ULUSLARARASI EĞİTİM ARAŞTIRMACILARI DERGİSİ (UEADER)

INTERNATIONAL JOURNAL OF SCHOLARS IN EDUCATION (IJSE)

ISSN: 2667-4998

CİLT/ VOLUME: 4 SAYI / ISSUE: 1 TARİH / YEAR: HAZİRAN (JUNE) 2021

CİLT / VOLUME: 4 ***SAYI / ISSUE***: 1

HAZİRAN 2021 / JUNE 2021

Uluslararası Eğitim Araştırmaları Dergisi (UEADER) ücretsiz yayım yapan hakemli bir dergidir.

Dergide yayımlanan makalelerin fikri ve mülki sorumluluğu yazarlara aittir.

International Journal of Scholars in Education is a peer-reviewed free journal.

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ISSN: 2667-4998

Dizinler / **Indexes**: DOAJ (Directory of Open Access Journals), IndexCopernicus, TEİ: Index of Turkish Education, Asos Index, DRJI (Directory of Research Journal Indexing), BASE (Bielefel Academic Search Engine), Google Scholar, ROAD, ESJI (Eurasian Scientific Journal Index), ResearchBib, InfoBase Index, Rootindexing, Neliti, Journal Factor, SJIFactor, i2or, ISRA (International Society for Research Activity), SIS (Scientific Indexing Services), IJIFACTOR (International Journal Impact Factor)

2021 KİLİS, TURKEY

İÇİNDEKİLER/ CONTENTS

ARAŞTIRMA MAKALELERİ/ RESEARCH ARTICLE

Research Article
Received: 14.12.2020
Accepted: 05.03.2021
First online: 14.03.2021
Published: 30.06.2021

Citation: Işıker, Y. & Emre, İ. (2021). The impact of argumentation-based instruction on academic achievements and scientific process skills of primary school students and their attitudes towards the science course. *International Journal of Scholars in Education, 4*(1). 1-14. doi:10.52134/ueader.840877

The Impact of Argumentation-Based Instruction on Academic Achievements and Scientific Process Skills of Primary School Students and Their Attitudes towards the Science Course*

Yakub IŞIKER**, İrfan EMRE***

***Abstract*:** The present study aimed to investigate the effect of argumentation-based instruction on academic achievements, scientific process skills of primary school 4th grade students and their attitudes towards the science course. The study was designed as a quasi-experimental research, and the study group included 47 4th grade students during the 2016-2017 academic year. Academic achievement test, scientific process skills test and attitudes towards science course scale were used as pre-tests and post-tests in the study to collect data. Independent groups t-test, paired groups t-test, Mann Whitney U test and arithmetic mean, standard deviation, frequency and percentage analysis were employed to analyze the study data, and .05 confidence interval was accepted as significant. The study findings demonstrated that argumentation-based instruction had a positive impact on academic achievements and scientific process skills of 4th grade primary school students; and the instruction led to a significant difference that favored the experimental group in attitudes towards the science course.
Anahtar Kelimeler: Academic achievement, argumentation-based instruction, attitudes towards science, scientific process skills.

Argümantasyon Tabanlı Öğretimin İlkokul Öğrencilerinin Akademik Başarılarına, Bilimsel Süreç Becerilerine ve Fen Bilimlerine Yönelik Tutumlarına Etkisi

***Öz*:** The Bu araştırmada argümantasyon tabanlı öğretimin ilkokul 4. sınıf öğrencilerinin akademik başarılarına, bilimsel süreç becerilerine ve fen bilimleri dersine yönelik tutumlarına ilişkin etkisi araştırılmıştır. Yarı deneysel model olarak tasarlanan araştırmanın çalışma grubunu 2016-2017 eğitim ve öğretim yılında öğrenim gören 47 öğrenci oluşturmaktadır. Veri toplama aracı olarak; akademik başarı testi, bilimsel süreç becerileri testi ve fen dersine yönelik tutum testi ön test ve son testleri kullanılmıştır. Araştırmadan elde edilen verilerin analizi için bağımsız gruplar t testi, eşleştirilmiş gruplar t testi, Mann Whitney U testi ile aritmetik ortalama, standart sapma, frekans ve yüzde analizleri kullanılmış ve verilerin yorumlanmasında .05 anlamlılık düzeyi kabul edilmiştir. Araştırmanın bulguları incelendiğinde, argümantasyon tabanlı öğretimin ilkokul 4. sınıf seviyesinde öğrencilerin akademik başarıları ve bilimsel süreç becerilerine olumlu etki yaptığı bununla birlikte fen dersine yönelik tutumlarına ilişkin deney grubu lehine anlamlı düzeyde fark oluşturduğu görülmektedir.
Anahtar Kelimeler: Akademik Başarı, Argümantasyon tabanlı öğrenme, bilimsel süreç becerileri, fen bilimlerine yönelik tutum.

* The present study was based on the master's thesis of the primary author and presented as a proceeding at 3rd International Culture and Civilization Congress

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Introduction

Knowledge production today is very rapid and simultaneous developments and changes in many scientific and technological fields occur due to the advances in the 21st century (Küçükyılmaz, 2014). Based on these developments, science education has been restructured to train competent individuals (Gençoğlan, 2017). The adoption of the constructivist approach in science programs aimed to develop learning environments centered on the student where the teacher acts as a counselor (problem-based learning, collaborative learning, project-based learning, argumentation, etc.) (The Ministiry of National Education, 2013; 2018). These objectives and learning environments aimed to train science literate individuals who could employ scientific thinking methods, make conscious decisions in scientific discussion environments and support their prepositions with reasons, and analyze the arguments with a critical approach (Köseoğlu, Tümay, & Budak, 2008). Thus, the concept of " argumentation ", which was included in the curricula for the first time, was described as an approach where students could express their ideas freely based on a rationale; defend opposing arguments to refute the arguments in verbal and written discussions (Öğreten & Uluçınar, 2014).

