: Nobel Academy Publishing.

Blighe, M. (2008). *Organising and structuring a visual diary using visual interest point detectors.* Dublin City University, School of Electronic Engineering, Unpublished doctoral dissertation.

Blighe, M., & O'Connor, N. E. (2008). Myplaces: detecting ımportant settings in a visual diary. *CIVR,* 8.

Burger, M. B.F.A. (2011). *The World in Pictures: Aesthetics And Visual Culture in The Art Classroom Development Visual Literacy in Digital Environment*, Degree of Master of Arts, Presented to the Faculty of the Graduate School of The University of Texas at El Paso.

Cahnmann, Taylor, M., & Siegesmund, R. (2008). *Arts-based research in education: Foundations for practice,* England: Routledge.

Can, R., & Altuntaş, B. (2016). Yansıtıcı günlük yazma uygulamasında ilişkin öğrenci görüşleri [Students views regarding of reflective journal writing]. Ana Dil Eğitimi Dergisi [Journal of Mother Tongue Education], 4(1), 53-63.

Cengiz, C., & Karataş, F. Ö. (2014). Yansıtıcı düşünmeyi geliştirme: fen bilgisi öğretmen adayları ile gerçekleştirilen yansıtıcı günlük tutma uygulamasının etkileri [Developing reflective thinking: effects of keeping reflective journals with pre-service science teachers]. *Eğitim ve Öğretim Araştırmaları Dergisi [Journal of Research in Education and Teaching], 3*(4), 120-129.

Chaplin, E. (2004*). My visual diary in Caroline Knowles and Paul Sweetman (eds) Picturing the Social Landscape: visual methods and the sociological ımagination*. London: Routledge, pp.35-48.

Chaplin, E. (1994). *Sociology and visual representation.* London: Routledge.

Çakır, M. (2014). *Görsel kültür ve küresel kitle kültürü [Visual culture and global mass culture]*. Ankara: Ütopya Publisher.

Çığır, E. (2016). *Görsel sanatlar öğretimine yönelik sosyal ağ odaklı görsel kültür uygulamalarının incelenmesi* (Yayımlanmamış Doktora Tezi) [*The investigation of visual culture practices focused on social network on visual art teaching* (Unpublished Doctoral Thesis)]. Anadolu Üniversitesi, Eğitim Bilimleri Enstitüsü [Anadolu University, Institute of Educational Sciences], Eskişehir.

Duncum, P. (1999). What elementary generalist teachers need to know to: Teach art well. *Art Education, 52*(6), 33-37.

Duncum, P. (2000). How art education contribute to the globalisation of culture. *Journal Art and Design Education, 19*(2), 170-180.

Duncum, P. (2001). Visual culture: development, definitions and directions for art education. *Studies in art Education A Journal of Issues and Research Art Education, 42*(2), 101-112.

Duncum, P. (2002). Visual culture art education: why, what and how? *Journal Art and Design Education, 21*(1), 14-23.

Duncum, P. (2003). The theories and practices of visual culture in art education. *Arts Education Policy Review, 105*(2), 19-25.

Erişti, S. D. (2012). Üstün yetenekli öğrencilerin görsel anlatımlarında geleceğin dünyasına ve teknolojisine ilişkin algıları [Perceptions of talented students in their visual representations about the future world and technology]. *Türk Üstün Zekâ ve Eğitim Dergisi [Turkish Journal of Giftedness and Education], 2*(2), 102-117.

Freedman, K. (2003). *Teaching visual culture: curriculum, aesthetics and the school life of art.* New York: National Art Education Association Teachers College Columbia University.

Genç, S., & Buyurgan, S. (2018). Oyuna dayalı müze etkinliklerinin öğrenci erişi ve görsel sanatlar dersine karşı tutumları üzerine etkisi [The effect of museum activities based on games to the student achievement and their attitude towards art classes]. *İnönü Üniversitesi Eğitim Fakültesi Dergisi [Inonu University Journal of the Faculty of Education], 19*(3), 687-699. DOI: 10.17679/inuefd.440804.

Gil-Glazer, Y. (2017). Visual culture and critical pedagogy: from theory to practice, *Critical Studies in Education, 1*(20).

Güler, E., & Bedir Erişti, S. D. (2019). Görsel sanatlar öğretiminde sosyal ağ odaklı görsel kültür eğitimi etkinliği: hieronymus bosch'un 'dünyevi zevkler bahçesi' eserinin incelenmesi [Social network-based visual culture ınstructional activity in visual arts education: examining hieronymus bosch's 'the garden of earthly delights']. *Eğitimde nitel araştırmalar Dergisi [Journal Of Qualitative Research in Education], 7*(2), 738-767.

Güneş, N. (2019). *Sanat eğitimcisi yetiştirmede alternatif bir yöntem: a/r/tografi [An alternative method in training art educators: a/r/tography in studio art class]*. Doktora Tezi [(Unpublished Doctoral Thesis) Gazi University, Graduate School of Educational Sciences]. Gazi Üniversitesi, Ankara, Türkiye.

Grushka, K. (2010). Conceptualising visual learning as an embodied and performative pedagogy for all classrooms, *Encounters on Education*,11, 13-23.

Helser, K. J. B.F.A. (2004). *A study of visual culture and ıts ımpact on adolescent ıdentıty*, Degree Master of Arts, Graduate School of The Ohio State University.

Huberman, A. M., & Miles, M. B. (2015). *Nitel veri analizi [Qualitative data analysis]*. (Çev. S. Akbaba Altun ve Ali Ersoy). Ankara: Pegem Academy.

Kennedy, M. (2019). Why You Might Want to Consider Keeping a Visual Diary. Retrieved 16 September 2019, from https://digital-photography-school.com/why-keep-visual-diary/.

Kırışoğlu Tekin, O. (2009). *Sanat, kültür, yaratıcılık, görsel sanatlar ve kültür eğitimi öğretimi [Art, culture, creativity, visual arts and cultural education teaching].* Ankara: Pegem Academy.

Mamur, N. (2012). Görsel sanatlar öğretmen adaylarının görsel kültür diyaloglarına yönelik algıları [Perceptions concerning visual culture dialogues of visual art pre-service teachers]. *Kuram ve Uygulamada Eğitim Bilimleri [Educational Sciences: Theory & Practice*], *12*(3), 2149-2174.

Mamur, N. (2015). Resim iş öğretmen eğitiminde "müze eğitimi ve uygulamaları" dersinde görsel kültür kuramı [The use of visual culture theory in "museum education and practices" coursein pre-service visual art education]. *E-Journal of New World Sciences Academy, 10*(1), 29–53.

Mason, R., & Cruickshank, I. (2017). Araştırma sürecinde fotoğrafı kullanmak [Using photography in the research process]. S. D. Bedir Erişti (Ed.), Görsel Araştırma Yöntemleri Teori, Uygulama ve Örnek [Visual Research Methods Theory, Practice and Example] in (ss.167-190). Ankara: Pegem Academy.

Mirzoeff, N. (2002). What is the visual culture*?* in N. Mirzoeff (Ed.), *Visaul Culture Reader?*, London and New York: Routledge.

Noor, N. F. M. (2004). *A study of the use of the visual diary and its impact on lower secondary art education in Singapore.* Academic Exercise (B.A. Hons.) (Art) National Institute of Education, Nanyang Technological University

Razıf, A. A. B. (2015). *The use of visual diary in understanding art history and culture.* University Technology Mara. Unpublished master dissertation.

Rogoff, I. (1998). Studying visual culture. in N. Mizoeff (Ed.), *The visual cultur reader* (pp. 24-37). New York: Routledge.

Shin, R. (2016). Gangnam style and global visual culture, *Studies in Art Education, 57*(3), 252-264.

Türkcan, B., &Yaşar, Ş. (2011). İlköğretim öğrencilerinin görsel dünyayı anlamlandırmasında görsel kültür çalışmalarının rolü [The role of visual culture studies on primary school students' interpretation of visual world]. *Kuram ve Uygulamada Eğitim Bilimleri [Educational Sciences: Theory & Practice], 11*(3), 1549-1570.

Yıldırım, A., & Şimşek, H. (2008). Sosyal bilimlerde nitel araştırma yöntemleri [Social information qualitative research methods]. Ankara: Seçkin Publishing.

Yılmaz, M., Yılmaz, U. & Demir Yılmaz, E. N. (2019). The relation between social learning and visual culture. *IEJEE, 4*(11), 421-4247.

Yükselgün, Ö., & Türkcan, B. (2012). İlköğretim görsel sanatlar dersi öğretim programındaki "görsel sanat kültürü" öğrenme alanının uygulanması [Applicatıon of the "visual art culture" learning field in the primary school visual arts course curriculum], *AİBÜ Sosyal Bilimler Enstitüsü Dergisi [IBU Journal of Social Sciences], 12*(20), 337-366.

Watson, J. (2012). Visual diary as prosthetic practice in Bobby Baker's "diary drawings". *JSTOR, 35*(1), pp. 21-44.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Visual Culture-Based Workshop: Visual Diaries
Discipline	Art Education
Type of Article	Research Article
Year of Data Collection	2016-2017

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that students voluntarily participate in the research.

Date 25/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Erzincan Binali Yıldırım University	Dr. Lecturer	Ebru GÜLER	
2.				
3.				

Correspondent Author's Info

Institute	Erzincan Binali Yıldırım University
Postal address	Erzincan Binali Yıldırım University/ Faculty of Education/Yalnızbağ Yerleşkesi/Erzincan
E-mail	ebru.guler@erzincan.edu.tr
Phone	05062756777

Bilgili, A. S., Gömleksiz, M. N. & Öner, Ü. (2020). Students' and teacher's views on the effectiveness of multiple intelligences-assisted layered curriculum in the social studies course, *Bartın University Journal of Faculty of Education*, 9(2), 407-426.

Bartın University Journal of Faculty of Education, 9(2), 407-426

buefad.bartin.edu.tr

Students' and Teacher's Views on the Effectiveness of Multiple Intelligences-Assisted Layered Curriculum in the Social Studies Course

Ali Sinan BİLGİLİ[a], Mehmet Nuri GÖMLEKSİZ[b], Ümmühan ÖNER[c*]

Article Info

DOI: 10.14686/buefad.615031

Article History:
Received: 03.09.2019
Accepted: 23.05.2020
Published: 05.06.2020

Keywords:
Layered Curriculum
Multiple Intelligences Theory
Social Studies Course

Article Type:
Research article

Abstract

The aim of this study is to determine students' and Social Studies teacher's views on the effectiveness of multiple intelligences-assisted layered curriculum. Study group includes 14 7th grade students and one Social Studies teacher at a primary school in Elazığ city center during 2010-2011 academic year. The research was conducted based on the "case study" research design, one of the qualitative research designs. As data collecting tool, student and teacher interview form and observation form consisting of open-ended questions were used. Content analysis was used to analyse the data. It was found out that the useful aspects of multiple intelligences-assisted layered curriculum were 'helping students to learn', 'repetition', 'motivating to do research', 'active participation in class' and 'increasing students' interest'. When choosing an activity, the students paid attention to whether the activities were 'difficult', 'easy', 'helpful for students to learn', 'interesting' and 'related to drawing'. In the process of implementation of the multiple intelligences-assisted layered curriculum, it was found out that the students had difficulty in 'writing story', 'writing essay', 'writing poem', 'solving test', 'drawing map', and 'selecting activity'

Sosyal Bilgiler Dersinde Çoklu Zekâ Kuramı Destekli Basamaklı Öğretim Programının Etkililiğine İlişkin Öğrenci ve Öğretmen Görüşleri

Makale Bilgisi

DOI: 10.14686/buefad.615031

Makale Geçmişi:
Geliş: 03.09.2019
Kabul: 23.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Basamaklı Öğretim Programı,
Çoklu Zekâ Kuramı, Sosyal
Bilgiler Dersi

Makale Türü:
Araştırma makalesi

Öz

Araştırmanın amacı çoklu zekâ kuramı destekli basamaklı öğretim programının etkililiğine ilişkin öğrenci ve öğretmen görüşlerini belirlemektir. Araştırmanın çalışma grubunu 2010-2011 eğitim öğretim yılında Elazığ il merkezindeki bir ilköğretim okulunda 7. sınıf düzeyinde öğrenim gören 14 öğrenci ve 1 Sosyal Bilgiler öğretmeni oluşturmaktadır. Araştırma nitel araştırma desenlerinden "durum çalışması" desenine göre yürütülmüştür. Veri toplama aracı olarak açık uçlu sorulardan oluşan öğrenci ve öğretmen görüşme formu ve gözlem formu kullanılmıştır. Veriler içerik analizine uygun olarak analiz edilmiştir. Çoklu zekâ kuramı destekli basamaklı öğretim programının faydalı yönleri 'öğrenmeye yardımcı olma', 'tekrar etme', 'araştırmaya sevk etme', 'derse aktif katılım', 'ilgiyi artırma' olarak belirlenmiştir. Öğrenciler etkinlik seçerken etkinliklerin 'zor olması', 'kolay olması', 'öğrenmeye yardımcı olması', 'ilgi çekici olması', 'çizimle ilgili olması' konularına dikkat etmişlerdir. Çoklu zekâ kuramı destekli basamaklı öğretim programının uygulanma sürecinde öğrencilerin en çok 'hikâye yazma', 'kompozisyon yazma', 'şiir yazma', 'test çözme', 'harita çizme', 'etkinlik seçimi' aşamalarında zorluk yaşadıkları belirlenmiştir.

* * **Corresponding Author:** uoner @firat.edu.tr
[a] Prof. Dr., Atatürk University, Erzurum, Turkey, http://orcid.org/0000-0003-3182-3002
[b] Prof. Dr., Fırat University, Elazığ, Turkey, http://orcid.org/0000-0002-8268-0163
[c] Asst. Prof., Fırat University, Elazığ, Turkey, http://orcid.org/0000-0003-2394-0049

Introduction

Each student has his/her own individual differences and intelligence areas. In this context, these differences should be taken into consideration while planning the learning processes. Approaches and strategies suitable for students' individual differences, intelligence areas and learning speed should be provided for the students.
The layered curriculum is a program that includes the division of the subjects within the learning process into three layers, the determination of the activities related to each layer, and the selection and evaluation of the activities by the students (Nunley, 2003, p. 35). Based on the conception that each student in the classroom has different interests and learning styles, this curriculum is a way of organizing the teaching-learning process, which gives students the opportunity to acquire knowledge, use the information they have obtained in daily life and present creative ideas (Başbay, 2006, p. 14). In this approach, the teaching-learning process is organized by allowing students to choose from activities they can perform. By ensuring the students participate in appropriate level of activities, the general objectives that will enable them to learn at the highest level within their capacity, and in accordance with their interests and abilities are determined. After making these general objectives layered within the framework of certain steps based on the activities, the implementation continues (Demirel, 2006, p. 243). The layered curriculum is based on three basic principles which are defined as preferential right, responsibility and progressive complex thinking style. Before preparing a lesson plan for layered curriculum, the basic concepts, tasks in the units, and intelligence areas of the students are determined. The increasingly complex tasks are divided into three layers taking into consideration the Bloom Taxonomy (Nunley, 2003, p. 35). These layers represent the practice required for the learning of the unit. Students can choose what they want to study in depth and conduct their practice (Nunley, 2002, p. 11). Within this framework, by determining the level of difficulty and the progressive relationships, activities to be performed within the curriculum and extracurriculum are divided into three levels as C, B and A from the easiest to the hardest one. Students perform different tasks and responsibilities in these layers and carry out the activities they chose by taking their interests into account (Başbay, 2010, p. 249). The bottom layer is C, where students can get the highest grades by performing the tasks in. This layer allows students to acquire a general knowledge of the subject. In the C Layer, there are tasks that address visual, tactile, auditory learners (Nunley, 2002, p. 13). Students can choose from 4 or 5 different tasks according to their interests and learning styles. In the B Layer, the students add new ones to the basic information obtained in the C Layer. (Maurer, 2009, p. 5, 6). In this layer, the students are asked to question the information they have previously learned, analyze it in detail, reach the synthesis and as a result, produce an original product. According to the topic they have chosen, students are expected to present the learnt knowledge creatively, analyze a current problem critically, and create an original idea (Demirel, Şahan, Ekinci, Özbay & Begimgil, 2006, p. 75). The aim of this layer is to allow the students to make connections with previous subjects (Maurer, 2009, p. 6). The layer B requires a higher level of thinking than the layer C. In the B layer, the students process and apply the knowledge they have learned in layer C. Students rearrange, use, design learning activities, solve problems and brainstorm the knowledge they have learned previously. The last layer, the A layer requires high-level thinking skills. The student in this layer uses the values, ethics and personal thoughts in the traditional research (Nunley, 1998). Because of these characteristics, the A layer is the most difficult layer in terms of tasks. What the students need to do is to propose new ideas based on the knowledge they have acquired in the lower two layers (Başbay, 2010, p. 248).

One of the important stages of the layered curriculum is evaluation. The layered curriculum is a process in which learners evaluate themselves, reveal their weaknesses and identify their own learning speed. In the evaluation process, graded scoring keys, oral defense and student development files are used to evaluate the process (Yılmaz, 2010, p. 61). The fact that evaluation criteria that will be included in the graded scoring scale will be determined together with the students and given to the students before the study will be guiding for them (Sezer, 2005). Preparation of the scoring keys requires intensive work at the evaluation stage. Clear and understandable scoring scales should be used for all tasks that learners should fulfill. Similar evaluation criteria can be used for similar tasks in different layers when preparing the scoring keys (Başbay, 2006, p. 43). The scoring key allows students to achieve a certain standard in evaluating their learning products. Verbal defense enables the student to test the knowledge of the subject and reveal the degree which the student has mastered the subject (Demirel, 2006, p. 246).

The layered curriculum suggests that it is wrong to continue the teaching-learning process with only one activity, and adopts the idea of creating activities that will appeal to different intelligence areas by considering the differences in the intelligence areas, interests, skills and thinking systems of individuals (Başbay, 2010, p. 245).

The multiple intelligences theory has emerged from Gardner's study of "project zero" which is within the scope of Harvard University project, in which the development of cognitive potential of normal and talented children and the brain disorders resulting mental disorders were investigated. The project started with the assumption that each individual has the potential to develop their strengths in more than one area. The project also includes identification of learners' intelligence areas and studying styles (Gardner, 1993, p. 89). Gardner, while creating the theory of multiple intelligence, has done research on people from different sections of society and benefited from many extensive and independent sources, including people in different cultures. Similar evidence gathered from different sources strengthened the idea that there might be different intelligence areas (Gardner, 2004, p. 11). In the multiple intelligences theory, intelligence was defined as "the ability to shape a product with one or more cultural values or problem solving" (Gardner, 1993, p. 7). According to this definition, intelligence is considered as a potential that exists in the individual and emerges in relation to opportunities. Cultural values have a significant impact on the behaviors considered as intelligence. In this context, the multiple intelligences theory that brings a different perspective to the concept of intelligence, argues that intelligence has a meaning beyond verbal and mathematical abilities (Gürel and Tat, 2010, p. 336). Two important features of multiple intelligences theory enable it to have a different structure from the traditional conception. First, the definition of intelligence available in the theory is based on problem solving and acquiring a product in real life. The second feature is that intelligence is considered as plural (Bümen, 2010, p.4). An individual does not use his/her intelligence separately; she/he uses it in multiple ways. Therefore, the intelligence areas of the individual are his/her biological potential and ready for development (Akboy, 2005, p. 230). Instead of achieving success in only one area of multiple intelligences, the individuals are desired to be successful in different areas as well (Demirel, Başbay & Erdem, 2006, p. 16). Gardner argues that an individual's intelligence area is effective on the way of his/her learning and that effective learning strategies can be developed by taking the individual's dominant intelligence area into consideration (Gürel and Tat, 2010, p. 336). The multiple intelligences theory focuses on the need to take into account the individual differences of students in the classroom. For this reason, it proposes a change of thinking based on teacher-centered approach (Saban, 2002, p. 61). In a student-centered teaching-learning process which is based on individual differences, the recognition that individuals can learn in different ways has brought about a different conception of teaching (Bümen, 2005, p. 21). Multiple intelligences theory, due to its nature and content, incorporates different learning and teaching strategies. The higher the rate of use of these strategies in the courses, the more effective, efficient and permanent learning will be provided. In this context, the use of different teaching strategies by the instructors will add wealth and diversity to the lesson (Baş, 2011, p. 17).

When the layered curriculum and multiple intelligences theory are examined, it is clearly seen that the starting point of both is the organization of the learning-teaching process based on the individual differences of the students. Teaching should be organized in a way to address the differences by taking into account the characteristics of all students and by providing a variety of methods and techniques. When all this is considered, it is thought that it will be useful to apply the applications/implementations related to the layered curriculum-assisted by multiple intelligences theory in the Social Studies course which includes topics related to different disciplines.

The aim of the study is to determine the views of students and teachers on the effectiveness of multiple intelligences-assisted layered curriculum. For this purpose, the answers to the following questions were sought:

1. What are the views of teacher and students about the useful aspects of using multiple intelligences-assisted layered curriculum in education? What are the observation results of its application?
2. What are the students' views regarding the criteria that are effective in the selection of activities while applying the multiple intelligences-assisted layered curriculum? What are the observation results of its application?
3. What are the views of teachers and students about the stages of difficulty when applying the multiple intelligences-assisted layered curriculum? What are the observation results of its application?

4. What are the students' views about the favorite/most popular activity when applying the multiple intelligences-assisted layered curriculum? What are the observation results of its application?
5. What are the views of the students about other courses in which the multiple intelligences-assisted layered curriculum can be applied?
6. What are the views of teachers and students about the different aspects of the multiple intelligences-assisted layered curriculum in comparison to the traditional teaching method?

Method

Research Design

This study was carried out according to the pattern of "case study" one of the qualitative research patterns. Case study is to investigate one or two cases in depth (Yıldırım & Şimşek, 2006, p.77).

Study Group

Study group includes 14 7th grade students and one Social Studies teacher at a primary school in Elazığ city center during 2010-2011 academic year. In determining the students in the study group, an appropriate selection was made in accordance with the maximum variety sampling. The aim of selecting this sampling type was to create a relatively small sample and reflect the diversity that could be a party to the problem being investigated (Yıldırım & Şimşek, 2006, p. 108). In determining the students who would be interviewed about the implementation process of the multiple intelligences theory-assisted layered curriculum, first of all, the Social Studies course and the general achievement levels of the students were examined. 14 students in three different levels of achievement were identified by taking into consideration the opinions of the Social Studies teacher. It was made sure that the students and Social Studies teachers would volunteer to make the interviews.

Data Collection Tools

Within the scope of this study, semi-structured interview technique and observation technique were used. The semi-structured interview allows the re-organization and evaluation of the questions by allowing partial flexibility to the researcher about the interviewee. In such an interview, the persons who are investigated are also controlled through research (Ekiz, 2003, p. 62). An interview form consisting of open-ended questions was used to determine the students' views on the process and applications. The questions to be included in the interview form were determined after examining the relevant literature and an interview form was created by taking into consideration the opinions of one Social Studies teacher and two faculty members working at the Curriculum and Instruction Department. Interviews were conducted in the class environment in the weekly course hours. The Social Studies teacher who conducted the experimental part of the study in the classroom was interviewed by the researcher of this study to determine his views on the implementation process of the multiple intelligences theory-assisted layered curriculum. In the interview form, open-ended questions were asked about the implementation process, positive and limitations of the multiple intelligences theory-assisted layered curriculum.

In this study, structured observation technique was used and observations were performed in the class environment. In the present study, observations were based on the "non-participant observation" approach. In the non-participant type of observation, there is no intervention of the observer (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2010, p.143). Observation forms were used to record the observations. Observation forms included the status of teachers and students, student-student interaction, and the sections related to the learning and teaching activities. The observer observed the classroom environment in consideration of these criteria.