Although concept of argumentation has a long history, Toulmin (1958, 1964) introduced the concept to the field of education (Gencel & Ilıman, 2019; Yalçın Çelik, 2010;). In the book "The Uses of Argument" published in 1958, Toulmin analyzed the natural process of a debate and presented a model that reflected the netural proceedings of a discussion, and demonstrated the basic elements and links between these elements in a discussion (Erduran, Simon, & Osborne, 2004; Kaya & Kılıç, 2008). Toulmin's argument model included six elements: a series of interrelated arguments, data that constitutes a basis for an argument, the reasons for the association between the data and the argument, the adjuvants that strengthen the justifications, limiting elements that determine the validity of the argument, and reject the argument when it is not true (Driver Newton & Osborne, 2000; Simon, Erduran, & Osborne, 2006). Toulmin classified the data, claim, justification and supporters as the basic elements, and refutation and limitations as auxiliary elements (Driver Newton & Osborne, 2000). The basic elements are required to construct the argument, while the auxiliary elements affect the persuasiveness and validity of the argument (Simon, 2008). Toulmin realized that the conventional discussion approaches were not adequate for problem solving in daily life and distanced the theory from conventional discussion approaches and focused the argument approach on retrospective reasoning (Aldağ, 2006; Puvirajah, 2007). The argumentation-based learning (ABL), a learning approach where argumentation-based activities are conducted, was based on the constructivist learning, several learning and instructional theories, scientific literacy, comprehension of the nature of science and adequate writing activities that could be discussed (Driver, Newton and Osborne, 2000). ABL is effective in learning science, since it includes learning-oriented writing activities and inquiry-based science learning through discussion (Akkuş, Günel, & Hand, 2007). Students reconstruct and analyze scientific concepts during the discussions in ABL (Hand, Wallace, & Yang, 2007). This discussion process includes not only verbal discussions, but also occurs when students write and read texts on a scientific topic (Keys, Hand, Prain, & Collins, 1999). Thus, in ABL, writing activities conducted by the students are important to construct knowledge, and for comprehension and discussion (Burke, 2005).

The argumentation-based learning approach was introduced in the 2013 Science curriculum, and the number of studies on the topic has increased ever since (Arık, 2016; Mallı, 2019; Memiş, 2017; Özer, 2019; Tümay & Köseoğlu, 2011; Uluay, 2012). However, a review of the literature on science education demonstrated that these studies were generally on middle and high school science courses (Hasançebi & Günel 2013; Memiş, 2017; Uluay 2012). Since learning scientific concepts accurately in primary school would lay the groundwork for advanced science courses, studies on argumentation-based learning in primary education should

be prioritized (Osborne, 2007; Özkara, 2011). Thus, students, who could express their ideas freely, express their ideas adequately, support these ideas with various reasons and develop opposing arguments to refute other arguments, acquire scientific knowledge through collaboration with others instead of accepting ready-made knowledge, could be trained (Ministry of National Education-MoNE, 2013).

The Aim of the Study

Several studies reported that the argumentation allows students to acquire critical thinking and inquiry skills and allows students to be active in learning areas and produce solutions to problems they may encounter in daily life through group discussions (Driver Newton & Osborne, 2000; Hand et al. 2018; Irish 2012; Küçükaydın, 2019; Osborne, 2007;). However, the analysis of the science course curricula in Turkey revealed that argumentation-based instruction has only recently introduced since 2013 (Anagün, Kılıç, Atalay, & Yaşar, 2015; MoNE, 2013). Furthermore, it should be noted that recent studies focused on middle school, high school and university level applications, and the number of studies on primary school curricula are limited (Naylor, Keogh, & Downing, 2007; Özkara, 2011; Zohar & Nemet, 2002). The students require learning environments where they could actively participate in teaching-learning processes at an early age, participate in activities as a researcher and questioner in educational activities, explain their ideas with scientific reasons, and support and discuss these ideas effectively (Açıkgöz, 2002). One of the best examples of such environments is the classroom environment where the argumentation-based instruction method is adopted.

The present study aimed to investigate the impact of argumentation-based instruction on academic achievement, scientific process skills and attitudes towards the science of primary school 4th grade students based on the scope of 'Let's Learn about Matter' unit. Because, there are the limited literature on primary school level argumentation-based instruction. In addition, "Let's Learn about Matter" includes the basic concepts about the matter and it is important to be understood in advanced classes.

The Problem Statement

Within the scope of the primary school 4th grade "Let's Learn about Matter" unit, what is the effect of argumentation-based instruction on academic achievement, scientific process skills of the students, and their attitudes towards the science course?

Sub-Problems

1. Is there a significant difference between the pretest and posttest academic achievement scores of the experimental and control groups?
2. Is there a significant difference between the pretest and posttest academic achievement scores of the control group?
3. Is there a significant difference between the pretest and posttest academic achievement scores of the experimental group?
4. Is there a significant difference between the pretest and posttest scientific process skill scores of the experimental and control groups?
5. Is there a significant difference between the pretest and posttest scientific process skill scores of the control group?
6. Is there a significant difference between the pretest and posttest scientific process skill scores of the experimental group?

7. Is there a significant difference between the pretest and posttest attitude towards the science course scores of the experimental and control groups?
8. Is there a significant difference between the pretest and posttest attitude towards the science course scores of the control group?
9. Is there a significant difference between the pretest and posttest attitude towards the science course scores of the experimental group?

Method

The Research Model and Design

The present study was conducted with the quasi-experimental model to compare academic achievements, scientific process skills of primary school 4th grade students and their attitudes towards science course based on the "Let's Learn about Matter" unit. Quasi-experimental models, which follow real experimental models in science, are employed when the controls required by real experimental models are not available or adequate (Çepni, 2011). In quasi-experimental design, pretest and posttest are applied to both groups, but the innovative methods are only applied with the experimental group (Cresswell, 2003). The quasi-experimental method has high application validity, considering its limitations (Karasar, 1999).

In the study, one of the students group was assigned as the control group and the other as the experimental group where argumentation-based instruction. The study was an experimental research with pretest-posttest control group. Pretests were applied before the instruction and posttest were applied after the instruction to both groups. The experimental design of the study is detailed in Table 1.

Table 1.
The Experimental Design

Group	Pretest	Instruction Method	Posttest
Experimental	Academic Achievement Test SPST Attitude Scale	Scientific Discussion (Argumentation)	Academic Achievement Test SPST Attitude Scale
Control	Academic Achievement Test SPST Attitude Scale	Conventional Instruction	Academic Achievement Test SPST Attitude Scale

***SPST**: Scientific process skills test*

The Study Group

The study group included 47 students attending two separate classes in a primary school in Mardin province in Turkey during the 2016-2017 academic year. The students in the experimental and control groups were assigned with the convenience sampling method based on the curricula. Thus, the first class that included 25 students (13 males, 12 females) was assigned as the experimental group where argumentation-based science instruction was adopted, and the second class that included 22 students (12 males, 10 females) were assigned as the control group where conventional instruction was implemented.

Procedures and Data Collection

The study was conducted in a five-week period, where there were three class hours per week, during the instruction of the "Let's Learn about Matter" unit in the primary school 4th grade science course during the 2016-2017 academic year. Elementary science education is important to prepare students to higher classes because the basic principles and concepts are taught with the subjects including "Lets Learn about Matter" given in these classes. Pre-tests were applied to both groups before the instruction and it was observed that the mean scores of the two groups were similar. After the pretests, as the classroom teachers started to instruct the unit in the control group, basic knowledge on argumentation-based learning was instructed in the control group, and the teacher initiated scientific discussions for the comprehension of argumentation-based instruction. During the instructions, argumentation was described, how to form arguments and the significance of arguments in science education, employment of worksheets developed by the author, how to form the groups for the activities were described, and the students were introduced to the argumentation-based instruction. During the instructions conducted with the experimental group, Toulmin's argumentation model was presented by the teacher and the teacher asked discussion questions to arouse the student curiosity, developing an environment for scientific discussion. Then, discussion groups were determined (paired discussion, pairs to couples, listening trios, ambassadors, role play, jigsaw technique), worksheets (table of statements, theories that compete with stories, guess-observe-explain, theories that compete with cartoons, designing experiments) developed by the author based on the argumentation method were distributed to the students, and they were asked to defend their arguments and state the evidence behind their arguments, and then they were asked to discuss why they disagreed with the with the opposing arguments, and why the arguments presented by the other group were wrong. At the end of the discussion, the students reached a consensus after the general evaluation of the discussion.

Data Collection Instruments

In the study, an academic achievement test developed by the authors based on a literature review was employed to determine the academic achievements of the control and experimental group students. The academic achievement test was developed based on the outcomes determined for "Let's Learn about Matter" in the curriculum and included 25 multiple-choice questions. The initial form of the test included 32 questions, and it was edited based on expert opinion and item analysis conducted by the same experts who included teachers and academicians, and the final test included 25 questions. The KR-20 of the achievement test applied to 101 participants was .92. Since the item discrimination values of the 1st, 4th, 19th and 24th questions in the achievement test were below .29, these items were reorganized.

To determine the scientific process skills of the students, 31-item "Basic Skills Scale-BSS" developed by Padilla, Cronin and Twiest (1985) and adapted to Turkish language by Aydoğdu and Karakuş (2015) was employed. The scale aimed to score observation (5), classification (5), inference (5), measurement (5), prediction (6), and communication skills (5). The reliability coefficient of the scale (KR–20) was .83, and the average difficulty of the scale was .55. Furthermore, the 5-point Likert type (totally agree, partially agree, do not know, disagree, completely disagree) "Attitudes Towards Science Course Scale" developed by Geban, Ertepınar, Yılmaz, Atlan, and Şahpaz (1994) was used to measure the attitudes of the control and experimental group students towards the science course. The reliability coefficient of the scale was determined as .83.

Data Analysis

In the analysis of the data collected with the academic achievement test, the scientific process skills test and the attitude towards science course scale applied to the control and experimental group students as pre-test and post-test, initially, the data was tested for normal distribution. The Kolmogorov-Smirnov test and other normality tests conducted on the study data revealed that the student scores exhibited normal distribution, and independent groups t-test, paired groups t-test, frequencies and percentages were used in data analysis. However, since it was determined that the scientific process skills pretest scores did not exhibit normal distribution, the Mann Whitney U test was employed for this data. The significance level of the study data was accepted as .05. Statistical analysis was conducted with the SPSS 21.0 (Statistical Package for the Social Sciences) software.

Findings

In this section, based on the study objectives, the study data were analyzed to determine the effect of argumentation-based instruction on academic achievements, scientific process skills of the students and their attitudes towards science and the study findings are presented.

The results of the independent groups t-test conducted on experimental and control group academic achievement and attitudes towards science pretest scores are presented in Table 2.