Data Collection

The unit titled "Journey of the Turkish History" in the 7th grade syllabus of the Social Studies course was divided into three layers taking into account the structure of the layered curriculum and the learning outcome in the unit. While determining the tasks to be fulfilled by the students in all three layers, the views of the Social Studies teacher were taken and appropriate activities suggested by the teacher were selected. While determining the activities, it was made sure to create activities that could appeal to students with different intelligence areas

taking into account the intelligence areas in the multiple intelligences theory. In the preparation of the activities, the textbook, student workbooks and test books were also used. While there were 12 tasks in the layer C, there were 5 tasks in the B layer and 3 tasks in the A layer. The activity lists, in which the students could choose at each layer, and the points/scores they would receive when they completed these activities, were prepared. After the topics in the layers were covered, these activity lists were distributed to the students to select the activities they wished to perform. The activity lists given to the students included the points/scores they would receive as a result of their activities and the number of points required to pass to the next layer. Before the implementation of the practices, the teacher of the course was given detailed information about the multiple intelligence theory-assisted layered curriculum and how the process would be conducted. The Social Studies teacher who participated the research was chosen as he was volunteer for the study. Afterwards, information was given about the multiple intelligences theory-assisted layered curriculum by going to the class where the practice would be conducted, and explanation was made in detail on what to do before, during and after the applications. While the students did activities they selected from activity list during the two class hours, they made presentations and the teacher evaluated their studies at the other class hour. After the subjects determined for the C Layer were covered, the list of the predetermined activities for this layer was distributed to the students and the students were asked to select the tasks they wanted. In the C Layer, there were tasks such as making presentations, preparing puzzles, writing texts, preparing picture cards, and writing paragraphs. The students who performed these activities in the C Layer were given a table with activities related to the B Layer. The tasks in this layer were preparing a dictionary, brochure, poster and writing an essay. The students who could not accumulate points/scores to pass the upper layers were given additional tasks. A list of the tasks related to the A Layer was distributed to the students who completed the B Layer. The tasks in the A Layer were writing an essay, poem and story. The activities of the students who performed the activities related to the A Layer were scored, the students who completed the application successfully were determined, and their results were announced. Students who could not get the required score were given additional tasks.

Data Analysis

The N-VIVO 10 program was used in the analysis of the data obtained in the study. Data were analyzed according to content analysis. The content analysis is the approach to reveal social reality, verbal and written messages through objective and unbiased classification in terms of grammar and language and expressing them with numbers and making inferences (Tavşancıl & Aslan, 2001, p. 2). The data obtained during the research process were carefully examined and a meaningful classification was made. In the present study, the codes were examined in depth and common points were found. After these applications, themes were determined. One week after the themes were determined, they were revised and various arrangements were made. Yıldırım and Şimşek (2006, p. 229) stated in the process of coding the data that the researcher had to read the data set several times and make arrangements on the resulting codes over and over again. Expert opinions were consulted on the resulting codes, themes, and names of the themes. After that, qualitative findings were interpreted.

In the studies conducted by applying content analysis, the validity and reliability conditions are necessary (Gökçe, 2008, p. 83). In qualitative research, it is very important to ensure internal validity, which is consistent in the data collection process and in the analysis and interpretation of the data. Internal validity can be achieved through a combination of different data sources and different data collection strategies during the study (Yıldırım & Şimşek, 2006, p. 267). In the present study, different data collection techniques such as interviews and observations were used to provide internal validity.

One of the ways of ensuring external validity is the detailed description of the study environment and processes (Yıldırım & Şimşek, 2006, p. 258). For this purpose, all activities that were carried out during the implementation process of the study, before and after were explained in detail. Similarly, information on the process of the creation of qualitative data collection tools and collection stage of qualitative data was given. Information on how the coding was done and how the themes were formed was provided. In addition, direct quotations related to themes and sub-themes were also given by taking into consideration the data obtained from interviews and observations. Direct quotations, with a pre-explanatory expression, were given in quotation marks by using an italic font.

At the beginning of the quoted sentences related to interviews and observations, explanatory statements consisting of the abbreviations such as '**S1-F /h', (Student1-female/high) 'Obs-01-12-2010', (Observation- Date), 'Teac'**

(Teacher) were presented. In the studies, enabling external validity related to the generalization of the results is another important issue to be addressed. One of the ways to ensure external validity is to diversify the sample that will allow for generalization (Yıldırım & Şimşek, 2006, p. 258). In the content analysis, one has to be careful in the selection of the sample in order to have a high representation power of the selected group (Tavşancıl & Aslan, 2001, p.46). In this study, using maximum diversity sampling to obtain external validity.

Findings

The main themes identified in relation to the effectiveness of the multiple intelligences theory-assisted layered curriculum were; 'the benefits of the application', 'the criteria for selecting the activity', 'the layer where it's difficult', 'the popular/favourite activity, 'the courses where it can be applied' and 'its difference from the traditional method'.

Benefits of the multiple intelligences theory-assisted layered curriculum

One of the themes emerged related to the effectiveness of the multiple intelligences theory-assisted layered curriculum is related to the 'benefits of the application'. Therefore, a theme named "benefits of the application" was created in the study. The model related to this theme is presented in figure 1.

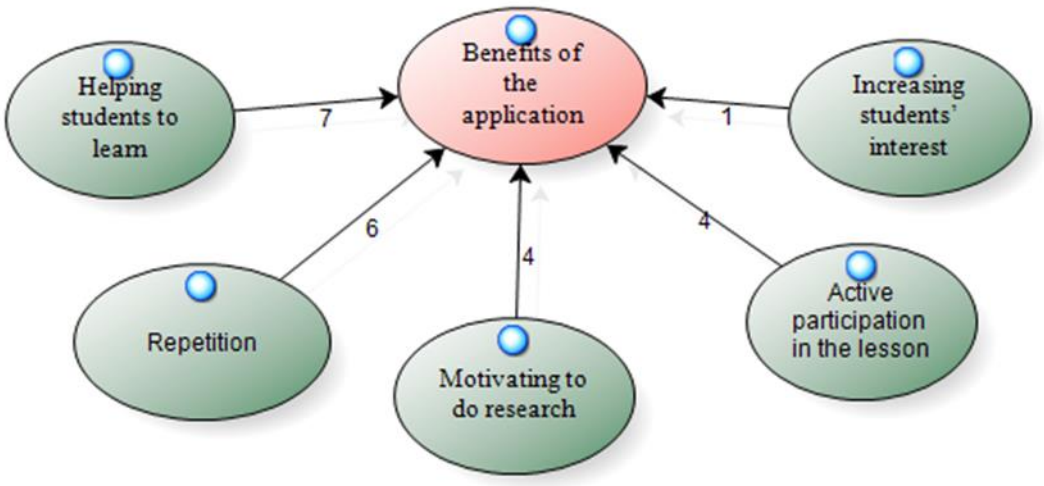


Figure 1. Model related to the useful aspects of the multiple intelligences theory-assisted layered curriculum

In the theme of benefits of the application, it is seen that the most loading was done in the sub-themes of 'helping students to learn' and 'repetition'. When the sub-themes were examined, it was found that they were related to each other. The students stated that they did research in order to perform their chosen tasks, repeated the subjects, and this situation facilitated their learning and increased their course achievement.

The students who drew attention to the dimension of 'helping students to learn' of the multiple intelligences theory-assisted layered curriculum stated that they learned the subjects more easily after the activities, and this affected their success in the exams. One of the students **(S3-F/m)** expressed her views as in the following "*It helped me learn the subjects. In my first test, I had many incorrect answers, but in my last first test, I had fewer incorrect answers. It improved my performance*". With the following statement *"...I learned many things better. For instance, with the activity of the principalities in which we marked the location of the principalities on the map, I learned the location of the principalities better"*, another student **(S5-M/l.)** stated that during the application process, use of maps facilitated his learning. Similarly, with the following statement, *"...it helped me learn the subjects because I had the opportunity to reinforce my knowledge. In order to do the activities I chose, I revised*

the issues that our teacher told us, and it helped me to learn better…" another student (**S7-M/h)** stated that the application process facilitated his learning. Another student (**S8-M/m**) stated with the following statement, *"It proved to be effective. It made me learn easier. I answered questions of the topics about which I did activities very easily"* that he learnt the subject better after the activities. Another student **(S10-F/h)** explicated how he felt about the application with the following statement *"Yes. After the teacher explained the subject, I reinforced what I learned because we did the activities; I believe that I learned the subjects better"*. Another student (**S12-F/h)** with the following explanation, "*Yes. It helped me to understand the subjects better. I learned the meaning of many words I did not know while preparing the dictionary"*, she stated that he learnt the subject better after the activities.

The students, who thought that the multiple intelligences theory-assisted layered curriculum was useful in terms of 'repetition', stated that they reviewed the subjects in order to be able to perform their activities and this gave them the opportunity to repeat the process. One of the students (**S1-F/h)** who expressed her opinions on this subject with following statement *"While researching these issues, it helped me to do both repetition and reinforcement. This gave us the opportunity to update my knowledge…"* that she managed to update her knowledge with repetition. Another student (**S2-M/l)** expressed his opinions with the following statement *"We had the opportunity to revise the subjects while doing homework on the subjects. This enabled us to be more successful in the exams".* While one of the students (**S7-M/h)** expressed his opinions with the following statement *"…It helped me learn the subjects because I had the opportunity to reinforce my knowledge. In order to do the activities I chose, I revised the issues that our teacher told us, and it helped me to learn better"*, another student (**S11-F/h)** similarly, expressed her opinions as in the following "*It helped us to remember the forgotten subjects; we had the opportunity to revise it again while doing research to do the activities*". Another student (**S13-M/m)** expressed his opinions with the following statement *"It helped me to understand the subjects better. Since we didn't do a lot of activities about the subject before, we could forget what we had learned; with the help of repetitions in Layered Curriculum, I learned better".* These opinions are supported also by the findings in the observation notes. This was expressed in the observation note (**Obs-01-12-2010**) as in the following *"…It seems that while doing research, they gathered information about the subjects that they did before and so they revised the subject".* Taking all these into consideration, it is possible to say that the multiple intelligences theory-assisted layered curriculum provided the students with the opportunity to repeat the subjects.

Another sub-theme related to the useful aspects of the multiple intelligences theory-assisted layered curriculum is 'to motivate student to do research'. One of the students, (**S4-M/m)** who thought that they did research to be able to do their chosen activities and this was useful for them stated that "…*It was useful. We had to do research in order to perform the activities we chose. This allowed us to learn the subjects better. He helped me to succeed better in the course*". Another student, (**S14-F/l)** stated her opinions as in the following; *"It helped me to learn. While I was doing activities, I did more research on the subject and learned more"*. Similarly, the course teacher emphasized that the application motivated students to do research by saying "*…its useful aspects can be listed as that it motivates students to research and use the methods of accessing information and knowledge"*. This was expressed in the observation notes as in the following, (**Obs-01-12-2010)** *"In order to carry out the tasks they chose, students did research by using textbooks and source books"*. In general, it is seen that the activities carried out on different subjects related to each layer in the applications, and the applications that motivated the students to do research were useful in this respect.

One of the sub-themes related to the useful aspects of the multiple intelligences theory-assisted layered curriculum was 'active participation in the lessons'. One of the students, (**S9-K/l)** who indicated that the multiple intelligences theory-assisted layered curriculum was effective in ensuring the active participation of the students in the lesson stated that *"…It may have been beneficial. In the past, I did not participate in the lessons very much; thanks to these activities my participation in the course increased, I had the chance to express myself more easily".* The necessity of selecting and performing the activities in each layer enabled the students to spend more active time in the classroom environment.

One of the sub-themes related to the useful aspects of the use of a multiple intelligences theory-assisted layered curriculum was to 'increase in interest'. The course teacher with his statement that "*It is seen that the interest of the students increased in the lower layers where activities were easier to do and in the higher layers where more difficult tasks were involved*" indicated that students' interest in the lessons increased with the activities in the application.

Activity selection criteria of the students when applying the multiple intelligences theory-assisted layered curriculum

The most important feature of the layered curriculum is that students are able to select the activities that should be done in order to proceed from one layer to another. Students do choose the activities that they think they can do from the given tables. During the preparation of the activities, attention was paid that they appealed to different intelligence areas. The model related to this theme is presented in figure 2.

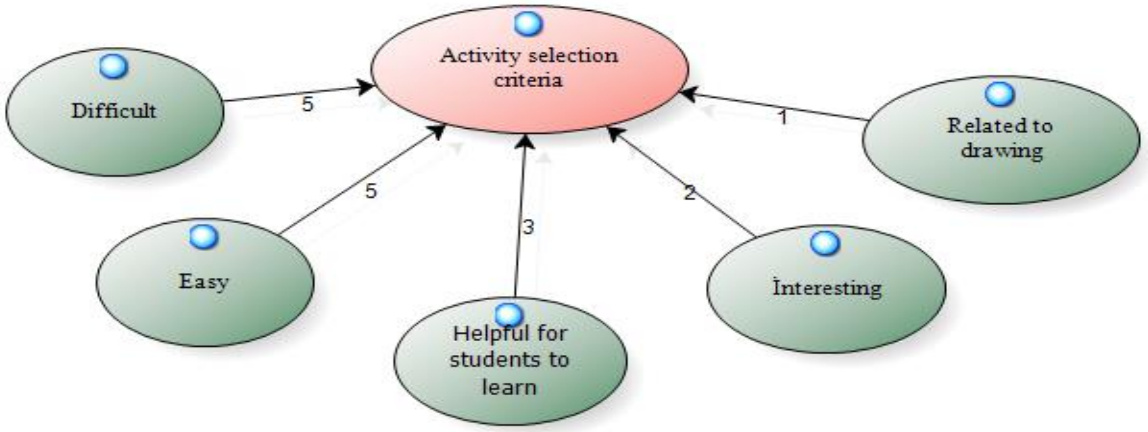


Figure 2. The model related to the activity selection criteria when applying the multiple intelligences theory-assisted layered curriculum.

As a result of the analysis on teacher, student interviews and observation notes, it was found that the sub-themes related to the selection of activities were 'easy', 'difficult', 'helpful for students to learn', 'interesting', 'and related to drawing'. The students, who preferred difficult activities, stated that they chose the subjects from the activities that were outstanding and needed to be learned. A student, (**S3-F/m)** who indicated that she made sure that it was difficult when choosing an activity expressed her opinion with the following statement; "*I tried to make sure that it was difficult and outstanding, and so difficult that nobody would be able to do it easily*". Another student, **(S8-M/m**) expressed his views as in the following "… *when choosing an activity, I made sure that I choose the difficult subjects which thought I had to learn*". Another student (**S9-F/l)** expressed his views as in the following; "*I choose the difficult subjects that I had to learn"*. Another student (**S12-F/h)** explicated her activity selection criteria as in the following; "*There were a lot of issues I didn't know about in the unit, so I chose the difficult things I thought I had to learn from them. I thought it would be easier for me to learn the subjects if I chose the activities related to difficult subjects"*. This situation was explicated in the observation notes, (**21-12-2010)** as in the following; "*Students often choose activities that interest them, that they can do more easily, those that won't take too much time. Additionally, there are students who choose activities from particularly difficult subjects and try to be different*".

One of the students, (**S1-F/h)** who said that she made sure that the activities were easy said the following; "...*I made sure they were easy. I tried to choose activities that would not exhaust and force me and not take a lot of time"*. Another student, (**S5-M/l)** expressed himself with the following statement; "*I made sure that the activity was easy".* Another student, (**S11-F/h)** summed up her assessment like this; *"I chose the subjects I already knew; I chose the easy ones…."* Another student (**S13-M/m**) stated his views with the following statement; "*I made sure that the activity was easy and is related to the subjects we learnt before"*. The statement in the observation notes (**Obs-21-12-2010)** "*Students mostly prefer the activities that often interest them, that they can do easily and do not take too much time to do…"* was similar to the students' views.

The students stressed that they chose the activities that helped them learn better. One of the students, (**S2-M/l)** expressed this as in the following statement; "*I made sure that I chose the activities that would allow me to repeat the poem type of subjects. I learnt better when I repeated the topics to do the activities*". Another student, (**S12-F/h)** expressed her views with the following statement; "*There were a lot of subjects I didn't know about in the relevant unit, so I chose the difficult ones I had to learn from. I thought it would be easier for me to learn the topics if I chose the activities related to difficult subjects…"* Similarly, another student, (**S14-F/l)** summed up her views as in the following statement; "*I chose the activities related to the subjects I was weak on, so I thought I would learn the subjects better this way"*. When all these are taken into consideration, it is possible to say that while selecting the activities, the students made sure to choose the activities that would help them learn. It is seen that the students who made sure that the activities were interesting while selecting them, chose the activities that they would enjoy and would not bore them. One of the students, (**S7-M/h)** expressed his views as follows; "*I made sure that the activities were interesting. I thought I would be more successful in the subjects that interested me*". Similarly, another student, (**S10-F/h)** explained her activity selection criteria as in the following; "*I was careful about the subjects. I tried to choose the subjects I would not to get bored and I would enjoy while studying, and made sure that they were interesting activities"*. Another student, (**S4-M/m)** stated that he made sure that the activity was related to drawing expressed his views with the following statement; "*I made sure to choose the activities in which I could draw. Since I like to draw pictures, I have chosen the activities such as preparing concept maps and posters…"*

The difficulty experienced in some layers in the application of the multiple intelligences theory-assisted layered curriculum

Within the scope of the present study, it was found that the students had difficulties in some layers while the practices were in progress. When analyzing the qualitative data, the encodings related to the problems experienced during the applications were gathered under the main theme of the "difficult steps". The model related to this theme is presented in figure 3.

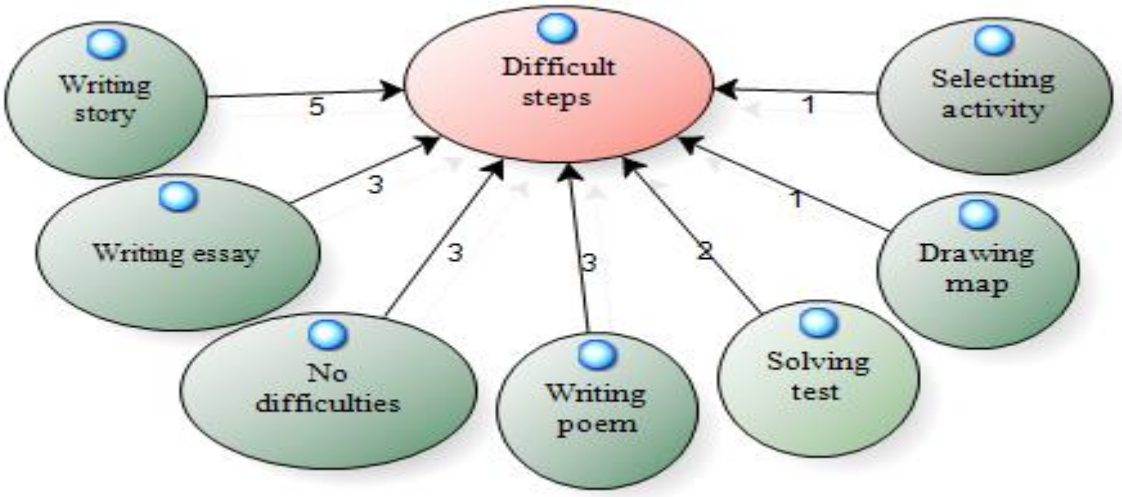


Figure 3. Model for the difficulty experienced in some steps in the application of the multiple intelligences theory-assisted layered curriculum

It is seen that the layers with the highest difficulty during the implementation of the multiple intelligences theory-assisted layered curriculum are listed as 'writing story', 'writing essay', 'writing poem', 'solving test', 'drawing map', and 'selecting activity'. Some of the students stated that they did not have any difficulty at any step in applying the multiple intelligences theory-assisted layered curriculum.

During the applications, one of the sub-themes related to the difficult steps was 'writing story'. The students who indicated that they had difficulty in writing a story stated that they had difficulty in the selection of the subject and felt the need to do research in the writing stage. One of the students, **S3-F/m.**, who indicated that she had difficulty in this step explicated why she had difficulty saying "*I had the most difficulty in the A Layer. I had a hard time in writing stories and poems. I've had a hard time in choosing subjects when writing stories and poems"*. Another student, (**S4-M/m)** stated that "*I had a hard time in Layer? A. I had trouble writing the story. I had to do research to write a story about the Ottoman period"*. Another student, (**S11-F/h)** summed up her views with the following statement; "*I had a hard time in the step of writing stories"*. Another student, (**S13-M/m)** expressed her views as follows; "*I had most difficulty in the B Layer. We were asked to write a story. I had a hard time in writing a story and essay"*. One other student, (**S14-F/l)** indicated the difficulty she experienced as follows; *"I had the greatest difficulty in Layer A. I had some difficulty in concentrating on my story*".

One of the students, (**S1-F/h)** who indicated that she had most difficulty in writing an essay explicated her views with the following statement "*I had some difficulty in writing an essay in the A Layer. It is because I also have a difficulty in writing essays in other courses. I have a difficulty in concentrating and organizing my thoughts*". Another student, (**S13-M/m)** expressed his views as follows; "*I had most difficulty in the B Layer. We were asked to write a story. I had a hard time in writing an essay"*. When the observation notes related to the layers in which difficulties were experienced in the application of multiple intelligences theory-assisted layered curriculum are examined, it is apparently observed that the students had difficulty in performing the activities in the upper layers. In the observation notes, (**Obs-21-12-2010)** it was explicated with the following statement; "*During the practice sessions, students had difficulties in performing activities in higher layers such as essay writing rather than the activities in the lower layers*".

One of the sub-themes that was regarded difficult during the applications was the "writing poem" activity. While one student, (**S3-F/m)** who indicated that she had difficulty in writing poem said that "*I had the hardest time in the A Layer. I had a hard time writing stories and poems. I've had difficulty in choosing stories when writing stories and poems*", another student, (**S6.F/m)** explicated as follows emphasizing similar points; "…*I had difficulty in the A Layer. I had a hard time in writing poem. I'm not good at writing poems and stories; I've had a hard time choosing a topic"*. Another student, (**S9.F/l**) explicated her views as follows; "*I had difficulty in the A Layer. I had a hard time especially in writing poem."* One of the students, (**S2-M/l)** who indicated that he had difficulty in the "test solving" activity, expressed his views with the following statement; "*I had a hard time in solving the test in the C Layer. I had difficulty in solving some of the questions in the test"*. Another student, (**S10-F/h)** indicated the difficulty he had as follows; "*I had a hard time in solving the test in the B Layer"*.

One of the students, (**S7-M/h)** who stated that he had no difficulty at all in any layer in the application, explicated his views as follows; "*I had no difficulty at all in any layer; I implemented all the layers easily"*. Another student, (**S8-M/m**) summed up as follows; "*I had no difficulty during the implementation of the activities*". Another student, (**S12-F/o)** summed up her views as follows "*There was no layer I had difficulty in*". One student, (**S5-M/l)** who indicated that he had difficulty in the "drawing map" activity, expressed his views as follows; "*I had a hard time the most in the C Layer in the stage of drawing a map*".

In the application of the multiple intelligences theory-assisted layered curriculum, one of the sub-themes related to the difficult steps was identified as "selecting activity". The teacher stated that the students had the greatest difficulty in choosing activities. The course teacher expressed his views "*I think that the students sometimes have problems in choosing the appropriate activities. They have had difficulty in identifying the activities they can do according to their abilities when selecting the activities from the lists given to them"*.

The most popular activity in the application of the multiple intelligences theory-assisted layered curriculum
It is seen that the students' encodings related to the activities they like doing are gathered under the theme of the 'most popular activity'. The model related to this theme is presented in figure 4.