Table 2.
Independent Samples t-Test Results: The Pre-test Experimental Group and the Control Group Scores

Group	n	x̄	sd	t	p	η2
Academic achievement						
Control	22	13,18	4,21	,604	,549	,008
Experimental	25	12,40	4,60			
Attitudes towards science						
Control	22	52,72	4,90	,362	,719	,002
Experimental	25	53,20	4,04			

As seen in Table 2, it was concluded that there was no significant difference (p>.05) between the experimental group and the control group pre-test academic achievement and attitude towards science scores before the application. This demonstrated that the academic achievements of both groups were similar before the application. The partial eta squared values were found to be less than .01 (small effect).

Table 3.
Mann-Whitney U Test Analysis Results: Experimental and Control Group Scientific Process Skills Pre-test Scores

Group	n	Rank mean	Rank total	U	p	η2
Control	22	25,36	558,00	245,00	,520	.002
Experimental	25	22,80	270,00			

As seen in Table 3, there was no significant difference (p>.05) between the scientific process skills pre-test scores of the experimental and the control groups before the instruction. This demonstrated that the scientific process skills of both groups were similar before the application. The partial eta squared value was found to be less than .01.

Table 4.
Independent Samples t-Test Results: Experimental Group and the Control Group Post-test Scores

Group	n	x̄	sd	t	p*	η2
Academic achievement						
Control	22	15,54	4,38	,738	,464	,01
Experimental	25	16,68	5,925			
Basic process skills test						
Control	22	14,54	4,52	1,351	,183	,03
Experimental	25	16,44	5,02			
Attitudes towards science						
Control	22	52,09	3,08	7,04	,000	,52
Experimental	25	60,36	4,66			

The results of the independent samples t-test conducted on the academic achievement, basic process skills and attitudes towards science pretest scores are presented in Table 4. It was found the small effect in academic achievement; the small-medium effect in basic process skill and the big effect in attitudes towards science between control and experimental groups.

Table 5.
The Control Group Paired Samples t-Test Results

Test	n	x̄	sd	t	p	η2
Academic achievement						
Pre-test	22	13,18	4,21	1,67	,11	,11
Post-test	22	15,54	4,38			
Basic process skills						
Pre-test	22	14,09	3,96	,317	,755	,004
Post-test	22	14,54	4,52			
Attitudes towards science						
Pre-test	22	52,72	4,90	,552	,587	,01
Post-test	22	52,09	3,08			

The results of the paired samples t-test conducted on the academic achievement, basic process skills and attitudes towards science pretest and posttest scores of control group are presented in Table 5. It was found the medium-big effect in academic achievement; the less than small effect in basic process skill and the small effect in attitudes towards science.

Table 6.
The Experimental Group Paired Samples t-Test Results

Test	n	x̄	sd	t	p*	η2
Academic achievement						
Pre-test	25	12,40	4,60	2,867	,008	,24
Post-test	25	16,68	5,92			
Basic process skills						
Pre-test	25	13,96	4,59	1,66	,11	,09
Post-test	25	16,44	5,02			
Attitudes towards science						
Pre-test	25	53,20	4,04	5,368	,000*	,53
Post-test	25	60,36	4,66			

p<.05

The results of the paired samples t-test conducted on the academic achievement, basic process skills and attitudes towards science pretest and posttest scores of experimental group are presented in Table 6. It was found the significant effect in academic achievement and attitudes towards science, the medium-big effect in basic process skill.

Conclusion and Discussion

The comparison of the pretest mean scores of the students in the experimental and control groups revealed that there was no significant difference between the groups. This finding demonstrated that before the study, the prior knowledge of the students in both groups on 'Let's Learn about Matter' unit were similar before the study. Following the instruction, the comparison of the post-test mean scores of the experimental and control groups revealed a difference between the groups based on academic achievement favoring the experimental group. It was determined that the difference was not significant but it was found small effect size based on partial eta square. Thus, it could be suggested that the argumentation-based science instruction could play a role in the improvement of the academic achievements of the students. However, the contribution could be significant when the duration of the instruction could be expanded. In previous studies, Cangöz (2020) reported that argument-based virtual laboratory applications positively affected the academic achievement of the students, Erdogan (2010) found that the academic success of the experimental group students when argumentation-based instruction was conducted in the primary school 5th grade 'Earth, Sun and Moon unit' was higher when compared to the control group that was instructed with the conventional method. Uluay (2012) concluded that the argumentation-based instruction effectively improved academic achievements of the students in the7th grade Science and Technology course 'Force and Motion' unit. In a study conducted by Öğreten and Uluçınar (2014), where the effect of argumentation-based activities on the academic achievement of 4th grade students and the development of discussion skills was investigated, it was observed that there was a significant difference between post-instruction academic achievements favoring the experimental group where argumentation-based activities were conducted. Yeşildağ-Hasançebi and Günel (2013) concluded that the application of argumentation-based science learning (ABSL) approach in the 'Structure and Properties of the Matter' unit contributed to the academic achievement of the students. Furthermore, other studies also reported the impact of argumentation-based instruction on student academic achievement (Akbaş, Şahin & Meral, 2019; Aslan, 2019; Driver Newton & Osborne, 2000; Noviyanti, Mukti, Yuliskurniawati Mahanal & Zubaidah, 2019; Yalçın, 2019). In addition, Nasimudheen and Musthafa (2015) indicated that argumentation is effective in enhancing achievement in science,

The analysis of the scientific process skills pre-test data demonstrated that there was no significant difference between the experimental and control groups. Thus, it could be suggested that the scientific process skill levels of the experimental and control groups were similar before the study. In addition, the analysis of the posttest scores showed that there was no significant difference between control and experimental groups. However, it was found small-medium effect size based on partial eta square among the groups. Thus, the argumentation-based instruction of the science course was effective on the development of the scientific process skills of the students. In the literature, there are studies that investigated the effects of argumentation-based instruction on the development of scientific process skills of the students. In a study by Tatlısu (2020), it was concluded that the argumentation method positively affected scientific process skills of the students. Similarly, Ural and Gençoğlan (2020) reported that the argumentation-based approach in science instruction had a significant effect on students' scientific process skills. The findings of the study conducted by Öç (2019) demonstrated that argumentation-based science laboratory applications improved the scientific process skills of pre-service teachers. Richmond and Striley (1996) also reported that conducted discussions led

to positive changes in the scientific research skills of the students. In another study done by Su (2020) showed that argumentation based study with concept maps promoting students' critical thinking and improving self-confidence of science process skills. However, in a study by Gümrah (2013), it was reported that the scientific discussion method did not lead to a significant difference between the scientific process skills of the experimental and control group students. The review of the findings reported in a study by Gültepe (2011) demonstrated that scientific discussion-based instruction adopted in certain curriculum units made a significant difference in the development of scientific process skills of high school juniors; however, it did not have a similar effect in the "Reaction Speed" unit. Since the development of scientific process skills at the primary school level would be the cornerstone of advanced grades, it is important to improve these skills with argumentation-based activities.

The analysis of the pre-test attitude scores of the experimental and control groups towards the science course demonstrated that there was no significant difference between the two groups before the application; however, a significant difference was determined after the application favoring the experimental group. Thus, argumentation-based instruction contributed to student attitudes towards the science course. Similarly, Oğuz Çakır (2011) reported that discussion-based instruction helped 6th grade students develop a positive attitude towards the science course. Çelik (2010) also determined that the scientific discussion-based instruction improved student attitudes towards the chemistry course during the instruction of 9th grade "Structure of Matter" unit and 10th grade "Gases" unit. In addition, in a study conducted by Erdoğan (2010) on 5th grade students, a significant difference that favored the experimental group was reported between the attitudes towards science scores of the experimental group where argumentation-based instruction was conducted and the control group where the courses were instructed with the conventional method. Other study findings were also consistent with the above-mentioned results (Osborne, Simon, & Collins, 2003; Walker et al., 2012; Yüksel, 2019).

An overview of the current study findings would reveal that argumentation-based instruction contributed to academic achievements, scientific process skills of 4th grade students and their attitudes towards the science course. However, there is a need for studies to be conducted with different samples and with more students. In addition, it is recommended to conduct longer studies that will continue for more than five weeks in future studies.

Recommendations

The following are recommended based on the study findings:

1. The study sample was limited. To generalize the effects of argumentation-based instruction and to understand its effects better, further studies could be conducted with larger samples.
2. The study was conducted only during the instruction of the "Let's Learn about Matter" unit in the science course. Argumentation could be analyzed during the instruction of other science topics or its effects on various courses could be investigated.
3. The study was conducted during five weeks, where the instructions were conducted three hours a week. Future research could be conducted during longer periods to re-analyze the present study findings.
4. Various material, worksheets and activities that would be interesting for the students could be developed to further include the argumentation method in school instruction.
5. In the study, the impact of the method on academic achievements, scientific process skills and attitudes towards science course were investigated. Instead, the effects of the

argumentation-based instruction method on various areas such as social skills could be investigated in future studies.

6. The study only included primary school 4th grade students. Argumentation-based instruction could also be investigated in 3rd grade level, where students encounter science for the first time.
7. Future studies could be conducted on the impact of the skills acquired by the students in argumentation-based instruction on daily life.
8. Teachers could further include argumentation-based classroom activities and scientific discussions in primary schools for students to comprehend the instruction method better.

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Research Article
Received: 11.02.2021
Accepted: 14.03.2021
First Online: 14.03.2021
Published: 30.06.2021

Citation: Sadak, M. (2021). How do pre-service mathematics teachers enhance their lessons through lesson study?. *International Journal of Scholars in Education*, *4*(1). 15-25. doi:10.52134/ueader.896081

How Do Pre-service Mathematics Teachers Enhance Their Lessons through Lesson Study?

Musa SADAK*

***Abstract*:** This study aimed to investigate how lesson study perspective could help pre-service teachers (PSTs) to enhance their mathematical instruction. Four PSTs along with their 13 other peers who took a semester long secondary level mathematics teaching methods course in one of the large-midwestern universities in the US participated in this study. While four PSTs planned and taught a lesson in two different groups by two, other PSTs took the role of giving feedback to their classmates. PSTs enhanced their lesson plans based on the feedback from their peers and provided self-reflections on these changes. As a result of the investigation of the changes PSTs did on their lesson plans and the reflections they provided, it was revealed that they enhanced their instruction on some specific issues, such as getting students' attention, using time efficiently, maintaining student interaction, using technology. It is also suggested to future researchers that it would be beneficial to study on PSTs' assumptions on the difference between the real students and the PSTs who pretended as students during the peer-taught lesson study activity.
Keywords: Lesson study, mathematics education, pre-service teachers, teacher education.