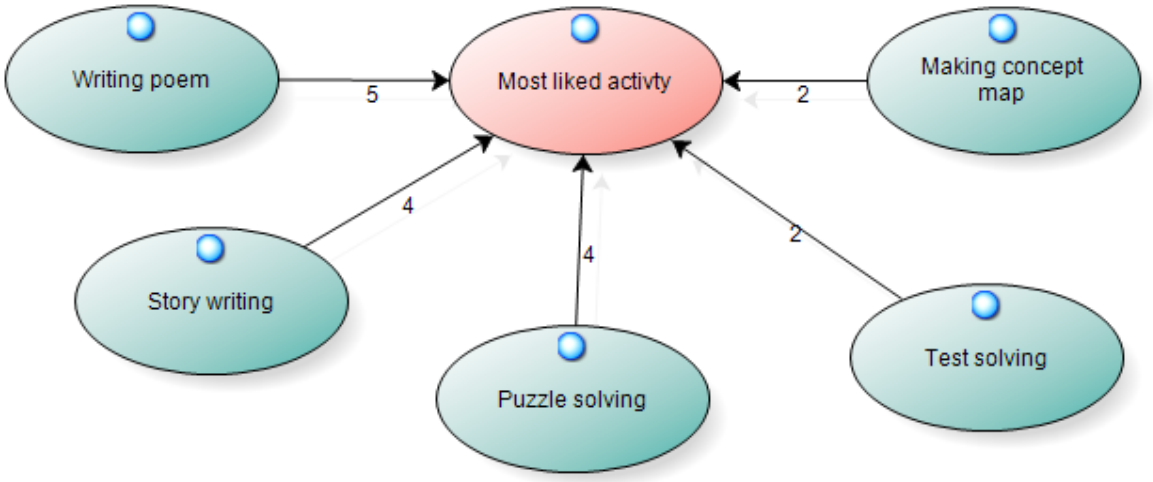


Figure 4. Model for the most liked activity in the application of the multiple intelligences theory-assisted layered curriculum

The students were asked to select the activities from the lists given to them while the application of the multiple intelligences theory-assisted layered curriculum was underway. The students did some of the activities from the list of activities prepared based on different intelligence areas more willingly than others. During the applications, it was found that the activities that students loved to do the most willingly were 'writing poem', 'story writing', 'puzzle solving', 'test solving' and 'concept mapping'.

One of the students, who (**Obs-S2-M/l)** stated that he loved writing poem the most in the application of the multiple intelligences theory-assisted layered curriculum, expressed his views as follows; "*I loved writing poems"*. Another student, **(S3-F/o)** indicated that she liked writing poem the most with the following statement; *"The activity I liked the most was writing poem.*". Another student, (**S11-F/h)** expressed her views as follows; "*I liked writing poem in the A Layer; puzzle solving in the C Layer"*. Similarly, another student, (**S12-F/h)** expressed her views as follows; *"I liked writing poem in the A Layer"*. Another student, (**S13-M/m)** expressed his views as follows; "*I loved writing poems the most"*.

One student indicating that her most favorite activity was writing a story, stated that she did research in order to write a story and that it was beneficial to her for learning the subjects. One of the students, (**S14-F/l)** who liked the story writing activity, explained her reasons as follows; "*The activity I liked the most was the story writing. While writing a story, I did a lot of research for it, therefore, I learnt many things"*.

One of the students, (**S4-M/m)** indicating that his most favorite activity was solving puzzles, expressed his views as follows; "*I liked the puzzle solving activity in the C Layer; I liked it a lot when answering the questions I knew; I did research on the questions I did not now*". Another student (**S7-M/h)** expressed his views as follows; "*I loved solving puzzles about Crusades*". While one student, (**S8-M/m)** expressed his views with the statement "*I enjoyed solving puzzles very much"*, another student, similarly, (**11-K/h)** expressed her views as follows; "*I liked writing poem in the A Layer; puzzle solving in the C Layer very much"*. One statement in the observation notes also seemed to support the fact that solving puzzles was one of the activities that students enjoyed doing the most. In the observation notes, (**Obs-21-12-2010)** the statement that "…*Although the students did not know the questions, they enjoyed puzzle-solving activity the most"* supported the statements of the students.

One of the students, (**S1-F/h**) who indicated that the activity she liked the most was doing tests, expressed her views with the following statement "*I enjoyed doing tests. I think it will be useful for my exams as well*", another student, (**S6.F/m**) expresses her views in a similar way, saying; "*I enjoyed doing tests the most*".

Other courses in which the multiple intelligences theory-assisted layered curriculum can be applied

The students stated that the multiple intelligences theory-assisted layered curriculum can be applied in other courses as well. The model related to this theme is presented in Figure 5.

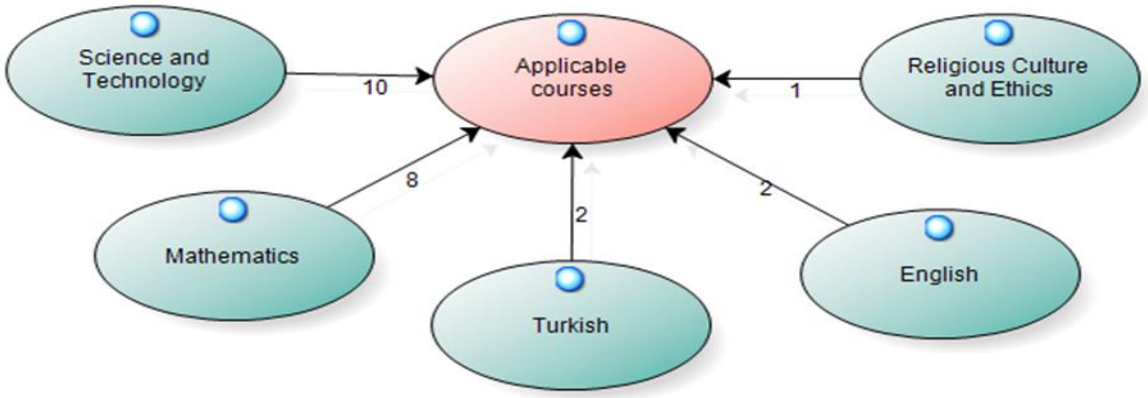


Figure 5. Model for the other courses in which the multiple intelligences theory-assisted layered curriculum can be applied

Considering the assessments of the students, the courses in which the multiple intelligences theory-assisted layered curriculum can be applied are listed as; 'Science and Technology', 'Mathematics', 'Turkish', 'English', and 'Religious Culture and Ethics'. The students who stated that the multiple intelligences theory-assisted layered curriculum could be applied in the Science and Technology course, emphasized that the course could be learned more easily this way and could be a lot of fun. One of the students, (**S1-F/h)** emphasized that the course would be a lot of fun saying "*Science and Technology and Mathematics; I am not very successful in these courses. I could be more successful if the layered curriculum was applied in these courses as well"*. Similarly, another student, (**S5-M/l**) summed up his views with the following statement; "*The program could be applied in the Science and Technology and Religious Culture and Ethics courses. The course could be a lot of fun"*. One other student, **S10-F/i.**, expressed her views with the following statement; "*I wish the program was applied in the Science and Technology course. The Science and Technology would be a lot of fun"*. While one student, (**S3-F/m**) stated that the course would be easier for her to follow with the following statement; "*The program could be applied in the Science and Technology course. It's because I do not understand anything in this course"*, another student, (**S2-M/l**) emphasized that "*It could be applied in the Science and Technology course. It may make it easier for the student to understand and follow this course"*. One another student, on the other hand, (**S4-M/m**) expressed her views as follows; *"…the Science and Technology course. It may make it easier for us to understand this course.* Another student, (**S7-M/h)** expressed his views as follows "*It could be applied in the Science and Technology and Mathematics courses"*. The students, who stated that the multiple intelligences theory-assisted layered curriculum could be applied in the Mathematics course, indicated that this course could be understood more easily and students' achievement levels would increase. One of the students, (**S8-M/m)** emphasized the fact that the application of the program made the learning of the courses easier saying "*It could be applied in Mathematics course. It's because I am not very successful in this course and I have difficulty in understanding the subjects"*. Another student, similarly, (**S11-F/h)** "*Science and Technology and Mathematics courses; I have difficulty in understanding these courses. If the layered curriculum is applied, I think I will be able to understand and follow these courses more easily"*.

While one of the students, (**S6.F/m**) who thought that the multiple intelligences theory-assisted layered curriculum could be applied in the Turkish Language course, stated that the program could be applied in the Turkish course as well saying "*It could be applied in the Turkish course"*, another student, (**S14-F/l)** stated that the courses would be a lot of fun with the statement; "*I wish the program was applied in the Turkish and Mathematics courses. These courses would be a lot of fun"*. One of the courses in which the multiple intelligences theory-assisted layered curriculum can be applied is the Religious Culture and Ethics course. The student, (**S5-M/l)** who expressed his views on this issue indicated that the courses would be more enjoyable; "*It could be applied in the Science and Technology course and Religion and Ethics courses. The courses could much more fun"*.

Findings related to different aspects of the multiple intelligences theory-assisted layered curriculum from the traditional method

When the findings were examined, it was seen that there were different student and teacher views on the different aspects of the multiple intelligences theory-assisted layered curriculum from the traditional method. Considering this situation, the main theme of 'the difference from the traditional method' was formed. The model related to this theme is presented in figure 6.

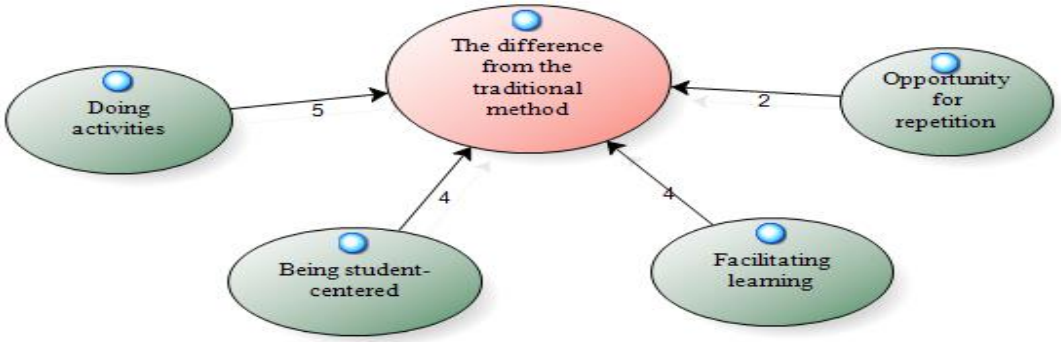


Figure 6. The model related to the different aspects of the multiple intelligences theory-assisted layered curriculum from the traditional method

As a result of the interviews carried out with the students and teachers, it was seen that sub-themes such as 'doing activities', 'being student-centered', 'facilitating learning' and 'opportunity for repetition' were formed related to different aspects of layered curriculum practices from the traditional method. One of the sub-themes related to the different aspects of the multiple intelligences theory-assisted layered curriculum from the traditional method was "doing activities". One of the students, (**S1-F/h)** who expressed her views related to this issue explicated her position saying; *"...It was different. Under normal circumstances, we do not do any activities in the lesson; we do not do tests or solve puzzles related to the relevant subject; in this sense, I think it is different"*. Another student, (**S4-M/m)** emphasized the different aspects of the application as follows; "*In the traditional method, the course teachers would simply lecture the subject; in this method, we did activities within the subject and had the chance for revision"*. While one another student, (**S10-F/h)** expressed her views with the statement "*After the course teacher lectured the subject, he did not do much (in terms of activities) apart from using the course book. Through the activities, we had revision; also it was a lot of fun to select activities from the table and do them*", another student, similarly, (**S14-F/l)** indicated that they did more activities with the new method and this helped them to learn better as follows; "*Previously, we would just move onto the following subject after reading the previous one; with this method, we did much more activities; I learnt much more this way*".

The students, who thought that the important difference of the multiple intelligences theory-assisted layered curriculum was that it was student-centered, indicated that especially the fact that the selection of activities by the student helped the students to have more say in the course. One of the students, (**S3-F/m**) emphasized the fact that the activities were selected by the students themselves "*Our teacher selected the activities we would do before; in this method, we were able to select the activities ourselves. We could have a lot of mistakes without knowing the subject, but after learning the subject, we found that we had fewer mistakes"*. Another student, (**S7-M/h)** saying

that "*The students are more relaxed; they act on their own ideas; they can express themselves and speak out without waiting for the course teacher to allow them to speak*", he indicated that they were able to express themselves more comfortably during the practices. Similarly, another student, (**S11-F/h**) expressed her views as follows; "*In the other (traditional) method, the teacher constantly explained (lectured); we only spoke when we were asked to answer, but in layered curriculum method, we prepared and taught the subject from what we know, what we remember and the information we have received from the books. This helped us to understand the subjects better"*. The findings obtained from the interview with the course teacher also support this state of affairs. The course teacher expressed his views as follows; "…*this stops the students to be the mere recipients of knowledge and information and enables them to generate it; this, eventually, boosts students' self-confidence"*.

One of the students, **(S2-M/l)** who emphasized the 'facilitating learning' aspect of the multiple intelligences theory-assisted layered curriculum, expressed his views as follows; "This method helped me to understand the subjects better. I learned better with the activities, I was not bored*"*. Another student, (**S5-M/l)** expressed his views as follows; "*This method helped me to understand the subjects better"*. Another student, (**S9-F/l)** emphasized that she learnt the subject she had difficulty with previously better through this method. "*I had difficulty in learning the subjects about history. Afterwards, when we started to cover the subjects with the layered curriculum method via the activities, this facilitated my learning"*. Another student, (**S12-F/h)** expressed her views as follows; "*What we always did in the class was to read the relevant subjects from the course book; but we utilized different sources this time; I think I have learnt much more this way"*. Students who emphasized the sub-theme of "the opportunity for repetition" in relation to the different aspects of the multiple intelligences theory-assisted layered curriculum indicated that they remembered the relevant knowledge more easily. While one of the students, **(S8-M/m)** stated that he had more chances to revise the subject with the layered curriculum method, expressed his views as follows; "*In the traditional method, we would forget the knowledge we had learned after a while, but in this method, we remembered the subjects during the exams more easily because we had the opportunity to repeat the subject through activities"*, another student, similarly, (**S13-M/m)** expressed his views as follows; "*Previously I would only read the relevant subject once and I would move on to the next one; we had a chance for repetition with the layered curriculum method; we were able to remember the subjects more easily this way"*. One another student, (**S6.F/m)** emphasized that the activities made the lesson more enjoyable as follows; "*Having lessons via the layered curriculum method was much more fun than the good old traditional method. We had more opportunities to do activities; we solved puzzles related to the subject*".

Discussion and Conclusion

This study aimed to determine students' and teacher's opinions about the effectiveness of multiple intelligences theory supported layered curriculum. To do that, 14 students and the Social Studies teacher were interviewed. The useful aspects of the multiple intelligences theory-assisted layered curriculum were identified as 'helping students to learn', 'repetition', 'motivating to do research', 'active participation in the lesson', and 'increasing students' interest' by students. Similarly, in Biçer's (2011) study, the contributions of the multiple intelligences theory-assisted layered curriculum were listed as increasing students' course success, facilitating the learning, enabling the permanence of knowledge, increasing students' vocabulary, and repetition. In another study carried out by Yılmaz and Gültekin (2013), on the other hand, it was concluded that the activities carried out with the layered curriculum facilitated students' learning. Yılmaz (2010) stated that with the layered curriculum, students' ability to make summary improved and the students had an opportunity to improve some of their skills and abilities that they were not aware of. In the study carried out by Duman and Özçelik (2017), it was concluded that the applications related to the layered curriculum increased the interest of the students towards the course. Ilıman and Evin Gencel (2018) concluded that layered curriculum had positive contributions such as permanency of learning and being intriguing. According to Akran Koç (2018), with layered curriculum program, the students undertake responsibility, use their creativity and assess things critically. During the applications, it was concluded that the students tried to participate the courses effectively and exerted efforts to carry out the assigned tasks. In a study by Başbay (2006), it was concluded that the layered curriculum increased the learners' desire to be in a learning environment and made learning enjoyable.

When they selected the activities, the students made sure that the activities were 'difficult', 'easy', 'helpful for students to learn', 'interesting', and 'related to drawing'. In general, they chose to do activities that were appropriate for their areas of interest. In parallel with the current study, Durusoy (2012) concluded that the students

chose activities in line with their own abilities and those that they could do more easily. Yılmaz (2010) found that the students preferred informative, entertaining, feasible and non-boring activities in their selection of activities. In the study conducted by Yıldırım (2016), it was found that when selecting the activities, the students made sure that the activities had the features such as being easy, difficult, enjoyable and challenging.

In the process of implementation of the multiple intelligences theory-assisted layered curriculum, it was revealed that the students had difficulties in the steps of 'writing story', 'writing essay', 'writing poem', 'solving test', 'drawing map', and 'selecting activity'. Considering the layers in which the students experienced difficulties during the applications, it was seen that they had difficulty in doing activities in the higher layers in general. There were also some students who stated that they did not have difficulty during the applications. In Gömleksiz and Öner's study (2013), students similarly stated that they had difficulties in choosing the activities. Yılmaz (2010) concluded that students experienced difficulties in writing essays and creating concept maps. The students also emphasized that they had problems in reaching the resources and making the related activities. Durusoy (2012) stated that some of the students had difficulties in performing the activities and found the process exhausting.

During the applications, the students enjoyed the activities such as 'writing poem', 'story writing', 'puzzle solving', 'test solving' and 'concept mapping' students stated that they liked doing the activities that were in line with their areas of interest. Biçer (2011) indicated that students liked the activities such as writing a paragraph, preparing for a test, conducting an interview, preparing a flashcard, writing poems or stories, drawing pictures, making a TV program and making a presentation.

Other courses in which the multiple intelligences-assisted layered curriculum could be applied were listed as 'Science and Technology', 'Mathematics', 'Turkish', 'English', and 'Religious Culture and Ethics'. The students generally indicated that the applications related to this layered curriculum could be applied in the courses that they thought were difficult, so they could learn more easily and the courses could be more enjoyable. In the study of Gömleksiz and Biçer (2012), in support of the present study, the students would wish the layered curriculum to be applied in the courses in which they had difficulties. Yılmaz (2010) stated in his/her study that the layered curriculum could be applied in the Turkish and Mathematics courses.

Another result obtained in relation to the application process of the multiple intelligences-assisted layered curriculum was related to the difference between the layered curriculum and the traditional method. The different aspects of the layered curriculum were 'doing activities', 'being student-centered', 'facilitating learning', and 'opportunity for repetition'. The students stated that they had the opportunity to do activities during the application of the program and that they performed many more tasks in the classroom. In the study of Yılmaz (2010), it was observed that the fact that the layered curriculum contributed to the active participation of the students was emphasized. In the study conducted by Önel and Derya Daşcı (2018), prospective teachers stated that the course became more enjoyable with the applications related to the layered curriculum. In Yıldız's study (2018), it was emphasized that layered curriculum enabled students to participate in the course more actively. Following recommendations are offered based on the results of the current study:

1. The appropriate materials needed for the multiple intelligences-assisted layered curriculum to be implemented in a classroom environment should be provided if we use this approach of course.
2. In this study, the layered curriculum was implemented with the assistance of the multiple intelligences theory. The Layered Curriculum can be applied by the combination of different learning approaches (Cooperative Learning, Problem Based Learning).
3. The activities related to the multiple intelligences-assisted layered curriculum can be performed in a computer environment in an intelligent classroom environment.
4. Additional quantitative and qualitative studies in which the multiple intelligences-assisted layered curriculum is implemented at different grade levels and in different courses can be carried out.

Acknowledgment

This article is a part of Ümmühan ÖNER's PhD thesis entitled "The effect of layered curriculum supported by multiple intelligence theory on students' academic achievement, attitudes and permanence" under the supervision of Prof. Dr. Ali Sinan BİLGİLİ and Assoc. Prof. Dr. Mehmet Nuri GÖMLEKSİZ at the Institute of Educational Sciences in Atatürk University.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Prof.Dr. Ali Sinan BİLGİLİ	☒	☒	☐	☐	☐	☒
Prof.Dr. Mehmet Nuri GÖMLEKSİZ	☒	☒	☐	☐	☐	☒
Asst. Prof. Ümmühan ÖNER	☒	☒	☒	☒	☒	☒

References

Akboy, R. (2005). *Eğitim psikolojisi ve çoklu zekâ [Educational psychology and multiple intelligence]*. İzmir: Kanyılmaz Printing House.

Akran Koç, S. (2018). 6. sınıf fen ve teknoloji dersinde basamaklı öğretim programı uygulamasının öğrencilerin biliş ötesi farkındalıklarına etkisi [The effect of the application of layered curriculum on the metacognition awareness of students in the 6th class science and technology lesson]. *Anatolian Journal of Educational Leadership and Instruction,* 6(1), 1-25.

Baş, G. (2011). Çoklu zekâ kuramının öğrenme-öğretme sürecine yansıması [Reflection of multiple intelligence theory on the learning-teaching process]. *Education in the Light of Science and Mind***,** 138, 14-28.

Başbay, A. (2006). *Basamaklı öğretim programıyla desteklenmiş proje tabanlı öğrenmenin sürece, öğrenen ve öğretmen görüşlerine etkisi [*Effect of project based learning approach supported by layered curriculum on learning process, opinions of the learners and teachers*]*. Doctorate Dissertation, Hacettepe University, Ankara, Turkey.

Başbay, A. (2010). Basamaklı öğretim programı *[*Layered Curriculum*]*, Özcan Demirel (Ed.), *Eğitimde yeni yönelimler [New trends in education]* (pp. 245-258). Ankara: Pegem Academy Publishing.

Biçer, S. (2011). *Fen ve teknoloji dersinde basamaklı öğretim yönteminin öğrenci başarısına, kalıcılığa ve tutumlarına etkisi* [Effects of the layered curriculum teaching method on student's success, permanence and attitudes in science and technology course*]*. Master Thesis, Fırat University, Elazığ, Turkey.

Bümen, N. (2005). *Okulda çoklu zekâ kuramı [Multiple intelligence theory in school].* Ankara: Pegem Academy Publishing.

Bümen, N. (2010). Çoklu zekâ kuramı ve eğitim *[*Multiple intelligence theory and education*]*, Özcan Demirel (Ed.)*, Eğitimde yeni yönelimler [New trends in education]* (pp. 1-38). Ankara: Pegem Academy Publishing.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2010). *Bilimsel araştırma yöntemleri [Scientific research methods]*. Ankara: Pegem Academy Publishing.

Demirel, Ö. (2006). *Kuramdan uygulamaya eğitimde program geliştirme (9. bs.) [Curriculum development in education from theory to practice (9th ed.)*. Ankara: Pegem Academy Publishing.Demirel, Ö., Başbay, A. & Erdem, E. (2006). *Eğitimde çoklu zekâ "kuram ve uygulama" [Multiple intelligence theory and practice in education]*. Ankara: Pegem Academy Publishing.

Demirel, Ö., Başbay, A. & Erdem, E. *(2006). Eğitimde çoklu zekâ "kuram ve uygulama" [Multiple intelligence in education "theory and practice]* Ankara: Pegem Academy Publishing.

Demirel, Ö., Şahan, H.H., Ekinci, N., Özbay, A.& Begimgil, A. M. (2006). Basamaklı öğretim programının süreç ve ürün açısından değerlendirilmesi *[*Evaluation of the curriculum in terms of process and product*]*. *Journal of National Education,* 172, 72-90.

Duman, B. & Özçelik, C. (2017). 7. Sınıf çember ve daire konusunda basamaklı öğretim uygulamasının öğrencilerin matematik dersine ilişkin akademik başarı ve tutumlarına etkisi [The effect of layered curriculum use for the 7th grade circle and circular region subject on academic success and attitude towards mathematics]. *Bartın University Journal of Faculty of Education,* 23(111), 51-55.

Durusoy, H. (2012). *6. sınıf kuvvet ve hareket ünitesinde basamaklı öğretim yöntemi ve yaratıcı drama yönteminin öğrenci erişisine ve kalıcılığa etkisi [The effects of curriculum layered and creative drama methods on 6th grade force and movement unit on student achievement and retention]*. Master Thesis, Hacettepe University Ankara, Turkey.