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Introduction

Despite the high availability of research on PSTs' knowledge development and the obstacles they encounter when starting the teaching practices, there was a limited direct research on their learning of teaching skills as a part of their teacher education focused undergraduate courses (Chen, Housner, & Wayda, 2011, Incikabi & Kacar, 2017; Pektas, 2014). That learners get involved in the learning, instead of only getting information from the instructor, has been determined as an essence of the education (Rubin, & Hebert, 2010). If the aim is to improve teaching, practitioners should be supported to show their art with the intent to improve their practices. Their strategy could be engaging in teaching to cover what is needed, consequently the improvement will occur by gaining insight by the other people's help. And if the main focus is on reflection, teachers would think about what happened, why it happened, and what improvements they could actualize to reach desired goals (Cruickshank, & Applegate, 1981). Collaborative learning and peer teaching are the encouraging learning methods among the active learning methods (Rubin, & Hebert, 2010). Wilson and Berne (1999) indicated three circumstances of teacher learning in any professional development as sustainable learning environments: (i) learners' community that redefines the teaching practices, (ii) the environment that is designed to help teachers to activate and redefine their own professional development, and (iii) the environment that provides the opportunity for teachers to support and critique the works of each other.

Copland (2009) stated that feedback from pre-service teachers' (PSTs') peers has an impact of having tension on themselves since they felt having to act in the shoes of those feedbacks. However, the evaluations on PSTs' teaching performances given by their peers are more complimentary than the ones given by the students (Stronck, 1976). The sociocultural reflection perspective suggests that teachers more imperviously learn in the settings, in which they engage in shared dialogues, than individual contexts, and examining how they engage in these dialogues and form their learning are substantial to develop effective teacher learning communities, especially when they newly begin teaching practices (Guarino, Santibañez, & Daley, 2006). Teachers will confidentially generate more specific and self-reliant actions to explain and change their practices if they take a part in a group where people are supported to dignify each other's thinking in a way that is reflective, growth-focused, and practice-based (Danielowich, 2012).

One example of peer evaluation-based team lessons was conducted by Burton (2005). In this research study, each student submitted their peer evaluation on team lessons that their peers taught as a requirement of a Methods and Materials of Teaching Mathematics in the Middle Grades class, and it was examined if these PSTs have fully included the six teaching standards of teaching mathematics of NCTM 1991. When teachers provide feedback to their colleagues, it enables their colleagues' and own learning at the same time (Danielowich, 2012).

Students' self- and peer-evaluations have essential learning outcomes for the students, additionally to the benefit of decreasing the teacher's work (Ozogul, Olina, & Sullivan, 2008). Danielowich (2012) also indicated as a result of his study that teachers' individual learning could be more supported with the following two conditions: when their own contradictions about their teaching are clear prior to their performance, and when they participate in the peer dialogues to reconsider their teaching adoptions and enhance their critical thinking.

In their study on teacher-, self-, and peer-evaluation groups, Ozogul et al. (2008) indicated that all the students in these three evaluation groups considerably enhanced their performances from draft to the revised lesson plans. They also stated that peer-evaluators gave more feedback than the self- and teacher-evaluators. From the metacognitive perspective, when students formally involved in evaluating their works, they could determine the mastery level

that they had, and realize the shortcomings of their work. While self-evaluation allocates students to be in an active role in critically thinking on their skills and own learning, peer-evaluation provides students to engage these processes in both way: as an evaluator, and the person being evaluated. Consequently, when students are having the both role of evaluators of and being evaluated by their peers, it affects the type and importance of the feedback that they give (Ozogul et al., 2008).

During the peer-evaluation process, getting feedback on their teaching from their peers provides opportunity for students to metacognitively aware of their self-evaluation skills by comparing to their peers' work (Topping, Smith, Swanson, & Elliot, 2000). Additionally, peer-evaluation allocates students to well understanding of the rubric through which they provide feedback, and to reduce the mistakes on their lesson plans (Ozogul et al., 2008).

Theoretical Model of the Lesson Study

Japanese Lesson Study became popular with the release of TIMSS 1999 Video Study especially in the Western and South-Eastern countries (Stigler, Gonzalez, Kawanaka, Knoll, & Serrano, 1999). Doig and Groves (2011) claimed that Japanese Lesson Study offers a model of extensive and maintainable professional development opportunities. Lewis, Perry and Hurd (2009) provided a theoretical model for the Japanese Lesson Study that was drawn from the researches made at the center of these studies. Based on this model, there are four features of a lesson study: Investigation, Planning, Research Lesson and Reflection. What should be included in these features when conducted a lesson study is illustrated in detail in the following table (Table 1).

Table 1.
Theoretical Model of the Lesson Study

Investigation	a. Consider students' current characteristics b. Consider long term goals for student learning and development c. Study the content area: key concepts, existing curricula, standards, learning trajectory, research
Planning	a. Select or develop research lesson b. Try task in order to anticipate student solutions c. Write up instructional plan, including goals for student learning and development, anticipated student thinking, data collection points, rationale for lesson design, connection to long-term goals
Research Lesson	a. Conduct research lesson b. Team members observe and collect data during live research lesson
Reflection	a. Share and discuss data from research lesson in post-lesson colloquium b. Team members (and often other observers) draw out implications for lesson redesign, for teaching-learning more broadly, and for understanding of students and subject matter c. Summarize in writing what was learned from cycle, to consolidate the learning d. [Revise and reteach the lesson]*

*An optional feature (Lewis et al., 2009, p. 287)

For this study, these crucial four elements of the lesson study were integrated into PSTs' implementation of the lesson. Table 2 illustrates how these four elements were included in the rubric of their lesson plans. Objectives they needed to provide in their lesson plans were reflected as sub-headings in the construct of the implementation of the lesson study with connection to each element.