Ekiz, D. (2003). *Eğitimde araştırma yöntem ve metodlarına giriş: Nitel, nicel ve eleştirel kuram metodolojileri* [Introduction to research methods and methods in education: Methodologies of qualitative, quantitative and critical theory]. Ankara: Anı Publishing.

Gardner, H. (1993). *Multiple intelligences: the theory in practice*. Basic Books Publication.

Gardner, H. (2004). *Zihin çerçeveleri çoklu zekâ kuramı [Frames of mind: The theory of multiple intelligences]* (Ebru Kılıç, trans.). İstanbul: Melisa Publishing.

Gökçe, O. (2008). *İçerik analizi kuramsal ve pratik bilgiler [*Content analysis theoretical and practical knowledge*]*. Ankara: Siyasal Book Publishing.

Gömleksiz, M. N. & Biçer, S. (2012). Fen ve teknoloji dersinde basamaklı öğretim programının öğrenci başarısına, kalıcılığa ve tutumlarına etkisi [Effects of the layered curriculum on student's success, permanence and attitudes in science and technology Course]. *International Journal of Human Sciences,* (9)2, 1657-1683.

Gömleksiz, M. N. & Öner, Ü. (2013). Basamaklı öğretim programının sosyal bilgiler dersinde öğrencilerin akademik başarılarına ve tutumlarına etkisi [The effect of stepped curriculum on students' academic achievement and attitudes in social studies course]. *Journal of National Education,* 43(198), 173-195.

Gürel, E. & Tat, M. (2010). Çoklu zekâ kuramı: tekli zekâ anlayışından çoklu zekâ yaklaşımına [Multiple intelligence theory: From unitary intelligence conception to multiple intelligence Approach]. *The Journal of International Social Research,* 3, (11). 336-356.

Ilıman, M. & Evin Gencel, İ. (2018). İngilizce dersinde basamaklı öğretim programına ilişkin bir eylem araştırması [An action research on layered curriculum in an efl class]. The 1st International Conference on Critical Debates in Social Sciences 05-07 October 2018 (pp.50-59). İzmir Democracy University, Turkey.

Maurer, L. A. (2009). *Evaluating the use of layered curriculum and technology to increase comprehension and motivatıon in a middle school classroom.* Master Thesis, Michigan State University, Michigan, United States of America.

Nunley, K. (2002). *Layered curriculum.* Morris Publishing.

Nunley, K. (1998). An overview of Dr. Kathie Nunley's layered curriculum. Retrieved 7 December 2011 Web: http://help4teachers.com/how.htm.

Nunley, K. (2003). Layered curriculum brings teachers to tiers. *Principal Leadership,* 69(1), 31-36.

Önel, A. & Derya Daşcı, A. (2018). Fen bilimleri öğretmen adaylarının basamaklı öğretim programı uygulamasına ilişkin görüşleri [Views of science teacher candidates related to layered education curriculum]. *Erzincan University Journal of Education Faculty.* 20(2), 517-535.

Saban, A. (2002). *Çoklu zekâ teorisi ve eğitim* [*Multiple intelligence theory and education*]. Ankara: Nobel Publishing.

Sezer, S. (2005). Öğrencinin akademik başarısının belirlenmesinde tamamlayıcı değerlendirme aracı olarak rubrik kullanımı üzerinde bir araştırma [A study on the use of rubrics as a complementary assessment tool in identifying the student's academic success]. *Pamukkale University Faculty of Education Journal*, 18, 61-69 Web: Accessed from the http://pauegitimdergi.pau.edu.tr/Makaleler/1916098105_6 address on March 29, 2012.

Tavşancıl, E. & Aslan, E. (2001). *Sözel yazılı ve diğer materyaller için içerik analizi ve uygulama örnekleri* [*Content analysis and application examples for verbal and written materials*]. İstanbul: Epsilon Publishing.

Yıldırım, A. & Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri* [*Qualitative research methods in the social sciences*]. Ankara: Seçkin Publishing.

Yıldırım, Z. (2016). *"Alan ölçme" öğretiminde basamaklı öğretim yönteminin etkisinin incelenmesi [Examining the effect of the layered curriculum method in teaching "area measurement"].* Doctorate Dissertation, Atatürk University, Erzurum, Turkey.

Yıldız, M. (2018). *İlkokul 4. sınıf fen bilimleri dersinde yansıtıcı öğretim ile desteklenmiş basamaklı öğretimin akademik başarıya ve tutuma etkisi [The effect of layered curriculum supported by reflective teaching on academic achievement and attitude primary school 4th grade science course*]. Master Thesis, Bartın University, Bartın, Turkey.

Yılmaz F. & Gültekin, M. (2013). Fen ve teknoloji dersinde basamaklı öğretim programı uygulamaları. [Applications of layered curriculum in science and technology course]. *Journal of Computer and Educational Research,* 1(1), 27-59.

Yılmaz, F. (2010). *Fen ve teknoloji dersinde basamaklı öğretim programı uygulamaları [Applications of layered curriculum in science and technology course]*. Doctorate Dissertation, Anadolu University, Eskişehir, Turkey.

Appendix 1

Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	Students' and Teacher's Views on the Effectiveness of Multiple Intelligences-Assisted Layered Curriculum in the Social Studies Course
Discipline	Education
Type of Article	Research article
Year of Data Collection	2010-2011 academic year

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that the study was conducted in 2011. Because ethical permission was not demanded at that time. We have the official permission to conduct the study and was given as attachment.

27/05/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Atatürk University	Prof. Dr	Ali Sinan BİLGİLİ	
2.	Firat University	Prof. Dr	Mehmet Nuri GÖMLEKSİZ	
3.	Firat University	Asst. Prof	Ümmühan ÖNER	

Correspondent Author's Info

Institute	Firat University
Postal address	Firat University Faculty of Education Department of Turkish and Social Sciences Education Elazığ.
E-mail	uoner@firat.edu.tr
Phone	05053487363

Yıldız Durak, H., & Tekin, E. (2020). Examination of social media use of the adults over the age of 50. *Bartın University Journal of Faculty of Education*, 9(2), 427-439.

Bartın University Journal of Faculty of Education, 9(2), 427-439

buefad.bartin.edu.tr

Examination of Social Media Use of the Adults Over the Age of 50

Hatice YILDIZ DURAK*[a], Emel TEKİN[b]

Article Info

DOI: 10.14686/buefad.618138

Article History:
Received: 10.09.2019
Accepted: 23.05.2020
Published: 05.06.2020

Keywords:
New communication technologies,
Social media use,
Individuals over the age of 50,
Lifelong learning,
Adult education

Article Type:
Research Article

Abstract

The aim of this study was to examine social media use statuses of the adults over the age of 50. The participants of the study consisted of 98 adults over the age of 50 living in Bartin province. Data were collected in face to face environment. Mixed method was utilized in the research. As a result of the research, while there was no difference in social media usage status of the participants depending on their gender, there were differences in social media usage status of the participants based on their age groups, working statuses and educational levels. When participant opinions are examined; it is understood that participants in general use social media to follow the agenda/people.When the codes are examined, it is observed that they mostly refer to usage with communicational/interactional and educational aims while explaining the reasons for using social media. It is understood that participants prefer not to use social media mostly because of lack of technical knowledge and skills. Afterwards, the reasons that thinking it having no contribution/unnecessary, reasons of health problems, being unattractive and not being widespread in the past/being not able to get used to were observed among the reasons for not using social media.

50 Yaş Üstü Yetişkinlerde Sosyal Medya Kullanımının İncelenmesi

Makale Bilgisi

DOI: 10.14686/buefad.618138

Makale Geçmişi:
Geliş: 10.09.2019
Kabul: 23.05.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
Yeni iletişim teknolojileri,
Sosyal medya kullanımı,
50 yaş üstü bireyler,
Hayat boyu öğrenme,
Yetişkin eğitimi.

Makale Türü:
Araştırma makalesi

Öz

Bu çalışmada 50 yaş üstü yetişkinlerde sosyal medya kullanım durumlarının incelenmesi amaçlanmıştır. Araştırmanın katılımcılarını Bartın iline yaşayan 98 tane 50 yaş üstü yetişkin oluşturmaktadır. Veriler yüz yüze ortamda toplanmıştır. Araştırmanın karma yöntem ile desenlenmiştir. Araştırma sonucunda katılımcıların sosyal medya kullanım durumlarında cinsiyetlerine bağlı bir farklılık bulunmazken, katılımcıların sosyal medya kullanım durumlarında yaş gruplarına, çalışma durumlarına ve eğitim düzeylerine göre bir farklılık vardır. Katılımcı görüşleri incelendiğinde; katılımcıların sosyal medyayı genellikle gündemi/kişileri takip etmek için kullandığı anlaşılmaktadır. Kodlar incelendiğinde katılımcıların sosyal medyayı kullanma gerekçelerini açıklarken en çok iletişim/ etkileşim, eğitsel amaçlı kullanıma değindikleri görülmektedir. Katılımcıların sosyal medyayı genellikle en çok teknik bilgi beceri eksikliğinden dolayı kullanmamayı tercih ettikleri anlaşılmaktadır. Daha sonra ise sırasıyla katkısı olmadığını/ gereksiz olduğunu düşünme, sağlık sorunları, ilgiyi çekmemesi ve eskiden yaygın olmaması/ alışamama nedenlerinin sosyal medya kullanmama nedenleri arasında olduğu görülmektedir.

***Corresponding Author:** hatyil05@gmail.com
[a] Assoc. Prof. Dr., Bartin University, Bartin/Turkey, http://orcid.org/0000-0002-5689-1805
[b]Student, Bartin University, Bartin/Turkey, http://orcid.org/0000-0003-2980-593X

Introduction

Age average of world population increases day by day. According to the report of Elderly in Statistics (2018) by Turkish Statistical Institute [TÜİK], United States of America Bureau of Population, based on International Database, indicates that 9,1% of world population was consisted by elderly population in 2018. When the countries having the highest rate of elderly population, Turkey comes in 66th among 167 countries and her elderly population rate is 8.8 in 2018. Again in the same report, this rate is expected to exceed 15% within approximately twenty years. As age average gets older, possibilities of the individuals in this age group to encounter problems in daily-life works and operations such as education, health services, transportation, banking etc. increase as well (Lee & Coughlin, 2015). Digital technologies' potential of enabling opportunities against these problems are observed to be high. However, it is observed that the individuals in middle-age and elderly periods experience much more fear and anxiety in use of digital technologies (Barnard, Bradley, Hodgson, & Lloyd, 2013). In relation with this status, Peek et al. (2016) attracts attention to the fact that individuals in this period experience problems about acceptance of technology. Though, Ekici-Gümüş (2016) indicate that information technologies make life easier for individuals at all age levels, but they provide solutions for needs of the individuals in middle-age and elderly periods in many areas such as health, personal care and socialization. However, it is stated that studies in the literature generally do not focus too much on the technology usage status of the individuals in this age period and even the individuals in this age period are particularly excluded from the platforms in relation with the use of information technologies (Jin, Kim, & Baumgartner, 2019; Kalınkara & Sarı, 2018). In this context, examination of use of information technologies and social media usage of individuals in middle-age and elderly periods, defined by Clarke (1998), is observed to be necessary.

According to Özsungur and Hazer (2018), during middle-age and elderly periods in which people are under biological and chemical effects in time and experience change, individuals need whole lot more technological devices which will assist them in their daily activities, enable them to perform banking transactions, to get social and psychological support, to have reminder of medicine use and other daily activities and to be more activate them in terms of socialites. This situation also affected middle adults' and elderly people's attitudes of technology usage, acceptances of technology and usage behaviors (Özkan & Purutçuoğlu, 2010). In addition, information technologies and social media environments are tools that adults can utilize to participate in informal learning (Jin, Kim, & Baumgartner, 2019). In this context, research of usage statuses of these technologies by the individuals taking part in this period will provide important clues with regard to lifelong learning.

According to Evens, Franz, Judges, Beermann and Baecker (2019), mid-adults and elderly individuals are psychologically (e.g. social isolation and loneliness) more defenseless. As the root cause of the status, such situations as decrease of mid-adults' and elderly individuals' social circles, decrease in their interactions, health status, physical activity efficacy are indicated. Furthermore, these psychological problems may affect life quality of the individuals in this age groups. Digital technologies may act as a solution in order that mid-adults and elderly individuals are less affected from the psychological problems which may stem from the development period they take part in. Thus, digital technologies may present opportunities and conveniences in order that the individuals having decreased mobility skill construct new social interactions. Within this context, this research will contribute to the literature because of the fact that it researched mid-adults' and elderly individuals' usage statuses of social media environments which provide further access to digital technology and particularly social interaction.

Importance and Aim of the Research

Today increase of life span and population of mid-adults and elderly in Turkey and even in whole world indicates that this age group is needed to be focused on (Yıldırım-Becerikli, 2013). According to the report of Pew Research Center (2018), nearly half (46%) of elderly adults taking part in general population have possession of smart-phone, internet and broadband at home, and their usage rates demonstrated increase. Again, according to report of Pew Research Center (2018), 34% of elderly adults in USA uses social networking sites and intensity of social media use of these users increased. This age group's current statuses of technology usage reveals that further studies are needed to be conducted in order to understand these individuals' motivation to use technology, contexts in which technology used and not used, obstacles and opportunities. Improper evaluation of digital technology usage needs and usage potentials of the individuals in this age group may prevent obtaining potential benefits which will be able to be provided from a large demographic group. Therefore, it is observed that increasing the

number of the researches on digital technology usage of the groups composed by mid-adults and elderly individuals having different demographic characteristics is important. On the other hand, as the world population gets older, adults in this age group will constitute an important part among current and potential users of digital technology. From this point forth, understanding mid-adults' and elderly individuals' status of internet use and how their usage develops may be guiding in terms of how to best support digital technology usage in this age group.

In this study, examination of social media usage of the adults over the age of 50 is aimed. In accordance with this purpose, replies were sought for following questions.

- How is the usage status of information technologies among adults over the age of 50?
    - Internet Usage Experience
    - Daily Internet Usage Time
    - Tools used in Internet access and usage frequency of these tools
    - Frequency of Access to Social Networking Sites
    - Level of competence in using social networks
    - Usage aim of social networks
- How are the social media usage levels of adults over the age of 50?
- Do the social media usage levels of adults over the age of 50 differ based on gender, age, educational level and working status?
- What are the opinions of the adults over the age of 50 about the reasons for using/not using social media?

Method

This research in which determination of social media usage statuses of the individuals over the age of 50 was conducted through mixed method in which qualitative and quantitative research designs were utilized together. Mixed method is a method in which qualitative and quantitative data were collected synchronously or respectively and analyzed in an integrated way (Onwuegbuzie & Johnson, 2006). In this research, among the mixed method designs, sequential descriptive design was utilized. This design is a design in which at first qualitative data and later quantitative data were collected and analyzed (Creswell & Clark, 2008). In this study, a screening study was conducted to determine the social media usage statuses of individuals over the age of 50. Interviews were conducted to gather in-depth information about participants' reasons for social media use. 86% of the participants voluntarily attended to the interview.

Study Group

The participants of this study consist of 98 adults over the age of 50 living in Bartın province. The characteristics of the participants are presented in Table 1. In the research, the data of the participants were listed from young to old in accordance with their age and coded as K1, K2, K98.

Table 1. Demographic Characteristics of the Participants

	Options	**f**	**%**
Gender	**Female**	26	26.5
	Male	72	73.5
Age	50-55 Years	42	42.9
	56-60 Years	19	19.4
	61-65 Years	20	20.4
	66-70 Years	12	12.2
	71 Years and older	5	5.1

Level of Education	Illiterate	2	2.0
	Primary school	22	22.4
	Middle School	8	8.2
	High school	21	21.4
	Graduate	40	40.8
	Postgraduate	5	5.2
Profession	Retired	33	33.7
	Worker	5	5.1
	Military personal	10	10.2
	Housewife	10	10.2
	Officer	15	15.3
	Teacher	19	19.4
	Other	6	6.1
Service Year	Not Working or Retired	45	45.9
	0-25 years	7	7.1
	26-30 years	20	20.5
	31 years and over	26	26.5

** Other: Engineer, Driver / Taxi Driver, Tradesman, Electrical Technician, Cook, Certified Public Accountant, Foreign Trade Expert, Veterinary, Manager.*

According to Table 1, 26.5% of the participants are women and 73.5% are men. The ages of the participants range from 50 to 86 years. The average age of the participants is 59.08 (SD = 7.52). 2% of the participants is illiterate, 22.4% has primary school degree, 8.2% has middle school degree, 21.4% has high school degree, 40.8% has graduate degree and 5.2% has postgraduate. While 33.7% of the participants is retired, 12.2% does not work; 54.1% works actively. The average year of service of the working participants is 30.19 years.

Data Collection Tools

Self-description form, a scale and semi-structured interview form were used as data collection tools.

Self-description form: This form was developed by the researchers. The form consists of two parts. In the first part, there are 5 items aiming to collect demographic, personal and professional information. The second part consists of 2 items related to usage statuses of information technologies and social media of individuals over the age of 50. In the development of this form, opinions of two experts in the field of Computer and Instructional Technologies were consulted and experts confirmed use of the items without any change.

Social Media Use Scale: This scale was originally developed by Jenkins-Guarnieri, Wright and Johnson (2013). The scale was adapted to Turkish by Akın, Özbay and Baykurt (2015). This scale consists of 10 items and two factors. The sub-dimensions of the scale were social integration and emotional attachment and integration with social routines. In this six-Likert type scale, scoring varies between "Strongly Disagree (1)" and "Strongly Agree (6)". In this study, it is 0.88 for the whole scale.

Semi-structured Interview Form: In this data collection tool developed by the researchers, as the purpose of the study two questions were asked to the participants. In order to ensure the validity and reliability during development process of this data collection tool, opinions of 2 field experts were consulted and accordingly the data collection tool was arranged in terms of narration.

Data Collection and Analysis

Data were collected in face-to-face environment through printed form. Then, the data in the printed forms were transferred to computer environment. Data were collected anonymously and only the participant code (K1, K2….K97, K98) was given to the participants.

Descriptive analysis, non-parametric tests and content analysis were used for data analysis. Mann Whitney U, Kruskal Wallis H test and descriptive statistics were used in the analysis of quantitative data. Before the analysis; normality, kurtosis, skewness coefficients and homogeneity of the data were examined and non-parametric tests were decided to be used. In the analysis of qualitative data, content analysis method was used. The data collected through interview forms were examined under themes and codes.

Research Ethics

In this study, it has been complied with ethical principles. Ethics committee approval was obtained for the study. Ethical committee approval information (committee name= Bartın Üniversitesi Sosyal ve Beşeri Bilimler Etik Kurulu, date= 12/02/2020 and number= 2020-12).

Findings

Findings are presented in accordance with the presentation order of research questions.

Findings on the First Sub-question

In the research, the first sub-question was determined as "How is the usage statuses of information technologies among adults over the age of 50?". Table 2 presents the arithmetic averages and standard deviations related to the usage statuses of information technologies in adults over the age 50 and Table 3 and Table 4 present descriptive findings on the use of social media

Table 2. Usage Status of Information Technologies of the Adults Over the Age of 50

Usage Status of Information Technologies		$\overline{X}$	**SD**
Internet Usage Experience (in years)		9.56	7.33
Daily Internet Usage Time (in hours)		2.80	3.12
Tools Used for Internet access and Frequency of Use	***Desktop Computer***	2.40	1.58
	Laptop (All kinds of portable computers)	1.87	1.29
	Tablet	1.28	0.76
	Smart-phone	3.87	1.64
	Other	1.06	0.35

According to Table 2, participants' Internet use experience is approximately 9.5 years. Daily internet usage of the participants is approximately 3 hours. In addition, it is observed that the most frequently used tools for the Internet access by the participants were smart phones and this was followed by desktop computers, laptops, tablets and other devices.

Table 3. Social Media Usage Status of Adults Over the Age of 50

Social Media Usage Status		**f**	**%**
Access Frequency to Social Networking Sites	***I don't use social networks.***	31	31.6
	Several times a week	8	8.2
	Once a day	19	19.4
	Several times a day	40	40.8
Level of competence in using social networking sites	***I'm not competent.***	27	27.6
	I'm partly competent.	13	13.3
	I'm intermediately competent.	27	27.6
	I am competent.	22	22.4
	I am fully competent.	9	9.2

According to Table 3, 40.8% of the participant's access to social media environments several times a day. Data on the level of competence in using social networking sites demonstrate that 27.6% of the participants replied as "I am not competent at all" and again 27.6% replied as "I am intermediately competent". When Table 4 is examined, it is observed that participants use social media environments mostly for personal (for daily works & communication) purposes and this is followed by educational and professional use.

Table 4. Social Media Usage Purposes of Adults Over the Age of 50

	Options	$\overline{X}$	**SD**
Usage Frequency of social networking sites based on usage purpose	**Personal (**for daily works & communication**)**	2.92	1.56
	Professional	2.20	1.39
	Educational	2.27	1.39

Findings on the Second Sub-Question

In the research, the second sub-question was determined as "How are social media usage levels of the adults over the age of 50?". Table 5 presents arithmetic averages and standard deviations of the scores of the items and scale dimensions of social media use scale of adults over the age of 50.

Table 5. Social Media Usage Levels of the Adults Over the Age of 50

Items and Dimensions	**k**	$\overline{X}$	$\overline{X}$ **/k**	**SD**
Social integration and emotional attachment scale	6	12.09	2.02	7.45
Integration with social routines scale	4	11.29	2.82	4.33
Scale total	10	23.38	2.34	10.89

**k= item numbers*

According to Table 5, average scores of social media usage levels of the adults over the age of 50 are 23.38 (SD = 10.89). The average score obtained from the social integration and emotional attachment subscale is 12.09 (SD = 7.45), whereas the total score for the integration with social routines subscale is 11.29 (SD = 4.33). For interpretation of reached scores' levels, the intervals which were determined in Likert structure of the scale were

taken into consideration. Dimension scores of the participants' social media use for social integration and emotional attachment purposes are at low level ($\overline{X}$ /k=2.02). Dimension scores of the participants' social media use for integration with social routines are at intermediate level ($\overline{X}$ /k=2.82). The scores reached for the general of the scale are at low level as well ($\overline{X}$ /k=2.34).

Findings on the Third Sub-Question

The third sub-question in the research was determined as "Do the social media usage levels of the adults over the age of 50 differ based on their gender, age, educational level and working status?". In Table 6, Table 7, Table 8 and Table 9; Mann Whitney U and Krusal Wallis H test results related to differentiation of social media usage of the adults over the age of 50 based on various variables are presented.

Table 6. Results of Mann Whitney U Test on Distribution of Social Media Usage Scores of the Adults Over the Age of 50

Variables	Gender	n	Mean Rank	Sum of Rank	U	p
Use of Social Media	Female	26	45.92	1194.00	843.00	.450
	Male	72	50.79	3657.00		

According to Table 6, it was determined that there was not statistically meaningful difference in the social media usage of the participants depending on their gender (U = 843.00, p> .05). Although there is not a meaningful difference, when ranks average of the groups were taken into consideration, it was observed that social media usage levels of men are higher than women.

Table 7. Results of Mann Whitney U Test on Distribution of Social Media Usage Scores of the Adults Over the Age 50 Based on Age Groups

Variables	Age Groups	n	Mean Rank	Sum of Rank	U	p
Use of Social Media	50-64 Years	78	52.32	4081.00	560.00	.049
	65 Years and older	20	38.50	770.00		

According to Table 7, there is a statistically meaningful difference in social media usage of the participants based on their age groups (U = 560.00, p <.05). When Mean Ranks of the groups are taken into consideration, it is observed that the social media usage level of the individuals from the age group of 50-64 is higher compared to the individuals aged 65 years and older.

Table 8. Results of Mann Whitney U Test on Distribution of Social Media Usage Scores of the Adults Over the Age of 50 Based on Work Status

Variables	Working Status	n	Mean Rank	Sum of Rank	U	p
Use of Social Media	Actively not working	45	41.94	1887.00	852.00	0.014
	Actively Working	53	55.92	2963.00		

According to Table 8, there is a statistically meaningful difference in social media usage of the participants based on their working statuses (U = 852.00, p <.05). When trunk averages of the groups are taken into consideration, it is observed that social media usage level of the actively working participants is higher compared to actively not working participants.

Table 9. Results of Kruskal Wallis H Test on Distribution of Social Media Usage Scores of the Adults Over the Age 50 Based on Educational Level

Variables	Educational Levels	n	Mean Rank	df	X^2	p
Use of Social Media	Illiterate + Primary School	24	33.48	4	17.32	0.002
	Middle School	8	26.81			
	High School	21	52.05			
	Graduate	40	58.58			
	Postgraduate	5	53.80			

According to Table 9, there is a statistically meaningful difference in the social media usage of the participants based on their educational level ($X^2 = 17.32$, $p < .05$). When Mean Ranks of the groups are taken into consideration, it is observed that social media usage level of the graduate participants is higher compared to the groups with other educational levels.

Findings on the Fourth Sub-Question

In the research, the fourth sub-question was determined as "What are the opinions of the adults over the age of 50 about the reasons of using/not using social media?". In Table 10 and Table 11; themes, codes and frequencies related to content analysis conducted to determine the reasons for social media usage of the adults over the age of 50 are presented. In addition, the number of frequencies is not identical with the number of participants because multiple opinions are expressed during the interviews with participants.

Table 10. Opinions of the Adults Over the Age of 50 on Reasons for Using Social Media

Theme	Codes	f
Reasons for preferring to use social networking sites	**Following the Agenda/persons**	12
	Communication/Interaction	8
	Educational purposes	5
	Professional reasons	4
	Sociality / Loneliness	4
	Making life easier / Meeting individual and health needs	4
	To keep up with technological developments	3
	Perceiving the use of social media as a need	3
	Ease of access to information	3
	Games / entertainment / leisure	3

When opinions of the participants in Table 10 are examined; it is understood that participants often use social media to follow the agenda/people. When the codes were examined, it is observed that the participants mostly mentioned about communication/interaction (f = 8) and educational use (f = 5) when explaining their reasons for using social media. Then, professional reasons (f = 4), sociality/loneliness (f = 4), making life easier/meeting individual and health needs (f = 4), keeping up with technological developments (f = 3), perceiving social media

use as a need (f = 3), ease of access to information (f = 3) and games / entertainment / leisure time (f = 3) were stated respectively. Some opinions of the participants are as follows:

Quotes from Participant Opinions

K48- I wonder the events happening in my surrounding, I generally use it to get news. I want to closely watch social events and tendencies.

K69- It eases my works and I easily and fast connect with other individuals.

K 28- I use in order to learn new subjects. I use it to share information with my teacher colleagues.

K3- I communicate via social networking accounts while making recruitment and search for the staff through these environments.

K17- Because I am lonely, I spend my leisure time.

K19- I research on my health problems. I receive information.

K9- I use it in order not to miss out new developments.

K7- Now these sites are regarded as a need. Not having a networking account makes one feel ashamed.

K21- I use it to have instant access to new information and to be able to make multiple shares of the information.

K 31- For entertainment purpose, I play games to spend leisure time.

Table 11. Opinions of the Adults Over the Age of 50 Years on Reasons Not to Use Social Media

Theme	Codes	f
Reasons not to use social networking sites	Incapable (lack of technical knowledge/skills)	5
	Thinking that it doesn't contribute / it is unnecessary	4
	Health problems	3
	Not interested	2
	Uncommon in the past/Not getting used to social media	2

When participants' opinions in Table 11 are examined it is understood that the participants mostly prefer not to use social media because it is generally not able to be used (lack of technical knowledge and skills). Afterwards, it is observed that thinking it not having any contribution / unnecessary (f = 4), health problems (f = 3), lack of interest (f = 2) and not being widespread/not getting used to (f = 2) are among the reasons for not using social media respectively. Some opinions of the participants are as follows:

Quotes from Participant Opinions

K5- I don't understand, I'm afraid when I'm in the wrong place. There's no one to ask.

K2- Unnecessary and I don't know how to use it as well; I don't have money and the pension is also not sufficient, I can't spend money on internet every month anyway.

K88- I cannot use due to health problems.

K65- It was not common in our time; I am not interested. I've studied it a little and it's not my interest at all.

K1- There was no such thing in the past. I can't get used to innovations.

Discussion and Conclusion

In this study, examination of social media usage statuses of the adults over the age of 50 was aimed. Qualitative data were also collected to determine the reasons of the individuals over the age of 50 for using social media in a detailed way.

In this study, it was found that participants' internet usage experience was about 9.5 years, their daily internet usage was about 3 hours and the most frequently used tool for internet access was smart phones. About half of the participants have access to social media several times a day. Approximately two-thirds of the adults over the age of 50 stated that their level of competence in using social networks is moderate and below. Participants mostly use social media for personal (daily works/communication) purposes. It is observed that occupational use is the last among the purposes of use on the other hand. According to Administration for Community Living (2018), the proportion of the individuals aged 65 years and older in the use of mobile technologies is expected to increase to approximately 24% within the next decade. This data means that especially mid adults and elderly adults have more access and education opportunities than previous generations. Current research findings support this situation as well. Moreover, experience of Internet usage and daily Internet usage of the individuals over the age of 50 have evidential value for this support. Pew Research Center (2017, 2018) indicates that approximately half of elderly adults have smart-phone and internet ownership, and more than one-third of them use social media environments, such ownerships and usage rates of the environments keep increasingly moving.

In this study, it was observed that use of social media was mostly preferred for personal works and usage competence was low and it is necessary to interpret the data about the usage period within this context. Therefore, mobile trainings presented integratedly with social media environments can be designed in order to improve the competencies of the adults using social media through mobile devices and to ensure the sustainability of the learning process. In addition, implications can be done about the contribution of mobile supported social media learning environments to the informal learning process of the adults over the age of 50.

There was not difference in the participants' social media usage statuses based on their gender. Even there is not a statistically meaningful difference, based on their Mean Ranks it is observed that social media usage levels of men are higher compared to women. There is a difference in the social media usage statuses of the participants based on their age groups. Social media usage levels of the individuals in age group of 50-64 years are higher compared to the individuals aged 65 years and elder. According to TUİK (2019) Household ICT Usage Survey data, while Internet usage in Turkey is 42.6% in total as general usage among individuals in age group of55-64 years, Internet usage rate of men (52.2%) is higher compared to women (33.2%). Among individuals aged 65-74 years, internet usage rate is 19.8% as general usage; it is, 25.3% in men and 15.0% in women. In this study, parallel results with the data of TUİK were found on social media usage of the individuals over the age of 50. From this point of view, measures to fill the digital gap with regard to gender based social media usage should take place in the policies to be developed.

There is a statistically meaningful difference in social media usage of the participants based on their working statuses. Even there is not a statistically meaningful difference, based on their Mean Ranks social media usage levels of the participants actively working are higher compared to ones actively not working. There is a statistically meaningful difference in social media usage of the participants based on their educational levels. It is observed that social media usage level of the graduate participants is higher compared to the groups with other educational levels.

When the participant opinions were examined, it is understood that participants often use social media to follow the agenda/people. When the codes are examined, it is observed that participants mostly mention about communication/interaction and educational use while explaining the reasons for using social media. Moreover, in the study conducted by Hunsaker & Hargittai (2018) with regard to literature examination, it was indicated that such determinant variables as access, skills and usage types come to the fore front in internet usage of the elderly. Accordingly, it was indicated that these variables are a finding demonstrating who use Internet among the elderly individuals. From this point forth, conduct of rankings based on skills and usage types may be advised for future studies while examining usage of digital technologies like social networking etc. by the mid adults and elderly

individuals. On the other hand, in the meta-synthesis study conducted by Ramprasad, Tamariz, Garcia-Barcena, Nemeth and Palacio (2019), it was emphasized that digital technologies have a significant place in lives of elderly individuals particularly in terms of health contributions. However, in the studies conducted in Turkey, it is observed that any statuses emerged regarding the usage in health field. In the referred study, promotion of elderly individuals' technology usage were advised in order to increase these individuals' quality of life. From this point forth, briefing applications can be attained by family health centers in order to promote mid adults' and elderly individuals' use of social networking sites for health purpose. It is understood that participants prefer not to use social media mostly because of lack of technical knowledge and skills. In the supporting way of this finding, Hunsaker & Hargittai (2018) indicated that competence levels of digital technologies' usage are among the basic determiners for use of the technologies like Internet by the elderly. Afterwards, it is observed that thinking it not making any contribution/unnecessary, health problems, not attracting attention and not being widespread/not being used in the past were among the reasons for not using social media. In the longitudinal study conducted by Szabo, Allen, Stephens and Alpass (2018), it was emphasized that Internet usage may contribute to life quality of the elderly individuals. However, in the referred study, it was indicated that each type of digital technology usage cannot be regarded as positive based on usage type and perceptions of the individuals. From this point forth, it is thought that there lie technology usage types, competencies and perceptions of participants under the data reached through the research. Within this context, studies may be designed in future studies by taking these variables into consideration.

Acknowledgments

This study was not funded by any funding agencies or academic organizations.

Statement of Publication Ethics

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflict of interest.

Researchers' Contribution Rate

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Hatice Yıldız Durak	☒	☒	☐	☒	☒	☒
Emel Tekin	☒	☒	☒	☐	☐	☐

References

Administration for Community Living . (2018). 2017 Profile of older Americans. Retrieved from https://www.acl.gov/aging-and-disability-in-america/data-and-research/profile-older-americans on 10.10.2019.

Akın, A., Özbay, A., & Baykut, İ. (2015). Sosyal Medya Kullanımı Ölçeği'nin Türkçe Formu'nun geçerliği ve güvenirliği [The validity and reliability of the Turkish version of the social media use integration scale]. *The Journal of International Social Research, 8*(38), 628-633.

Barnard, Y., Bradley, M. D., Hodgson, F., & Lloyd, A. D. (2013). Learning to use new technologies by older adults: Perceived difficulties, experimentation behaviour and usability. *Computers in Human Behavior, 29*(4), 1715-1724.

Clarke, N. W. (1998). Adult development and lifelong learning: A woman's perspective. Retrieved from: https://elibrary.ru/item.asp?id=6681392 on 10.06.2019.

Creswell, J. W. & Clark, P. L. (2008). *Mixed Methods Reader*. California: Sage Publication.

Ekici, S. K., & Gümüş, Ö. (2016). Yaşlılıkta teknolojinin kullanımı [Technology usage in older ages]. *Ege Tıp Dergisi*, *55*., 26-30.

Hunsaker, A., & Hargittai, E. (2018). A review of Internet use among older adults. *New Media & Society*, *20*(10), 3937-3954.

Jin, B., Kim, J., & Baumgartner, L. M. (2019). Informal learning of older adults in using mobile devices: A review of the literature. *Adult Education Quarterly*, 69(2), 120-141.

Kalınkara, V., Sarı, İ. (2018). Yaşlıların bilgi teknolojileri kullanımı ve yaşam doyumu potansiyel ve engeller, ergonomik yaklaşım [Information technology usage among older adults and life satisfaction: Potential and barriers, ergonomic approach]. *Journal of Engineering Sciences and Design, 6*(ÖS: Ergonomi2017), 1–13.

Lee, C., & Coughlin, J. F. (2015). *PERSPECTIVE*: Older adults' adoption of technology: an integrated approach to identifying determinants and barriers. *Journal of Product Innovation Management*, *32*(5), 747-759.

Neves, B., Franz, R., Judges, R., Beermann, C., & Baecker, R. (2019). Can digital technology enhance social connectedness among older adults? A feasibility study. *Journal of Applied Gerontology*, *38*(1), 49-72.

Onwuegbuzie, A. J. ve Johnson, R. B. (2006). The validity issue in mixed research. Research in the schools. *Mid-South Educational Research Association, 13*(1), 48-63.

Özkan, Y., & Purutçuoğlu, E. (2010). Yaşlılıkta teknolojik yeniliklerin kabulünü etkileyen sosyalizasyon süreci [Socialization process effecting technological innovation acceptance in old ages]. *Sosyal Politika Çalışmaları Dergisi*, *23*(23), 37-46.

Özsungur, F., & Hazer, O. (2018). Analysys of the acceptance of communicaction technologies by technology acceptance model of the elderly: example of the Adana province. *International Journal of Eurasia Social Sciences, 9*(31), 238-275.

Peek, S. T., Luijkx, K. G., Rijnaard, M. D., Nieboer, M. E., van der Voort, C. S., Aarts, S., ... & Wouters, E. J. (2016). Older adults' reasons for using technology while aging in place. *Gerontology*, *62*(2), 226-237.

Pew Research Center. (2017). Tech adoption climbs among older adults. Retrieved from http://www.pewinternet.org/2017/05/17/tech-adoption-climbs-among-older-adults/

Pew Research Center. (2018). Mobile fact sheet. Retrieved from http://www.pewinternet.org/fact-sheet/mobile/# on 02.09.2019.

Ramprasad, C., Tamariz, L., Garcia-Barcena, J., Nemeth, Z., & Palacio, A. (2019). The use of tablet technology by older adults in health care settings—is it effective and satisfying? a systematic review and meta analysis. *Clinical gerontologist*, *42*(1), 17-26.

Szabo, A., Allen, J., Stephens, C., & Alpass, F. (2018). Longitudinal analysis of the relationship between purposes of Internet use and well-being among older adults. *The Gerontologist*, *59*(1), 58-68.

Türkiye İstatistik Kurumu [TÜİK] (2018). İstatistiklerle Yaşlılar [Elderly with Statistics, 2018]. https://hsgm.saglik.gov.tr/depo/birimler/kronik-hastaliklar-engelli-db/hastaliklar/Yasli_Sagligi/raporlar_istatistikler/TUIK_Yasli_Istatistik_2018.pdf

Türkiye İstatistik Kurumu [TÜİK] (2019) Hane Halkı Bilişim Teknolojileri Kullanım Araştırması 2019 [Household Information Technologies (IT) Usage Survey, 2019]. http://www.tuik.gov.tr/PreTablo.do?alt_id=1028

Yıldırım-Becerikli, S. (2013). Kuşaklararası iletişim açısından yeni iletişim teknolojilerinin kullanımı: İleri yaş grubu üzerine bir değerlendirme [Use of new communication technologies with a focus on intergenerational communication: assessment of older age group]. İ*stanbul Üniversitesi İletişim Fakültesi Dergisi*| *Istanbul University Faculty of Communication Journal]*. (44), 19-31.

Eyceyurt Türk, G., & Kılıç, Z. (2020). The effect of argumentation-supported problem based learning on the achievements of science teacher candidates regarding the subjects of gases and acids-bases. *Bartın University Journal of Faculty of Education*, 9(2), 440-463.

Bartın University Journal of Faculty of Education, 9(2), 440-463

buefad.bartin.edu.tr

The Effect of Argumentation-supported Problem Based Learning on the Achievements of Science Teacher Candidates Regarding the Subjects of Gases and Acids-Bases

Gülseda EYCEYURT TÜRK[a*], Ziya KILIÇ[b]

Article Info

DOI: 10.14686/buefad.643630

Article History:
Received: 06.11.2019
Accepted: 03.06.2020
Published: 05.06.2020

Keywords:
Problem-based learning,
Argumentation,
Pre-service science teachers,
Gases and acids/bases.

Article Type:
Research article

Abstract

In this study, our aim was to investigate whether the missing element in the Problem Based Learning (PBL) method could be supplied by supporting the PBL method with argumentation during a class on the topic of acidity/alkalinity and gases. In the research, a non-equivalent (pre-test and post-test) control-group design was used. The research sample was composed of 140 science teacher candidates at a state university in Turkey. The study was carried out with two experimental groups and one control group. In one of the experimental groups, problem based learning (PBL) was applied (N=44), and, in the other experimental group, argumentation-supported problem based learning (AS-PBL) was applied (N=46). In the control group, a traditional teaching approach (TTA) was carried out (N=50). The study lasted for eight weeks. Data was collected through a) the acids/bases academic achievement test and b) the gases academic achievement test and were analyzed by t-test and ANOVA (analysis of variance). The results revealed that the academic achievement of the students in the experiment group where teaching method AS-PBL was applied regarding acids/bases and gases were higher than the academic achievement of the students in the other experimental group at a significant level.

Argümantasyon Destekli Probleme Dayalı Öğretimin Fen Bilgisi Öğretmen Adaylarının Gazlar ve Asit-Bazlar Konularındaki Başarılarına Etkisi

Makale Bilgisi

DOI: 10.14686/buefad.643630

Makale Geçmişi:
Geliş: 06.11.2019
Kabul: 03.06.2020
Yayın: 05.06.2020

Anahtar Kelimeler:
probleme dayalı öğrenme,
argümantasyon,
fen bilgisi öğretmen adayı,
gazlar ve asit/bazlar.

Makale Türü:
Araştırma makalesi

Öz

Bu çalışmada, asitlik/bazlık ve gazlar konularının öğretimi sırasında, Probleme Dayalı Öğretim (PDÖ) yöntemi argümantasyonla desteklenerek, PDÖ yönteminin eksik görülen tarafının argümantasyon yöntemiyle tamamlanıp tamamlanamayacağının incelenmesi amaçlanmıştır. Araştırmada ön test-son test eşitlenmemiş kontrol gruplu yarı deneysel desen kullanılmıştır. Araştırmanın örneklemini, Türkiye'de bir devlet üniversitesinde öğrenimini sürdüren 140 fen bilgisi öğretmen adayı oluşturmaktadır. Çalışma iki deney grubu ile yürütülmüş, bu grupların birinde probleme dayalı (N=44), diğerinde argümantasyon destekli probleme dayalı öğretim (N=46) uygulanmış, kontrol grubunda ise mevcut program (N=50) ile sekiz hafta süreyle yürütülmüştür. Veriler; a) Asitler-Bazlar Başarı Testi ve b) Gazlar Başarı Testi ile toplanmış, t-testi ve varyans analizi (ANOVA) ile analiz edilmiştir. Analiz sonuçlarına göre, argümantasyon destekli probleme dayalı öğretim yönteminin uygulandığı deney grubundaki öğrencilerin Asit/Bazlar ve Gazlar konularındaki akademik başarılarının diğer gruplardaki öğrencilerin akademik başarılarından anlamlı derecede yüksek olduğu bulunmuştur.

*__Corresponding Author:__ geyceyurt@cumhuriyet.edu.tr
[a] Dr., Sivas Cumhuriyet University, Sivas/Turkey, http://orcid.org/0000-0002-4757-3696
[b] Prof. Dr., Gazi University, Ankara/Turkey, http://orcid.org/0000-0002-7825-9608)

Introduction

A common topic of discussion in communities is how people will develop and whether the education system will support this development. As we enter the age of information technology, an increase in the need for quality human power has accelerated these discussions. The failure of students to learn science issues, the understanding that individual behaviors are not automatic reactions given to environmental stimulators, and the increasing importance of individual differences have activated educators and directed them to search for new approaches (Greenwood, 1999). Particularly in the second half of the twentieth century, radical changes have been lived through regarding development and learning of information, and student-centered teaching approaches have gained importance (Duschl & Osborne, 2002).

Educational approaches, methods, and techniques being developed by educators are applied by teachers in various branches in their classes, and their advantages and disadvantages are determined, and findings are discussed among educators. One of the methods being most discussed among science teachers is problem-based learning. It is a method that was developed by medical educators who considered that more than one health problem can occur in one person at the same time (McDonald, 2002). Later on (after the 1970s), PBL applications were observed in areas other than health (Barrows & Myers, 1993; Boud & Feletti, 2013; Camp, 1996). After the 1980s, the PBL method was adopted by science educators and rapidly applied the teaching of all science topics (Chin & Chia, 2004; Dahlgren, Castensson & Dahlgren, 1998; Kelly & Finlayson, 2009; Marklin Reynolds & Hancock, 2010; Pepper, 2010; Peterson & Treagust, 1998). In these studies, where the effect of the PBL method on the subject learning by students was investigated generally students receiving education with the new method have been more successful than students receiving education with the traditional approach (e.g. Etherington, 2011).

Problem Based Learning (PBL)

In the classes where PBL was applied, as result of the course activities being correlated with their daily lives, students were able to transfer the skills and knowledge that they gained as into their daily lives, and they gained the skill to solve new problems that they confronted with. These elements have been considered a big advantage because, in PBL classes, students are faced with a problem for the first time, they try to understand the problem, and they question it and try to solve it (Schwartz, Webb & Mennin, 2001). They turn into independent individuals who learn for a lifetime, and they continue to learn all through their lives (Ali, Hukamdad, Akhter & Khan, 2010). It is a model that helps students to create the logical thinking and communication skills that are required today (Duch, Groh &Allen, 2001). Since it is a method in which learners form their own information in an active way, it is evaluated within context of a structured teaching approach (Ronis, 2007, p. 37). Success requires that teaching based on experiments be organized around resolution and the investigation of complex and actual life problems (Torp & Sage, 2002, p. 15).

With this method, it is expected that students will learn the fundamental concepts of a branch of science by means of solving problems, applying this information in their later professional applications, and developing their reasoning and problem-solving skills (Barrows & Tamblyn, 1980; Savery, 2006).

In the classes where PBL is applied, students have discussions among themselves to understand a problem that is given to them by their teacher generate solutions, and find alternative solutions, and try to create an accumulation of knowledge. Afterwards, they find an opportunity to compare their opinions with the ideas and perceptions of their friends in other groups and to examine everyone's opinions (Hmelo-Silver, 2004; Hmelo-Silver and Barrows, 2008). During this time, they are encouraged by their teacher to change their opinions, if the evidence requires that. The effectiveness of PBL which has been investigated in the learning of almost every science topic, has been applied in many studies of the teaching of chemistry such as general chemistry concepts (Groh, 2001; Donnel, Connor & Seery, 2007; Ramstedt et al., 2016) and acid-based (Dobbs, 2008) and analytical chemistry (Larive, 2004; Yuzhi, 2003), and its effectiveness has been accepted.

Despite all these positive gains, there are important deficits of this method including students not having sufficient information regarding the subject in the classes where PBL is applied and them thinking only about the limited content of a subject (Banta, Black & Kline, 2000). During the PBL process, students focus only on the problems given to them which they try to solve. If other concepts related to the subject are not within the problem scenario and students are not expected to investigate them, the student can be deficient in this area. According to the results of a meta-analysis of 43 pieces of experimental studies being conducted in relation to PBL in higher

education, the negative impact of PBL on students is related to the gaining of missing information (Dochy, Segers, Bossche & Gijbels, 2003). The disadvantage of PBL in terms of gaining missing information has also been revealed in other studies (Albanese & Mitchell, 1993; Vernon & Blake, 1993). For students to structure all the concepts of the subject, it is necessary for the PBL process to be organized in the proper way so as to make students feel this deficiency. Only in this case can the learner be aware of deficiencies in resolving the problem and learn by structuring the whole subject correctly in his or her mind. However, even though PBL may not be successful in increasing information, PBL is quite important in aiding people in experimenting with their teaching environments (Albanese, 2000).

Dochy, Segers, Bossche and Gijbels's (2003) remarkable finding is that students in PBL gained slightly less knowledge. Similarly, while students solve the specified problem as a group in the classes where PBL is applied, they remain uninformed regarding fundamental chemistry knowledge. It can be thought that this arises from activities such as students asserting their own ideas (making assertions) and comparing them with the opinions of their other friends and invalidating the assertions that they consider to be incorrect. A deficiency of PBL that has been criticized is the small group discussions are based on an argumentation approach. In PBL during the group discussions, students are required to create valid arguments to solve the problem in the correct way and to show the reasoning that led to their decisions. In this case, argumentation is clearly a necessary mechanism that serves as a guide for evidence-based communication among students during the problem-solving process (Jonassen, 2011; Walton, 2007).