Table 2.
The Linkage between the Theoretical Model and the Implementation of the Lesson Study

Theoretical Model	Implementation of the Lesson Study
Investigation	– Determination of Title of the lesson – Determination of Target audience of the lesson – Determination of Overall goal of the lesson – Determination of Common Core State Standards and Mathematical Practices Addressed
Planning	– Determination of Student learning objectives – Determination of Student prior knowledge – Determination of Assessment – Determination of Length of the lesson – Scheduling the Activities – Determination of Adaptations – Determination of Materials needed
Research Lesson	– Implementation of the planned lesson in the classroom – 45 minutes – Observation by the group members and other PSTs
Reflection	– Feedback from the peers in the classroom – 30 minutes – Revising lesson plan based on the feedback – Writing overall reflections on the revisions

Lewis et al. (2009, p. 287)

Methods

Study Design

Four PSTs who are taking semester-long secondary level mathematics teaching methods course in one of the large mid-western universities in the US participated in this study along with their 13 other peers who are the ones giving feedback to these four students. These four PSTs were consisted of two groups by two. While a group of two students were teaching a lesson other 15 PSTs were in the role of giving feedback. They taught a lesson on two topics of geometry (G) and mathematical applications (M) with a group of two (one group consists two) to their classmates for the first 45 minutes of a class session, and got feedback from them for the last 30 minutes, where one class session was 75 minutes. Students were also required to have a meeting with the instructor of the course to discuss their teaching ideas at least one week prior to their class teaching, and then planned the lesson. After teaching the lesson in the classroom and getting feedback from their peers, PSTs revised the lesson based on the feedback, and actually redesigned the lesson plan with the changes.

For the peer-taught lesson study, they planned the lesson as a group based on the following three phases: Before, during, and after, as explained above. When they submitted their group lesson plans on these three phases before they teaching the lesson, they used the following blank form (Figure 1). The inclusion of the elements of this template was already given in Table 2.

Title of the Lesson:
Audience of the Lesson:
Aim of the Lesson:
Student Learning Objectives:
Student Prior Knowledge:

Assessment: *(Go back to "student learning objectives". What will your audience do to show that they fulfil the "student learning objectives?" Please make sure each student learning objective is matched up with an assessment objective)*
Common Core State Standards (CCSS) and Mathematical Practices: *(Download, copy and paste the CCSS standard from the website: http://www.doe.in.gov/standards/mathematics)*
Length of Lesson: *45 minutes (one day)*
Activities Schedule: *(Specifically think about what students and teachers will do in each step)* Launch/Before: *(minutes)* Investigate/During: *(minutes)* Summarize/After: *(minutes)*
Adaptations: *(How can you control to gear up or gear down the lesson based on your initial observation? How can you accommodate students with special needs?)*
Materials Needed: *(Think about the activities you planned and consider the materials and technologies needed in your lesson)*

Figure 1. Lesson Plan Template for Peer-taught Lesson Activity

"Before, during and after" (BDA) model is a lesson structure format, through which activities of the lesson could be organized in a way that students could catch the principal meanings that lie under the lesson (Wilburne, & Peterson, 2007). They indicated that if, especially mathematics, classes were designed by the activities based on BDA model, it would allocate effective teaching and learning environment, and improve students' mathematical experiences.

In the "before" phase, teacher gets students' attention to the lesson, and sets up the platform of the main content. The activities in the before phase could be in a format of prompt review of the prior lessons to revealing students' prior knowledge, or be a quick review of common mistakes related to the main topic, and also could be a quick assessment of skills needed in the "during" phase. In the "during" phase, the core content of the lesson is provided to the students, and students involve in the experiments, investigations, and concept discoveries as in the small groups or individuals. Finally, "after" phase mainly relies on a reflection practices on what explored in the "during" phase, and it provides students to make sense of the mathematical concept covered in the lesson, and the further extensions on reasoning and problem solving skills (Wilburne, & Peterson, 2007).

Following Table 3 is the guiding questions formed by Wilburne and Peterson (2007) to help teachers to facilitate before, during, and after phases in their lesson plans. Students in this activity examined this table when learning peer-taught lesson activity.

Table 3.
Teachers' Guide to Developing a Before-During-After Lesson

The Before Phase	• Does it relate to today's lesson? • Is it a 5- to 10-minute activity? • Does it grab students' attention? • Does it allow for connections and/or assess prior knowledge? • Do students have the opportunity to share their thinking? • Does it actively engage students?
The During Phase	• Is it aligned with academic standards? • Does it meet the course/content objectives? • Does it reflect a problem-solving approach? • Does it promote opportunities for students to communicate their learning?

	• Are students actively talking, reading, writing, and making sense of the mathematics?
The After Phase	• Does it require application of the new knowledge? • Does it assess what the students have learned? • Does it provide opportunity for the students to reflect on their learning and make sense of the mathematics?

(Wilburne and Peterson, 2007)

Based on lesson template plan and BDA activity, which is also included in the lesson template plan, PSTs prepared the lesson. Afterwards, they taught the lesson to their peers. At the end of each group's teaching, other PSTs who were in the student position gave feedback (verbally and in a written format) to their classmates also based on these three phases. After PSTs, who taught the course, took notes what their classmates pointed about their teaching and collected the written feedbacks, they submitted the individual revised lesson plans also on this form, but with the changes at this time and not as a group. Additionally to the revised lesson plans, PSTs were also required to submit their individual self-reflections on the lesson they taught.