In teaching methods, new applications have been tried in the classes with respect to radical changes, changing the emphasis from the behavioral approach to a cognitive and socially structured way of thinking, a student centered teaching process where the student is active. This requires some preliminary knowledge of the student regarding the new particulars he or she will learn including the construction of scientific information in order to correctly reflect this information. One of these pieces of knowledge is argumentation (Duschl & Osborne, 2002).

Widely used in argumentation is the Toulmin Model and according the model, components that form an argument are the data, claim, warrant, backing, qualifier, and rebuttal. (Driver et al., 2000; Jiménez-Aleixandre et al., 2000; Jiménez-Aleixandre & Pereiro-Muñoz, 2005; Osborne et al., 2004). Argumentation is a reasoning activity, the process of correlating assertions with data and thus achieving validity, strengthening assertions with reasoning and support, and invalidating the counter assertions if there are any (Erduran & Jiménez-Aleixandre, 2008). It has been shown that when argumentation applications were applied in the science class, qualities such as conceptual learning, achievement, attitude, critical thinking, self-confidence, self-expression, and communication were improved (Bağ & Çalık, 2017; Çelik & Kılıç, 2014; Gültepe & Kılıç, 2015; Hefter et al., 2014; Joung, 2003; Nussbaum and Edwards, 2011; Osborne, Erduran, Simon, and Monk, 2001; Osborne, Erduran & Simon, 2004; Sağır & Kılıç, 2012; Velez, 2008; West, 1994).

When we look at the history regarding the formation and development of cognitive concepts, we see that scientists revealed their scientific assertions by supporting them with experimental or cognitive evidences and that they make an effort for others to accept their assertions by convincing them. For example, Thomas Martin Lowry and Johannes Nicolaus Bronsted both revealed their theories related to acidity and basicity as "proton theory in relation to acid-base interactions" without knowing about the other. Although Gilbert Newton Lewis asserted his "electronic theory related to acid-base reactions" in the same year as the theory by Bronsted-Lowry was adopted, Lewis' theory was not accepted, and Lewis had to wait for nearly 15 more years to convince fellow scientists and to invalidate counter assertions (Atkins & Jones, 2009). As the students form their scientific conclusions in the science classes where argumentation approach is applied similar to the way scientists form their own scientific conclusions, they can achieve better and more meaningful learning (Driver et al., 1994; Driver et al., 2000; Osborne et al., 2004) In order for students to learn scientific information in a meaningful way, they need to understand the structure of that information and how it was formed. "Knowing" is not only being able to define what a phenomenon is but also includes understanding its importance and its correlation to the other events. In this respect, argument has a significant impact on education by incorporating these steps (Driver, 2000; Ford, 2008).

Although there are many studies in education literature about the applicability of an approach, method, or technique in a particular area being taught, the impact of these studies on the factors influencing the achievement of students (such as attitude and motivation) and bringing about a change in their accomplishment, hybrid methods such as Argumentation Supported (AS) -PBL (where more than one method are used together) are quite new and

limited in number. Until now, instead of being used together, argumentation and problem based learning were made the subject of studies that compared which of them is more effective (Tüysüz et al., 2013) or investigating whether argumentation skills improved when PBL was applied. In order to give meaning to mathematical ideas, Cassel (2002) examined argumentation in a PBL environment. The research reveal that argumentation made a contribution during the process during which students attached meaning to mathematics. Cassel stated that an argumentation environment being correlated with PBL acted as a catalyzer in correlating and developing the mathematical thinking of students and in giving meaning to them. In the study where the impact of the problem-based learning method supported via computer on the argumentation skills of students were examined, the research outcomes showed that this method had a meaningful impact on the argumentation skills of students having a medium level of achievement (Belland, 2010). Belland, Glazewski, and Richardson (2011) asserted that the ability of junior high school students to produce arguments based on evidence after solving the problems in a PBL environment was insufficient, and, in order to assist in the structuring of argument based one evidence in a unit on the Human Genome Project, they examined the impact of the usage of argumentation with computer support with PBL. The findings showed that the argument assessment skills of student with low achievement level developed and that students in small groups used argumentation structures to communicate and organize. According to the findings of another study investigating the effect of argument usage of university students in philosophy education during the PBL process on the problem solving skills and motivations of students, while the conclusion was reached that the problem solving skills of group being executed by argumentation developed more fully, no difference was observed in their motivations (McGhee, 2015). Ju and Choi (2018) formed a new conceptual framework by integrating Toulmin's argumentation model (1958) into Barrow's (1994) HDR (Hypothetico-Deductive Reasoning) process regarding the problem based learning process in medical education. When this framework was applied, students developed their question asking skills. But for its effects to be seen in the long term, they asserted that this conceptual frame needed to be continued to be applied.

Purpose of the Research

During the problem-based learning process, argumentation should be effectively used while students support their assertions with evidence and reasoning while specifying the problem, during the process of questioning the problem, and especially during the problem solving stage which involves examining and discussing their own opinions and the opinions of their friends. Starting with the position that argumentation support should be provided to eliminate disadvantage of PBL regarding missing learning and to effectively support discussion during the application process and thus to enable meaningful conceptual learning for students. In this study, the argumentation method was integrated into the PBL method, and the aim was to determine the effectiveness of this hybrid method. For this purpose, the accomplishments of teacher candidates in a problem-based learning environment with argument support, a problem-based learning environment, and a traditional learning environment were compared.

Regarding the argumentation, while students determine the problem by considering the given problem situation during the problem based learning process, argumentation enables them to support their assertions with evidence and reasoning, questioning the problem and especially their own examination process, and to discuss their own opinions and the opinions of their friends during problem solving stage; thus, the process become more effective. The utilization of argumentation was specified in the "discussion" processes in the PBL stages as being given in the form of problem scenario, problems to be discussed, revelation of current information, determination of the information needed, discussion of the information related to the problem, discussion of the problem, and solution proposals and discussion as detailed in the PBL process (Barret & Naughton, 2015, pp. 45-47; Wood, 2003, pp. 328-330).

Research Question

When problem-based learning environments with argumentation support are compared to problem-based teaching environments and traditional teaching environments, is there a difference in their influence on the successes of science teaching candidates regarding the subjects of acids/bases and gases?

Method

Research Design

At the faculty where the study was conducted, students taking the Scientific Laboratory Applications course were registered as Class A, Class B, and Class C and, as it was impossible for us to change the class, in this research, a non-equivalent (pre-test and post-test) control group design was used (Creswell, 2002, p.193).

Control Group A, Experimental Group B, and Experimental Group C were selected without random selection. All of the groups took a pre-test and post-test. Only the experimental groups received the treatment (Creswell, 2002, p. 193).

Participants

This study was conducted with science teacher candidates in their third year at a state university in Turkey. Distribution of numbers and gender types of students participating in the study is shown in Chart 1.

All of the teacher candidates specified in all three groups had taken chemistry courses such as general, analytical, and organic chemistry; and educational science courses such as private teaching methods. There were no differences between the groups with respect to the courses they had taken in previous years.

Chart 1. Distribution of numbers and gender types of students participating in the study

Groups	Female	Male	Total
Control Group, CG	35	15	50
Experimental Group I, RG_1	29	15	44
Experimental Group II, RG_2	26	20	46
Total	80	60	140

Instruments and Procedure

With the aim of investigating research problems, the Gases Academic Achievement Test (GAAT) and the Acid-base Academic Achievement Test (ABAAT) were available. Both success tests are multiple choice test with two stages that are prepared by researcher. In order to eliminate the obstacles related to multiple choice tests, such as students revealing their critical opinions, students selecting the correct answer by chance even though there are distractors composed of incorrect concepts, and students not being able to determine their self-opinions, diagnostic tests with two stages were developed (Treagust, 1988), and they began to be used widely in physical science areas (Garnett & Treagust, 1992; Mann & Treagust, 1998; Voska & Heikkinen, 2000).

In the research, GAAT and ABAAT tests of the research were prepared in two stages according to the three main stages and steps as suggested by Treagust (1988), and the related literature was examined and based on the misconceptions of the students as a result of the pilot study.

GAAT: GAAT is composed of 16 questions. While four of these questions require the students to make drawing specifying the gas concept image structured in their minds, other questions are constituted of tests with two stages enabling the measuring of academic knowledge levels related to the subject (the application of gas laws for a closed system and a mobile system). In the first stage, the student must answer the question in multiple choice form, and, in the second stage, the student must explain the reason for his or her answer in the student's own sentences.

In order to check the appearance, structure, and concept validity of the test, a table of questions was prepared, which questions whether the gains of gases are measured in the test. The test examined by 5 experts in science education; Feedback was obtained to ensure that the appearance, structure, and concept were valid. After being edited in accordance with the formal recommendations, it was accepted as high validity. Furthermore, during the pilot administration of the test, it was administrated to 160 students, and material analysis was conducted. After the evaluation of data, following the elimination of three questions the differentiation level of which was found to

be below 0.29, the average differentiation level of the remaining questions was found to be 0.47. Average difficulty level of the test was 0.40.

ABAAT: The ABAAT is composed of 19 questions. While three of these questions are open ended to determine the graphic reading and drawing skills of students and to specify their level of ability in determining necessary procedures for preparing solutions, other questions are composed of tests with two stages, enabling the measurement of academic knowledge levels related to acidity/basicity concepts (acid-base definitions, weak/strong acidity and basicity, pH and pOH, titration, dilution). In the first stage of test, the student is asked to answer by means of multiple choice; in the second stage, the student is asked to explain the reason for the answer with his or her own sentences.

To control the validity of appearance, concept, and structure of the test, a table of specifications was prepared to examine whether learning gains on the subject of acidity-basicity were measured in the test or not, and after the test was designed, in was examined by five people being experienced in science education in accordance with the proposals, and its validity was accepted to be high. Furthermore, it was administered to 160 people during the pilot test application and a material analysis was completed to test its validity. As a result of the evaluation of the data following the elimination of a question which was below 0.29 in differentiation level, the average differentiation level of the remaining questions was found to be 0.46. The average difficulty level of test was 0.34.

The reliability of the GAAT and the ABAAT was examined by calculating KR21 and two Guttman semi-reliance coefficients. While KR21 value was 0.73 and the Guttman coefficient value was 0.80 for the GAAT, the KR21 value was calculated as 0.82, and the Guttman coefficient value was 0.87 for the ABAAT, and reliance was found to be at a high level. The obtained findings showed that reliability of the tests is was high. When all the findings were considered together, it could be stated that validity and reliance of the success tests that were prepared was high.

Sample question for the GAAT and ABAAT are given Table 1.

Table 1: Sample question for the GAAT and ABAAT

GAAT/ Q7: A candle was placed in a glass lantern and the lid was closed. Since the candle can burn for 10 minutes in the bell-jar in which there is a certain amount of O_2 and N_2, which of the below options is correct regarding the total pressure and partial gas pressure present in the jar in the fifth minute?

***P** Total*	P_{O_2}	P_{N_2}	**Explain the reason for your answer:**
a) Reduces	Reduces	Doesn't change	
b) Reduces	Reduces	Increases	
c) Doesn't change	Reduces	Doesn't change	
d) Doesn't change	Reduces	Reduces	

GAAT/ Q8: In the below figure, you can see gases that are inside two steel tubes that are room temperature with two closed steel tube, and images symbolizing molecule are given (the boiling point of both of the gases is below -250º). If you could see the molecules until the steel tube is cooled down to – 150ºC or heated up to 150ºC, what kind of a distribution would you expect them to show? Please make your drawing at the below relevant places.

$H_{2(g)}$  $He_{(g)}$ 

Explain the reason for your answer:

-150ºC **150 ºC**

$H_{2(g)}$ $He_{(g)}$ $H_{2(g)}$ $He_{(g)}$

ABAAT/ Q9: When the solutions given below in an order are added separately to a 100 mL 0,01 M KOH solution, how the initial solution OH concentration is affected? In which of the following changes occurring in OH concentration of the solution at the start been correctly given?

I. 100 mL of pure water

II. 100 mL 0,01 M KOH

III. 100 mL 0,01 M HCl

	I	II	III	**Explain the reason for your answer:**
a)	Doesn't change	Increases	Reduces	
b)	Reduces	Increases	Reduces	
c)	Increases	Increases	Doesn’t change	
d)	Increases	Doesn't change	Increases	
e)	Reduces	Doesn't change	Reduces	

Procedure

The application process of the research is explained below as the pilot application and the main application.

Pilot Application

In order to determine beforehand the negative situations that can arise during the main application process, to make necessary adjustments, and to enable researcher to get accustomed to the application, a pilot application has been conducted before initiating the main application. The pilot applications was conducted one year before the main applications with science teacher candidates being educated at the same faculty and department and the experimental groups were formed. Since the researcher was used to the work of the control group and as he had been working in the same department for a long time, a separate pilot application was not needed for the control group. 85 teacher candidates in their third year of their education participated in the pilot application. The specification of groups was made as similar as possible to the one in the actual study. The application was conducted by a researcher over 16 course hours for a period of four weeks. At the beginning of the study, pretests were administered to both groups, and information was given related to methods to be used during the application process. Since the application was begun in the experimental group, the argument-supported problem-based learning method was followed up (N=42), and problem-based learning was followed up in the control group (N=43). By making use of the pilot study, changes were made related to the activities being used in sentences that could not be understood by the students in the scenarios, and they were prepared for the main application. At the end of the study, posttests were applied to both of the groups. Several study papers related to the course that were accepted as meeting the same gains and objectives were reduced to one. Validity and reliability analyses of the prepared scale and success tests were conducted. Not understood or misunderstood by students of the questions were eliminated or were rearranged. By considering certain failures experienced and observed during pilot study, necessary corrections were made, and the questions were passed on to the main application.

Research Application

Physical science teacher candidates getting their education at the Faculty of Education where this study was conducted, as participants in two experimental groups and one control group had taken general chemistry, general physics, and general biology courses and laboratory applications of these courses; analytical and organic chemistry courses; general education sciences courses related to teacher education with respect to the Laboratory Application II course (research techniques, teaching principles and methods, etc.) and the Laboratory Applications I course.

Since the science teacher candidates were divided into three groups when they registered at the education faculty and since they get their education as three groups in parallel, researchers did not use their initiative to determine the groups in this study (success, gender, sociocultural features, etc.). Number and gender distributions of the groups is given in Schedule 1. Assignment of groups was randomly made by researchers, and they were specified as stated below:

CG: Traditional Teaching Approach (TTA)

RG_1: Problem-based Learning (PBL)

RG_2: Argumentation Supporting Problem Based Learning (AS-PBL).

In all three groups, the courses were carried out by the researcher. Study was conducted with the subjects of gases and acids/bases within the scope of the course for four hours per week for a duration of eight weeks long. In the first week, information was given to students related to the purpose and scope of the course and the applications. Notification of the method to be applied in the course within the same period was made only to the experimental groups. Pretests were administered in the first week.

Instruction in the control group CG.

The context of the Laboratory Application II course and the application periods of subjects are specified in the ECTS package. Since the researcher had given this course in previous years, he was accustomed to the applications. In accordance with the context being specified in the ECTS package related to the subjects of gases and acids/bases, researcher had gathered information from various sources, determined sub-topics, made course plans, and prepared presentations.

After the researcher explained the subject to the students with the help of computer presentations, the teacher candidates at CG were divided into groups of five people, and they were asked to make presentations related to experiments that could be conducted in relation to the subject being explained, about how the subject could be evaluated in elementary school programs, and about the incorrect comprehension of elementary school students; and they were asked to share the information they had gathered with their friends in the class one week later. Following student presentations, the researcher transmitted his final information related to the subject to the teacher candidates and answered their questions. He then administered a posttest at the end of the unit. Flow chart of courses applied to the control group are shown in Figure 1.

Three students each were chosen based on their level of success within the group (low-medium-high), and semi-structured interviews were conducted with them about the processing of the course and student gains.

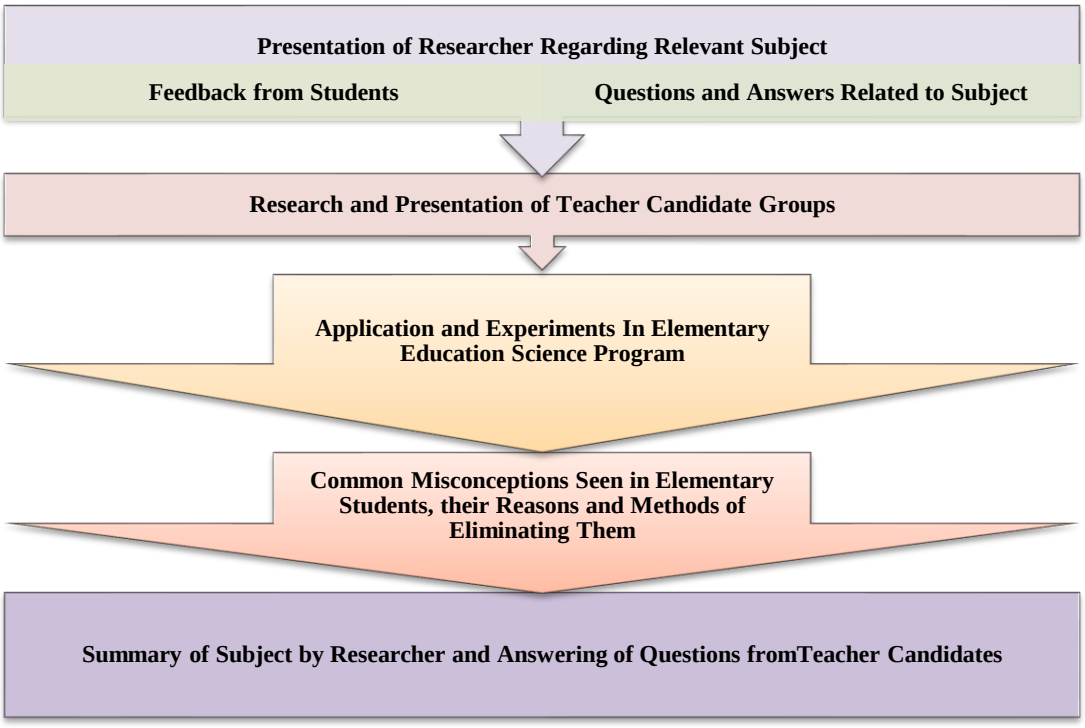


Figure 1. Course Flow Chart that was applied to control group

Instruction in the experimental group 1 RG_1

At the beginning of application, by eliminating the failures determined in the pilot applications, the final version of the problem scenarios that were prepared by the researcher was created (applicability of experiments, student perceptions, and similar particulars). The teacher candidates at RG_1 were divided into groups of four people. Pretests were applied in the first week to the RG_1 group. As per the unit program, teacher candidates first read the problem scenario, they then developed a hypothesis, and, finally, they designed experiments to test these hypotheses. Within course hours and during the following period, the groups completed their work, and, in the following week, they conducted the experiments to test their hypothesis in the laboratory.

Each group discussed among themselves, shared their hypothesis and findings with the other groups, and, finally, prepared experiment reports.

Depending on their level of success (low-medium-high), three students were determined from within the group, and semi-structured interviews were conducted with them regarding the processing of the course and student gains. A flow chart about how a problem scenario created for the relevant subject was carried out by the groups is presented in Figure 2.

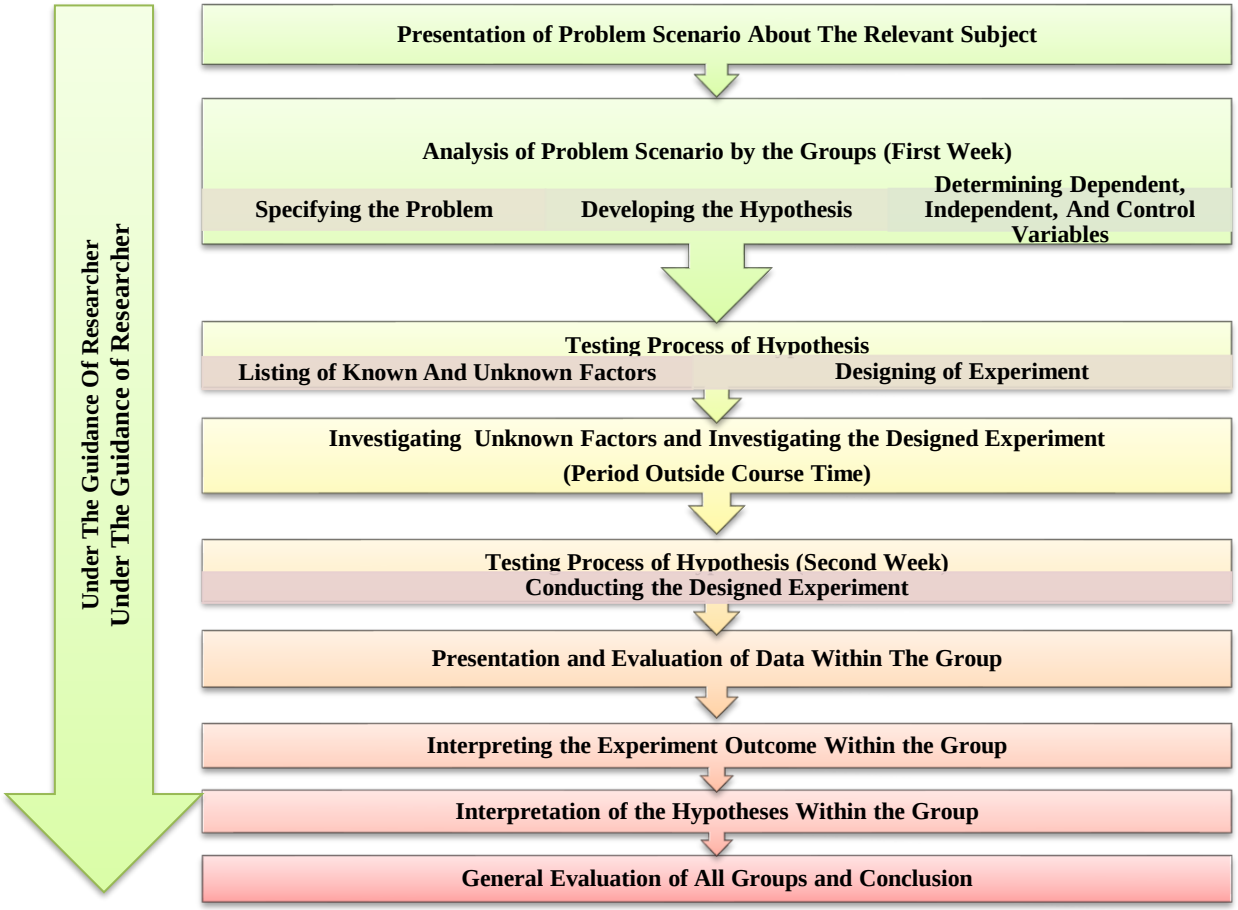


Figure 2. Course flow chart being applied to problem-based learning experiment group

Instruction in the experimental group RG_2.

Studies conducted with the group to which argumentation supporting problem-based learning (AS-PBL) was applied were very similar to those of RG_1. The only differences were that information was given about argument development, Toulmin's argumentation model of Toulmin, and an argumentation orientation event was conducted for teacher candidates. Afterwards, during the activities that continued over a period of eight weeks, students

reached outcomes and created reports for them by processing per the scenarios, and by having discussions with their fellow group members and the whole class at each stage (in accordance with argumentation components). The students in this group conducted argumentation activities in the form of making claims according to the Toulmin's argumentation model for the problem situations they faced, producing supporting reasons for their claims, designing experiments that would prove their reasons, and suggesting a proof or rebuttal for their claims after implementation (Figure 3). At the end of the course, data collection tools were applied as a post-test, and, following the analysis of the obtained data, discussions were conducted with a total of nine people, composed of three sets of three people each determined according to the score they got from the success tests from each level (successful, intermediate, unsuccessful) about evaluation of the processing of the course and determining the factors affecting individual development.

A flow chart about how a problem scenario created for the relevant subject was carried out by the groups when argumentation was included is presented in Figure 3.

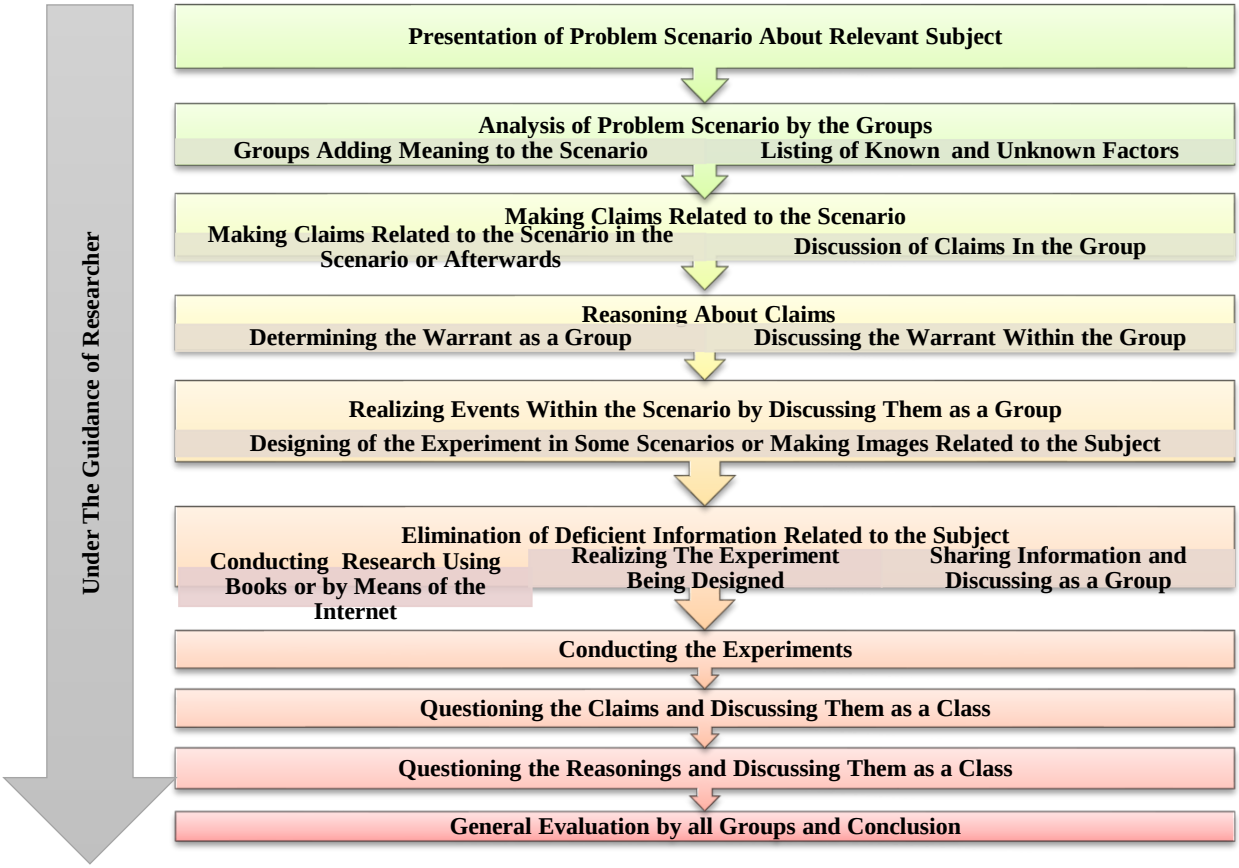


Figure 3. Course flow chart applied to argumentation supported problem-based learning experiment group

Findings

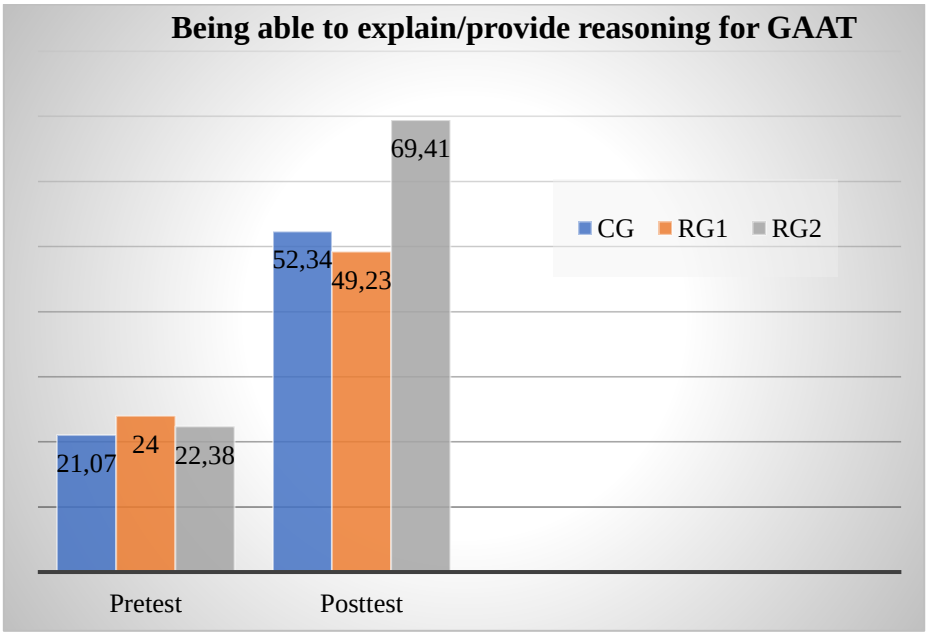
Within the contect of research, subjects of Acids-Bases and Gases in Scientific Laboratory Applications II course were taught to science teacher candidates by using three different teaching methods: the traditional teaching approach (TTA), problem-based learning (PBL), and argumentation supported problem based learning (AS-PBL). Following the training being given, the effect of teaching method being applied on the success levels of students was examined. Findings obtained in line with the purpose of the research are as follows.

Gases

Within the research context, before and after experimental processing, by using the Gases Success Test composed of 16 articles, the success levels of students related to knowledge of gases were determined. Test scoring was done so that if students chose the correct option at the first stage, and, if they explained the reason for their answer correctly, they got 1 point, and, if they chose the correct option at the first stage but made an incorrecdt explanation or left the explanation part empty, they got 0 points, and, if both of them were wrong or empty, they got 0 points. In order to be able to interpret the success scores of students more easily, scores were converted to a system of 100 points in which each question had an equal score. Descriptive statistics related to the success levels of students in terms of the subject of gases before and after experimental processing are given in Table 2. Rates of students being able to explain the questions/ reasoning are given in Figure 4.

Table 2: Descriptive statistics about the success level regarding the subject of gases

Group	GAAT (Pretest)						GAAT (Posttest)					
	Min.	**Max.**	***Mean***	**S.D.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**	**Mean**	**S.D.**	**Skewness**	**Kurtosis**
TTA	0,00	69,23	*21,07*	*13,51*	0,98	2,33	15,38	84,62	*52,34*	*16,10*	0,01	-0,42
PBL	0,00	46,15	*24,00*	*13,96*	-0,36	-0,88	15,38	92,31	*49,23*	*16,81*	0,48	0,49
AS-PBL	0,00	76,92	*22,38*	*14,25*	1,59	4,22	23,08	100,00	*69,41*	*17,28*	-0,17	-0,15



CG: TTA, RG1: PBL and RG2: AS-PBL

Figure 4. Average figures related to teacher candidates being able to explain/provide reasoning for GAAT items

In the groups for which different teaching methods were used, it was seen that the achievement levels of students in the groups related to gases were similar before the experimental process and that there were differences between the groups following the experimental process. In order to examine the meaningfulness of the difference between the achievement levels of the students in terms of their knowledge of gases depending on teaching method, first, the fulfilment of the normality and homogeneity of assumptions about variances was examined. The results

of the Shapiro-Wilks and Levene tests conducted for this purpose verified that homogeneity was achieved and that normal distribution was revealed. Results of the one-way ANOVA conducted to examine the meaningfulness of the difference between achievement levels of students regarding gases as per teaching method due to the fulfillment of required assumptions are shown in Table 3.

When the results of the one-way ANOVA were examined, the difference between the post-test scores and pre-test scores of students were found to be meaningful for all three teaching methods. Accordingly, it can be stated that all three teaching methods were effective in improving the accomplishment of students related to knowledge of gases. In order to understand the effect of the experimental process better, the magnitude of the Cohen's d impact were calculated for the differences between the groups. The magnitude values of the Cohen's d impact between groups were 0.09 (small effect), 0.45 (small effect), and 0.50 (medium effect) respectively for TTA/PBL, AS-PBL/TTA, and AS-PBL/PBL (Cohen, 1988). According to these results, AS-PBL was more effective with respect to the other two methods.

Table 3: ANOVA results of achievement level related to knowledge of gases as per teaching method

Measurement	Statistics	Sum of Squares	df	Mean Squares	F	p	Difference	Cohen's d
GAAT (Pre-test)	Between groups	207.09	2	103.54	0.535	0.59	-	
	Within group	26496.21	137	193.40				
	Total	26703.30	139					
GAAT (Post-test)	Between groups	10764.88	2	5382.44	19.225	0.00	**TTA/PBL**	0.09
	Within group	38356.00	137	279.97			**AS-PBL/ PBL**	.45
	Total	49120.88	139				**ASPBL/ PBL**	0.50

* Positive values show that there was an increase in measured features following experimental process

The results of the dependent sample t-test being conducted to examine the meaningfulness of the difference between post-test scores and pre-test scores on the students' gases achievement test regarding the teaching method being applied within scope of research is given in Table 4.

Table 4: Results of dependent sample t-test for achievement level regarding gases

Group	Post-test/pre-test difference*			Dependent sample t-test		
	Mean	**S.D.**	**Cohen's d**	**t**	**df**	**Sig**
TTA	31.27	17.35	0.72	12.23	49	0.00
PBL	25.23	19.72	0.63	9.05	43	0.00
AS-PBL	47.03	17.73	0.82	17.60	45	0.00

* Positive values show that there was an increase in measured features following the experimental process

**p<.01*

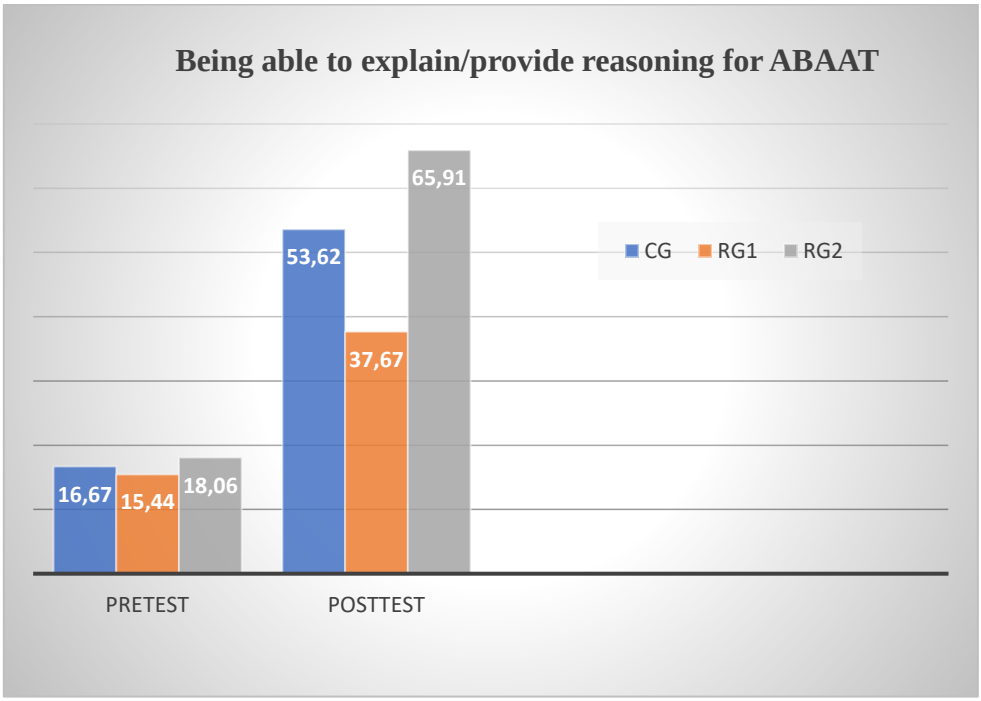
When results of dependent sample t-test were examined, the difference between the post-test scores and the pre-test scores of students for all three teaching methods was found to be meaningful. Accordingly, it can be stated that all of the three teaching methods were effective in improving the accomplishment of the students related to their knowledge of gases (p<.01 or .05). When impact magnitudes were examined, while the most effective method for students in improving their accomplishment level was AS-PBL (0.82-big); it was followed by TTA (0.72-medium) and PBL (0.63-medium) teaching methods. According to these results, it can be said that the AS-PBL method is more effective than the other two methods.

Acids/bases

Within the research context, by using an achievement test for the students before and after the experimental process on the subject of acids/bases subject composed of 19 articles, the students' achievement levels in terms of their knowledge of the acids/bases subject were determined. The test scoring was so that if students chose the correct option at the first stage and if they explained the reason for the answer correctly, they got 1 point, and if they chose the correct option but made an incorrect explanation or left the explanation section empty, they got 0 points, and if both of them were wrong or empty, they got 0 points. In order to interpret the achievement scores of the students more easily, scores were converted into a system of 100 where each question would have an equal score. Descriptive statistics related to the achievement levels of students regarding the subject of acids/bases before and after the experimental process are given in Table 5. The rates of students explaining the questions are given in Figure 5.

Table 5: Descriptive statistics for achievement level related to acids/bases subject

Group	ABAAT (Pretest)						ABAAT (Posttest)					
	Min.	**Max.**	***Mean***	**S.D.**	**Skewness**	**Kurtosis**	**Min.**	**Max.**	***Mean***	**S.D.**	**Skewness**	**Kurtosis**
TTA	0.00	38.89	*16.67*	*10.08*	0.28	-0.38	22.22	83.33	*53.62*	*14.40*	0.28	-0.17
PBL	0,00	38.89	*15.44*	*8.86*	0.31	-0.03	5.56	77.78	*37.67*	*16.28*	0.46	-0.26
AS-PBL	0,00	44.44	*18.06*	*10.59*	0.41	0.42	22.22	94.44	*65.91*	*18.19*	-0.39	-0.47



CG:TTA, RG1:PBL and RG2:AS-PBL

Figure 5. Average figures of teacher candidate being able to explain/provide reasoning for ABAAT items

In the groups for which different teaching methods were used, it was seen that the achievement levels of students in the groups related to acids/bases were similar before the experimental process and that there were differences among the groups following the experimental process. With the aim of examining the meaningfulness

of the difference between the achievement levels of students regarding knowledge of bases/gases depending on the teaching method, first, the fulfilment of assumptions about the normality and homogeneity of the variances was examined. The results of the Shapiro-Wilks and Levene tests conducted for this purpose verified that homogeneity was achieved and that normal distribution was revealed. The results of the one-way ANOVA test conducted to examine the meaningfulness of difference between the achievement levels of the students regarding acids/bases per teaching method due to the fulfillment of required assumptions are shown in Table 6.

When results of the one-way ANOVA test were examined, the difference between post-test scores and pre-test scores of the students for all three teaching methods was found to be meaningful. Accordingly, the magnitude values of the impact of Cohen's d among the groups was 0.46 (small effect), 0.35 (small effect), and 0.63 (medium effect) for the TTA/PBL, AS-PBL/TTA, and AS-PBL/PBL differences, respectively (Cohen, 1988). According to these results, the AS-PBL method was more effective with respect to the other two methods.

Table 6: ANOVA results for acids/bases achievement level per teaching method

Measurement	Statistics	Sum of squares	df	Mean squares	F	Sig.	Difference	Cohen's d
ABAAT	Between groups	159.57	2	79.78	0.826	0.44	-	
(Pre-test)	Within groups	13235.49	137	96.61				
	Total	13395.06	139					
ABAAT	Between groups	18899.36	2	9449.68	35.421	0,00	TTA/PBL	0.46
(Posttest)	Within groups	36549.28	137	266.78			AS-PBL /PBL	0.35
	Total	55448.63	139				**AS-PBL /PBL**	0.63

$p<.05$

The results of the dependent sample t-test conducted to examine the meaningfulness of the difference between the post-test and pre-test scores of acids/bases achievement test of students in terms of the teaching methods being applied within the context of research are given in Table 7.

Table 7: Results of dependent sample t-test for acids/bases achievement level

Group	Difference of post-test/pre-test *			Dependent sample t-test		
	Mean	**S.D.**	**Cohen's d**	**t**	**df**	**Sig.**
TTA	36.96	16.28	0.82	15.40	49	0.00
PBL	22.22	15.75	0.65	9.98	43	0.00
AS-PBL	47.85	20.13	0.85	15,77	45	0.00

* Positive values show that there has been an increase in measured features following the experimental process.

When results of dependent sample t-test were examined, the difference between the post-test scores and pre-test scores of students was found to be meaningful for all three teaching methods being applied. Accordingly, it can be stated that all three teaching methods were effective in improving the accomplishment of students regarding the subject of acids/bases. When the magnitudes of the impact were examined, the most effective method in improving student accomplishment was the AS-PBL (0.85-big), followed by the TTA (0.82-big) and the PBL (0.65-medium) teaching methods.

Following the process, semi-structured discussions were held with teacher candidates. The opinions of teacher candidates about their accomplishment related to the subjects of gases and acids-bases are exemplified below.

Among students in the control group (CG):

CG$_{S2}$ commented that " the *research I did with my friends as a group and presentations in the class were quite good. The course was joyful, but still I cannot manage chemistry well."* emphasizing that he thought well of the course was thought well but that he could not manage chemistry;

CG$_{S5}$ commented that "*As always, I listened to my course, I worked, and I got good grades*," and he stated that the course progressed as always, and that he could be successful when he worked.

CG$_{S9}$ commented that *"the teaching of subjects at the courses was quite successful, and I learned much better. In particular, our investigation of incorrect conceptions and experimental samples improved our successes,"* and he considered the course to be positive in the direction of improving the level of success.

Among students in experiment group 1 (RG_1):

RG$_{1S1}$ said, '*PBL was a method new to me, and my groupmates and I had difficulty in finding experiments related to certain subjects. For this reason, we may not have learned those subjects completely*," explaining that the difficulties experienced were due to the fact that the method was newly implemented.

RG$_{1S5}$: Has said: '*During the courses my group friends did everything and not much was left for me. I am used to the courses told by the teacher and for this reason I could not eliminate my deficiencies relating with certain subjects.' and* he believes that he will be more successful if he continues his course with TTA.

RG$_{1S8}$: Has stated**:** '*Courses were entertaining with PBL and I liked it very much to search for certain things with my friends and to find answers to the problems. For this reason, I think that I have been successful.'* and he finds himself successful with this method.

Among students in experiment group 2 (RG_2);

RG$_{2S2}$: Has said: '*This course processing had a style I was not accustomed to and I think I had some difficulty for this reason*.' and he shows the method he is not used to as the reason of his failure.

RG$_{2S6}$: Has said**:** '*With the help of argumentation I understood what I thought and why. It helped me to correct it if I have learned a subject wrongly and our discussions with my friends were very effective. For this reason, my success improved.'* and he links the increase in his success to argumentation.

RG$_{2S8}$: Has said: '*PBL is a beautiful method. Problem given was in fact related with the questions in my mind and they were the things I could not understand. In this way by investigating I could answer them, and I understood the subject. Besides argumentation activities I had enabled me to strengthen the issues.*' and he has used the method to solve his own problems and he has stated that he could enhance them by means of argumentation.

When the student's opinions are examined, reasoning of outcomes coming out of quantitative analysis can be seen.

Discussion and Conclusion

Even though many teaching methods and techniques have been developed and applied in the past, generally students could not achieve success levels expected from them in science education and especially in learning chemistry (Dochy, Segers, Bossche & Gijbels, 2003; Nakhleh, 1992; Tatar, 2007; Tosun vd., 2015; Serin, 2009). Today, in order for students, whose interests, perceptions, environments and school opportunities change, to be successful in science classes it is necessary to change/update the implemented programs and the teaching approaches being used.

In this study, the impact of the PBL and AS-PBL methods on student achievement levels with respect to traditional teaching approaches was investigated and, furthermore, whether the part of the PBL method defined as "missing learning" in terms of being a general examination subject of educators could be completed with argumentation support or not was investigated.

It was discovered that the accomplishment of science teacher candidates related to the subjects of gases and acids/bases on which the study was carried out had improved at a meaningful level at the end of the study with respect to pre-tests. Since teacher candidates also were taught about these subjects with nearly the same content during their high school education. their success as members of three groups composed of students of the same level (control, PBL and AS-PBL groups) also increased in each of the three groups in post-tests, but when the magnitude of the impact of Cohen's d was examined, the most effective method in increasing success was AS-PBL, followed by TTA and PBL. This situation is in line with the literature studies concluding that PBL does not make a significant difference in success (Serin, 2009; Selçuk, 2010; Şahin, 2009; Taşoğlu & Bakaç, 2010).

Since the success tests used in the study were diagnostic tests with two stages, they could show whether teacher candidates answering the questions have understood the subject per scientific model or not. The situation in which teacher candidates who could not structure this explanation part correctly could not get full scores is evidence of students receiving missing information related to the subject. We can see that teacher candidates in all groups answered the part, "Explain the reason for your answers" related to gases in pre-tests with approximate values (Figure 4). In the post-tests, biggest success was achieved by the argumentation supported PBL group who gave correct answers at average rate of 69%. It could be that the reason for this difference was that, during the argumentation process, students learned with which reasoning process an assertion could be explained. (Driver et al., 1994; Driver et al., 2000; Osborne et al., 2004). In other words, during the class activities, the AS-PBL group learned how an assertion could be reasoned about and defended. Thus, in the exam, these students could provide justification and explain the reasons for their answers. These results are in line with the conclusion that the argumentation of Cassel (2002) and Belland (2010) increases success by supporting PBL.

In this same test, the lowest success was achieved by students in the PBL group. This means that teacher candidates continuing their education with PBL could not provide reasoning for the test articles. This is a situation worthy of discussion, and there are two probable reasons for this situation. First, students in PBL group did not have the information required to explain/justify their answer effectively. The second reason is that pre-service science teachers do not know how to be warrant. When these two probable reasons are evaluated by considering the research findings, the situation in which the post-test success rate of success reflected by the low test scores of PBL group supports the idea that these students were not able to improve their area knowledge during the PBL applications. This situation shows the disadvantage of missing information acquisition of PBL and is in line with the literature (Dochy, et.al. 2003). In a similar way, one of the students in the PBL group (RG_1S_1) stated that they focused heavily on the PBL process during the interviews, and, for this reason, the area of field information remained missing.

Even though these two findings support the conclusion that that the area of field information of the PBL group students remained missing, the second probable reason has still not been invalidated. In this research, the TTA and PBL group students did not receive training on how to conduct an argumentation during the period of activities, or they did not participate in an event. This situation is a difference that must be considered while invalidating the second probable reason. The students learned that, in order for the AB-PBL group to defend their assertions in an effective way during the argumentation process, the area information was important, and, thus, they attached importance to learning the chemistry subject in the relevant experiments. They also learned how reasoning should be conducted. However, since the PBL and TTA group students did not defend any assertions, they had not learned how reasoning should conducted. As in the section where reasons for their answers were asked for in the gases and acids/bases tests from these two groups, the PBL group was more unsuccessful in both tests This situation supports the idea that this failure originated from "missing field information" and not from "not knowing how to reason."

These results of the research supports the assertion that information missing from the courses carried out with PBL bears significant importance for the literature.

It can be seen in Figure 5 that the situation is similar for the acids/bases subject, and, since the argumentation supported problem based learning method improves the skills of students in making assertions and to making presentations by justifying their assertions through questioning the reasons, it can minimize the missing gains related to the attainment of information. While students in the second experimental group were interviewed, they stated that by means of the S_6 argumentation, they could fill in the "explain the reason for your answer" section easily, and that they could learn the topics better; they also stated that with S8, they were able for them enhance what they had learned with argumentation and that they could understand much better. The teacher candidates were generally convinced that argumentation was part of the process. In this case, the opinion that presence of argumentation in the problem based learning process played the role of a guide for evidence based communication and that it was a required mechanism for permanent learning is in conformity with the outcomes of the study (Jonassen, 2011; Walton, 2007).

AS-PBL was effective in improving the success of students in both of the subjects and in their being able to use the information they gained. PBL had less effect with respect to TTA. It overlapped with the outcome obtained by Tüysüz et al (2013) that argumentation supported teaching improved achievement more with respect to PBL

and laboratory supported teaching (we can consider it a traditional method) and that PBL improved student achievement least. Furthermore, studies stating that the argumentation supported PBL method was more effective in developing question asking and answering skills with respect to problem based learning (Ju & Choi, 2018), and it is more effective in developing problem solving skills (McGhee, 2015) which also supports the outcome of this research. During the interviews conducted with the students, the group which was most satisfied with respect to understanding the subject was AS-PBL. The PBL students stated that they worked to solve the problems, but they could not do so and understood the subject less. Because these teacher candidates were not accustomed courses being conducted in this way, they were not able to structure the information correctly; the achievement of the TTA group shows that the education system they were accustomed to was in this way.

By adopting a student-centered teaching approach with the radical change of following a behavioral approach, numerous teaching approaches, methods, and techniques were developed. The Effects of the approaches, methods, and techniques generally developed by education scientists are investigated by field educators. It is expected that the impact of a method in education to vary according to the ages, sociocultural environments, and learning environments of students in the classes and according to such factors as courses, units, and subjects. According to these factors, some methods may have advantages and some may have disadvantages. Can a more positive outcome be obtained by eliminating the disadvantage of a method by an advantage of another method in relation to the teaching of a subject?

In this study conducted by starting from above mentioned idea, with respect to all parameters being investigated, an outcome was reached that argumentation supported problem based learning applications and activities caused more efficient results to be obtained with respect to all parameters being examined.

While studies in which argumentation and problem based learning are hybridized in the literature are quite rare, they do occur in the areas of medical education (Ju & Choi, 2018) and philosophy education (McGee, 2015). In this respect, this study proposed a new method that will contribute to this area and which asserts that it is necessary that, in chemistry education, problem based learning should be applied by being hybridized with argumentation. This proposal should shed light on new studies.

Suggestions

These days when we are trying to adapt to a world that is constantly developing and changing, we can keep up as long as we are science literate individuals who learn for a life time and who continuously improve themselves .Thus, our task as teachers is to provide contemporary education to our students in conformity with today's conditions. Instead of education where information is received directly in a passive way based on memorization, we should aim to educate individuals who think about the information they have learned, who question, and who have problem solving skills. For this reason, it is necessary to convince teachers that argumentation is an important component of science education. This research results have shown that argumentation supports PBL quite successfully. Based on this result, the necessity of including argumentation in PBL environments is an important suggestion of this research.

AS-PBL activities in this study applied in science laboratory can be organized and applied in the same conditions outside the laboratory, in different laboratory courses and on different topics and a database can be created. Furthermore, it can also be applied in different education levels.

During the formal education period at our schools throughout the country, our students should be made accustomed to methods such as PBL, argumentation, and cooperative learning which are widely used throughout the world in a programmed way.

Since effective usage of PBL and argumentation methods can also be affected by the social and cultural environment, this study can also be attempted in regions with varying social and cultural differences.

By establishing different teaching methods, techniques, and hybrid methods, the effectiveness of such methods such as argumentation and PBL can be compared.

In studies with longer periods (such as two or three periods), how AS-PBL affects variables such as attitude, self-sufficiency, desire for debate, and critical thinking can be investigated and supported in a qualitative way. The

proposal by Ju and Choi (2018) that the outcomes with applications for long term periods should be looked at are also presented in this study.

Acknowledgments

This article has been produced from first author's "The Effect of Argumentation-Supported Problem Based Learning Applications on the Success of Scientist Candidates on Acid / Bases and Gases" titled doctoral dissertation.

Statement of Publication Ethics

In this study, scientific, ethical and citation rules were ensured all responsibility belongs to the Corresponding Author. The research has no unethical problems.

Conflict of Interest

This study does not have any conflict of interest.

Researchers' Contribution Rate

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Gülseda Eyceyurt Türk	☒	☒	☒	☒	☒	☒
Ziya Kılıç	☒	☒	☒	☒	☒	☒

References

Albanese, M. (2000). Problem-based learning: Why curricula are likely to show little effect on knowledge and clinical skills. *Medical Education, 34*, 729-738.

Albanese, M.A. & Mitchell, S. (1993). Problem-based learning: a review of literature on its outcomes and implementation issues. *Academic Medicine*, 68, 52–81.

Ali, R., Hukamdad, Akhter, A., & Khan, A. (2010). Effect of using problem solving method in teaching mathematics on the achievement of mathematics students. *Asian Social Science*, *6* (2), 67-72.

Allen, D. E., Duch, B. J., & Groh, S. E. (1996). The power of problem-based learning in teaching introductory science courses. *New Directions for Teaching and Learning, 1996*(68), 43-52.

Atkins, P., & Jones, L. (2009). *Chemical principles*. Macmillan.

Ayyıldız, Y., & Tarhan, L. (2013). Case study applications in chemistry course: gases, liquids, and solids. *Chemistry Education Research and Practice*, *14*(4), 408-420.

Bağ, H., & Çalık, M. (2017). A thematic review of argumentation studies at the K-8 Level. *Education & Science, 42*(190).

Banta, T. W., Black, K. E., & Kline, K. A. (2000). *PBL 2000 plenary address offers evidence for and against problem-based learning, PBL Insight to solve, to learn, together*. A newsletter for undergraduate Problem Based Learning from Stamford, 3 (3).

Barrett, T., & Naughton, C. (2014). Problem-based learning: an integrative approach to the cultivation of person-centeredness, empathy, and compassion. In *Integrative Learning* (pp. 65-79). Routledge.

Barrows, H. S., & Myers, A. C. (1993). Problem-based learning in secondary schools. *Unpublished monograph. Springfield, IL: Problem-Based Learning Institute, Lanphier High School and Southern Illinois University Medical School*.

Barrows, H. S., & Tamblyn, R. M. (1980). *Problem-based learning: An approach to medical education*. Springer Publishing Company.

Belland, B. R. (2010). Portraits of middle school students constructing evidence-based arguments during problem-based learning: The impact of computer-based scaffolds. *Educational technology research and Development, 58*(3), 285-309.

Belland, B. R., Glazewski, K. D., & Richardson, J. C. (2011). Problem-based learning and argumentation: Testing a scaffolding framework to support middle school students' creation of evidence-based arguments. *Instructional Science, 39*(5), 667-694.

Boud, D., & Feletti, G. (2013). *The challenge of problem-based learning*. Routledge.

Bouwma-Gearhart, J., Stewart, J., & Brown, K. (2009). Student misapplication of a gas-like model to explain particle movement in heated solids: implications for curriculum and instruction towards students' creation and revision of accurate explanatory models. *International Journal of Science Education, 31*(9), 1157-1174.

Camp, G. (1996). Problem-based learning: A paradigm shifts or a passing fad? *Medical Education Online, 1*(1), 4282.

Cassel, D. G. (2002). *Synergistic argumentation in a problem-centered learning environment*. Doctoral dissertation, The University of Oklahoma, Oklahoma

Chin, C., & Chia, L. G. (2004). Problem-based learning: Using students' questions to drive knowledge construction. *Science Education, 88* (5), 707-727.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative* (pp. 146-166). Upper Saddle River, NJ: Prentice Hall.

Çelik, A. Y., & Kılıç, Z. (2014). The impact of argumentation on high school chemistry students' conceptual understanding, attitude towards chemistry and argumentativeness. *Eurasian Journal of Physics and Chemistry Education*, *6*(1), 58-75

Dahlgren, M. A., Castensson, R., & Dahlgren, L. O. (1998). PBL from the teachers' perspective. *Higher Education, 36* (4), 437-447.

Dobbs, V. (2008). Comparing Student Achievement in The Problem-Based Learning Classroom and Traditional Teaching Methods Classroom. *ProQuest Information and Learning.*

Dochy, F., Segers, M., Van den Bossche, P. & Gijbels, D. (2003). Effects of problem-based Learning: a meta-analysis. *Learning and Instruction, 13* (5), 533–568.

Donnel, C. M., O'Connor, C. and Seery, M. K. (2007). Developing practical chemistry skills by means of student-driven problem-based learning mini-projects. *Chemistry Education Research and Practice, 8* (2), 130-139.

Driver, R., Asoko, H., Leach, J., Scott, P., & Mortimer, E. (1994). Constructing scientific knowledge in the classroom. *Educational researcher*, *23*(7), 5-12.

Driver, R., Newton, P., & Osborne, J. (2000). Establishing the norms of scientific argumentation in classrooms. *Science education, 84* (3), 287-312.

Duch, B. J., Groh, S. E. & Allen, D. E. (2001). *The power of problem-based learning.* Stylus Publishing. Virginia (USA).

Duschl, R. A., & Osborne, J. (2002). Supporting and promoting argumentation discourse in science education. *Studies in Science Education*, *38*(1), 39-72).

Erduran, S., & Jiménez-Aleixandre, M. P. (2008). Argumentation in science education. *Perspectives from Classroom-Based Research. Dordre-cht: Springer*.

Erduran, S., & Mugaloglu, E. Z. (2013). Interactions of economics of science and science education: Investigating the implications for science teaching and learning. *Science & Education*, *22*(10), 2405-2425.

Erduran, S., & Pabuccu, A. (2012). Bonding chemistry and argument: teaching and learning argumentation through chemistry stories. *Bristol: University of Bristol*.

Etherington, M.B. (2011) Investigative primary science: A problem-based learning approach. *Australian Journal of Teacher Education*, 36(9), 53-74).

Ford, M. (2008). Disciplinary authority and accountability in scientific practice and learning. *Science Education, 92* (3), 404-423.

Garnett, P.J. & Treagust, D.F. (1992). Conceptual difficulties experienced by senior high school students of chemistry: electrochemical (galvanic) and electrolytic cells. *Journal of Research in Science Teaching*, *29*(10), 1079-1099.

Gultepe, N., & Kilic, Z. (2015). Effect of scientific argumentation on the development of scientific process skills in the context of teaching chemistry. *International Journal of Environmental and Science Education*, *10*(1), 111-132.

Greenwood J. D. (1999). Understanding the "Cognitive Revolution" in Psychology. *Journal of the History of the Behavioral Sciences, 35*(1), 1-22).

Groh, S. E. (2001). *Using problem-based learning in general chemistry*. (Eds.: Allen Deborah E.). The Power of Problem-Based Learning: A Practical "how to" for Teaching Undergraduate Courses in Any discipline (pp. 207).

Hefter, M. H., Berthold, K., Renkl, A., Riess, W., Schmid, S., & Fries, S. (2014). Effects of a training intervention to foster argumentation skills while processing conflicting scientific positions. *Instructional Science, 42,* 929-947.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational psychology review*, *16*(3), 235-266.

Hmelo-Silver, C. E., & Barrows, H. S. (2008). Facilitating collaborative knowledge building. *Cognition and instruction*, *26*(1), 48-94.

Hmelo S. & Cindy E. (2004) Problem-Based Learning: What and How do students learn? *Educational Psychology Review*. 2004(16), 35-66;

Jiménez-Aleixandre, M. P., Bugallo Rodríguez, A., & Duschl, R. A. (2000). "Doing the course" or "doing science": Argument in high school genetics. *Science Education*, *84*(6), 757-792.

Jiménez-Aleixandre, M. P., & Pereiro-Muñoz, C. (2005). Argument construction and change while working on a real environment problem. In *Research and the quality of science education* (pp. 419-431). Springer, Dordrecht.

Joung, S. (2003). *The effects of high-structure cooperative versus low-structure collaborative design on online debate in terms of decision making, critical thinking, and interaction pattern.* Doctoral Dissertation, The Florida State University, Florida.

Jonassen, D. H. (2011). Design Problems for Secondary Students. *National Center for Engineering and Technology Education*.

Ju, H., & Choi, I. (2018). The Role of Argumentation in Hypothetico-Deductive Reasoning During Problem-Based Learning in Medical Education: A Conceptual Framework. *Interdisciplinary Journal of Problem-Based Learning*, *12*(1), 4.

Kelly, O., & Finlayson, O. (2009). A hurdle too high? Students' experience of a PBL laboratory module. *Chemistry Education Research and Practice*, *10*(1), 42-52.

Larive, C. K. (2004). Problem-based learning in the analytical chemistry laboratory course. *Analytical and Bioanalytical Chemistry*, *380* (3), 357-359.

Mann, M., Treagust, D. F. (1998). A pencil and paper instrument to diagnose students' conception of breathing, gas exchange and respiration. *Australian Science Teachers Journal*, *44*(2), 55-59.

Marklin Reynolds, J., & Hancock, D. R. (2010). Problem-based learning in a higher education environmental biotechnology course. *Innovations in Education and Teaching International*, *47* (2), 175-186.

McDonald, J.T., 2002. Using problem-based learning in a science methods course. Proceedings of the Annual International Conference of the Association for the Education of Teachers in Science, ERIC ED 465 621, Charlotte.

McGhee, M. (2015). *The effects of argumentation scaffolding in a problem-based learning course on problem-solving outcomes and learner motivation.* Doctoral Dissertation, The Florida State University, Florida.

Mehalik, M. M., Doppelt, Y., & Schuun, C. D. (2008). Middle-school science through design-based learning versus scripted inquiry: Better overall science concept learning and equity gap reduction. *Journal of Engineering Education*, *97*(1), 71-85.

Noh, T., & Scharmann, L. C. (1997). Instructional influence of a molecular-level pictorial presentation of matter on students' conceptions and problem-solving ability. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, *34*(2), 199-217.

Nussbaum, E. M., & Edwards, O. V. (2011). Critical questions and argument stratagems: A framework for enhancing and analyzing students' reasoning practices. *The Journal of the Learning Sciences*, 1-46.

Osborne, J., Erduran, S. & Simon, S. (2004). Enhancing the quality of argumentation in school science. *Journal of Research in Science Teaching, 41* (10), 994-1020.

Osborne, J., Erduran, S., Simon, S., & Monk, M. (2001). Enhancing the quality of argument in school science. *School science review*, *82*(301), 63-70.

Özmen, H. (2011). Effect of animation enhanced conceptual change texts on 6th grade students' understanding of the particulate nature of matter and transformation during phase changes. *Computers & Education*, *57*(1), 1114-1126.

Papastergiou, M. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computers & Education*, *52*(1), 1-12.

Pepper, C. (2010). 'There's a lot of learning going on but NOT much teaching!': student perceptions of problem-based learning in science. *Higher Education Research & Development*, *29* (6), 693-707.

Peterson, R. F. & Treagust, D. F. (1998). Learning to teach primary science through problem-based learning. *Science Education, 82* (2), 215-237.

Ramstedt, M., Hedlund, T., Björn, E., Fick, J., & Jahnke, I. (2016). Rethinking chemistry in higher education towards technology enhanced problem-based learning. *Education Inquiry, 7* (2).

Ronis, D. L. (2007). *Problem-based learning for math & science: Integrating inquiry and the internet.* Corwin.

Sağır, Ş. U., & Kılıç, Z. (2012). Analysis of the Contribution of Argumentation-Based Science Teaching on Student Success and Retention. *Eurasian Journal of Physics & Chemistry Education*, *4*(2).

Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning*, *1*(1), 3.

Schwartz, P., Webb, G., & Mennin, S. (Eds.). (2001). *Problem-based learning: Case studies, experience and practice*. Psychology Press.

Selçuk, G. S. (2010). The effects of problem-based learning on pre-service teachers achievement, approaches and attitudes towards learning physics. *International Journal of Physical Sciences*, *5*(6), 711-723.

Serin, G. (2009). *Probleme dayalı öğrenme öğretiminin 7. sınıf öğrencilerin fen başarısına, fene karşı tutumuna ve bilimsel süreç becerilerine etkisi [The effect of problem based learning instruction on 7th grade students' science achievement, attitude toward science and scientific process skills]*. Doctoral Dissertation, Middle East Technical Universty, Ankara, Turkey.

Skamp, K. (1999). Are Atoms and Molecules Too Difficult for Primary Children? *School Science Review*, *81*(295), 87-96.

Şahin, M. (2009). Exploring University Students' Expectations and Beliefs about Physics and Physics Learning in a Problem-Based Learning Context. *Eurasia Journal of Mathematics, Science & Technology Education*, *5*(4).

Taşoğlu, A. K.,& Bakaç, M. (2010). The effects of problem based learning and traditional teaching methods on students' academic achievements, conceptual developments and scientific process skills according to their graduated high school types. *Procedia-Social and Behavioral Sciences*, *2* (2), 2409-2413.

Torp, L. & Sage, S. (2002). *Problem as Possibilities: Problem-Based Learning for K-16 Education.* Alexandria, VA, USA: Association for Supervision and Curriculum Development.

Treagust, D. F. (1988). Development and use of diagnostic tests to evaluate students' misconceptions in science. *International journal of science education*, *10*(2), 159-169.

Tüysüz, C., Demirel, O. E., & Yildirim, B. (2013). Investigating the effects of argumentation, problem and laboratory-based instruction approaches on pre-service teachers' achievement concerning the concept of "acid and base". *Procedia-Social and Behavioral Sciences*, *93*, 1376-1381.

Velez, A. B. (2008). *Thinking critically together: The intellectual and discursive of controversial conversations.* Doctoral Dissertation, The Harvard University, Massachusetts.

Vernon, D. T., & Blake, R. L. (1993). Does problem-based learning work? A meta-analysis of evaluative research. *Academic medicine, 68* (7), 550-63.

Voska, K. W., Heikkinen, H. W. (2000). Identification and analysis of student conception used to solve chemical equilibrium problems. *Journal of Research in Science Teaching*, *37*(2), 160-176.

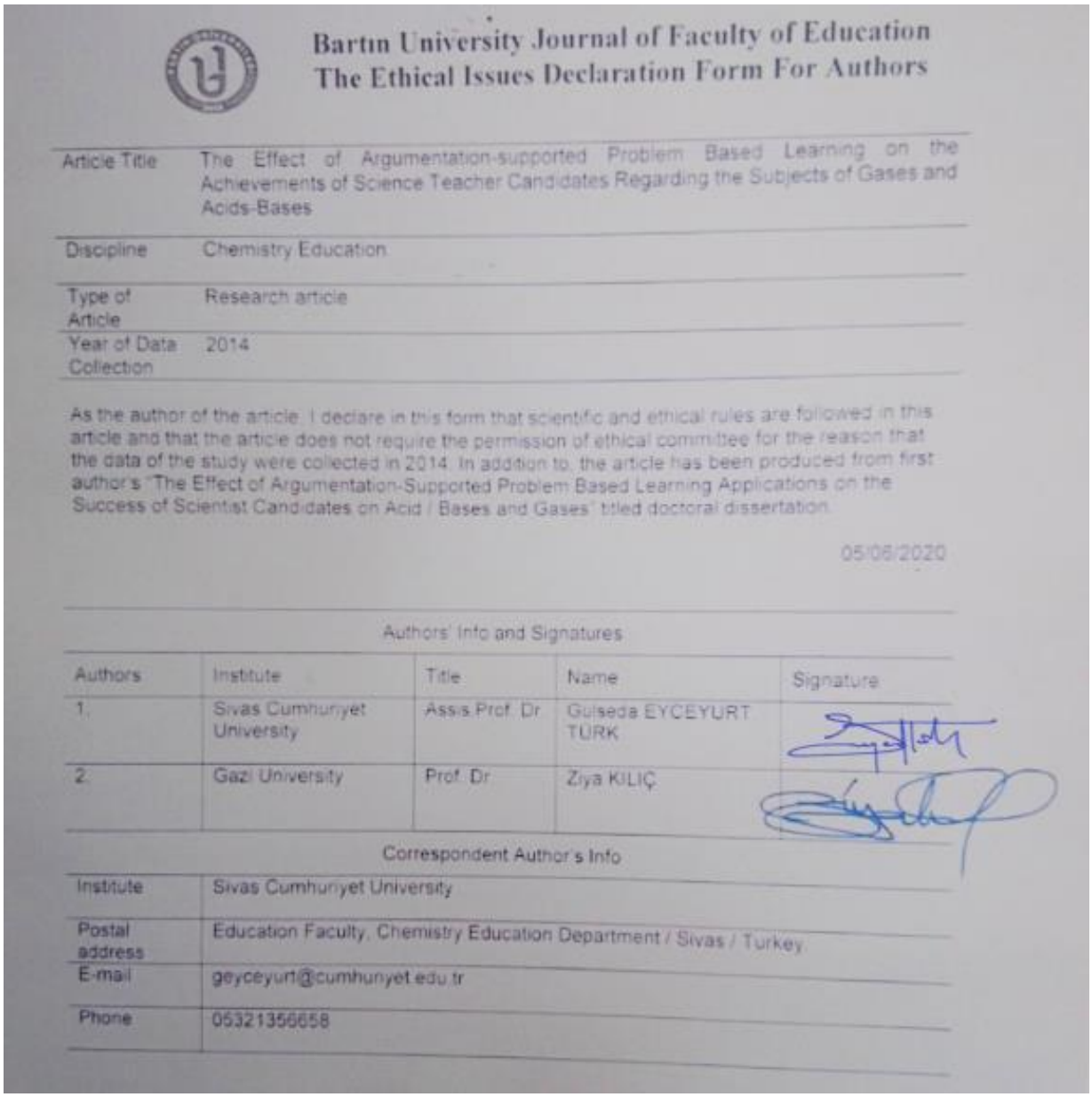
Walton, D. (2007). *Media argumentation: dialectic, persuasion and rhetoric*. Cambridge University Press.

West, T. L. (1994). *The effect of argumentation instruction on critical thinking skills.* Doctoral Dissertation. Southern Illinois University, Chicago.

Wood, D.F. (2003). Problem based learning, *ABC of learning and teaching in medicine*, *326* (7384): 328-330

Yuzhi, W. (2003). Using problem-based learning in teaching analytical chemistry. *The China Papers*, *2*, 28-33.

Appendix 1



Bartın University Journal of Faculty of Education
The Ethical Issues Declaration Form For Authors

Article Title	The Effect of Argumentation-supported Problem Based Learning on the Achievements of Science Teacher Candidates Regarding the Subjects of Gases and Acids-Bases
Discipline	Chemistry Education
Type of Article	Research article
Year of Data Collection	2014

As the author of the article, I declare in this form that scientific and ethical rules are followed in this article and that the article does not require the permission of ethical committee for the reason that the data of the study were collected in 2014. In addition to, the article has been produced from first author's "The Effect of Argumentation-Supported Problem Based Learning Applications on the Success of Scientist Candidates on Acid / Bases and Gases" titled doctoral dissertation.

05/06/2020

Authors' Info and Signatures

Authors	Institute	Title	Name	Signature
1.	Sivas Cumhuriyet University	Assis.Prof. Dr	Gulseda EYCEYURT TURK	
2.	Gazi University	Prof. Dr	Ziya KILIÇ	

Correspondent Author's Info

Institute	Sivas Cumhuriyet University
Postal address	Education Faculty, Chemistry Education Department / Sivas / Turkey
E-mail	geyceyurt@cumhuriyet.edu.tr
Phone	05321356658