Data Collection and Analysis

For this study, students' lesson plan submissions on the form (Figure 1), both the prior group lesson plan and revised individual one, and their individual self reflections on the lesson plans were used as a data source to define the changes. Those two lesson plans could be defined as a pre- and post-data determining the changes that PSTs did through the help of peer-taught lesson study, and the self-reflections could be defined as an explanatory for the changes. Thus, with these two plans PSTs submitted, it was analyzed what PSTs still want to include, or want to eliminate from the previous plan, and was narratively reported in the discussion part. And, their self-reflections revealt the reasons of why they wanted to change or keep the same the lesson plans. Some excerpts from the lesson plans are also provided in the discussion section to give the sense of the changes that PSTs did. Between the pre- and post-lesson plans, it was employed a simply thematic content comparison to uncover the changes that was caused by the peer-taught lesson study, and reach the main bullets of changes.

Discussion

Group 1: Geometry (G)

In the geometry group, two students (G1, and G2) provided post- lesson plans with the changes that they made on the pre- lesson plan on the "lesson plan template" (Figure 1) format. Figure 2 is provided as their pre- lesson plan that they submitted as a group. Since they only changed the "schedule of activities" part in their individual post-lesson plans from pre- lesson plan, Figure 2 only shows that part to make sense of the changes they did. The remained parts of the lesson plan were the same on both pre- and post- lesson plans by these two students. Therefore, those parts were not included.

Activities Schedule: *(Specifically think about what students and teachers will do in each step)*
Launch/Before: (5 minutes) Teachers: Question about what are parallel lines (i.e. what does it mean if two lines are parallel, what does that look like) and what is a transversal Students: Create a set of parallel lines and transversal in GSP while teachers walk around and check what they are doing

Investigate/During: (25 minutes)
Students: Work on GSP worksheet on exploring parallel lines and angles
Teachers: Walk around room and provide support

Summarize/After: (10 minutes)
Students: Share out discoveries from completing worksheet exploration
Teachers: Guide discussion

Figure 2. Pre- lesson design of the geometry group (G1 and G2)

Based on their first lesson plan (Figure 2) G1 made a change in the "before" phase by adding the time separation for teacher's and students' to do statements, at first (Figure 3). Then added 4 warming up questions to the teacher's 5 minutes part. G1 stated on her self-reflection, which might be the clue on the change she did:

> The warm up was a little short. I think for a group of college students who know all of this forward and backward, it was fine, but teaching this to actual high school students would require more to be done and probably something more engaging.

The other change G1 did on the pre- lesson plan was on the "after" phase by making a specific explanation on teacher's part (Figure 3). The further explanation was about the homework assignment for the following lesson, and teacher's guidance about it if the class time lets to do so. She stated about this change on her self-reflection:

> The homework assignment could have been structured a little better, but part of that was me having the spur of the moment idea of each of them to write their own definition rather than allowing one or two people in the class to do all of the thinking and answering the question for everyone else.

Activities Schedule: *(Specifically think about what students and teachers will do in each step)*

Launch/Before: (15 minutes)
Teachers: Question about what are parallel lines (i.e. what does it mean if two lines are parallel, what does that look like) and what is a transversal (5 minutes)

- Question 1: What does it mean when two lines are parallel?
- Question 2: What is a transversal line?
- Question 3: How many angles are formed from two parallel lines and their transversal?
- Question 4: Can a transversal line intersect non-parallel lines? Or is it specific to parallel lines?

Students: Following along with teacher, create the GSP file that will be used in the exploration (10 minutes)

Investigate/During: (20 minutes)
Students: Work on GSP worksheet on exploring parallel lines and angles
Teachers: Walk around room and provide support

Summarize/After: (10 minutes)
Students: Share out discoveries from completing worksheet exploration
Teachers: Guide discussion of discoveries, lead students to homework assignment of writing a definition of parallel lines involving the angles, give time to work in class on assignment with teacher around to help

Figure 3: Post- lesson design from the geometry group (Student G1). The changes that Student G1 did provided with blue-colored form

G1 also indicated separately from the lesson plan form:

> Having this projected on technology may have been useful, so I was not constantly erasing the board between groups.

On the other hand, G2 made an addition on the "during" phase, at first (Figure 4). As could be seen, G2 added an objective for the student to share their experience on Geometric Sketch Pad (GSP) with their classmates. Also, G2 added that teacher could initially help the students when they were lost in working on the GSP by illustrating an example on the board. She also indicated that when teachers walk around the class, they should work cooperatively with the students in the groups. In her self-reflection, G2 stated regarding this issue:

> We had a good plan of having each different table present a different angle to the class and not letting them know which angle their table was assigned until the end of the activity. I believe that this encourages more focus because they won't feel like they're only required to focus on their table's angle.

Lastly, G2 added also on the "after" phase in the student role that students could develop a definition for parallel lines by the help of different types of angles (Figure 4). In regard to this point she reported on her self-reflection:

> Our hope was to strengthen our definition of parallel lines using the students' understanding of corresponding, consecutive, alternate exterior and alternate interior lines. During our lesson, we didn't quite reach this goal, and I think we could have done better with presenting this task to the class.

Activities Schedule: *(Specifically think about what students and teachers will do in each step)*

Launch/Before: (5 minutes)

Teachers: Question about what are parallel lines (i.e. what does it mean if two lines are parallel, what does that look like) and what is a transversal

Students: Create a set of parallel lines and transversal in GSP while teachers walk around and check what they are doing

Investigate/During: (25 minutes)

Students: Work on GSP worksheet on exploring parallel lines and angles;

Each table will be presenting a different type of angle to the class after the exploration

If the students are having trouble building their parallel lines with transversal, the teacher can put an example on the board, or the teacher can build these lines on GSP on the board if the students are completely suck

Teachers: Walk around room and provide support;

Work together with table partners or other members of the group at the table

Summarize/After: (10 minutes)

Students: Share out discoveries from completing worksheet exploration;

Develop a new definition of parallel lines given the properties found of the different types of angles

Teachers: Guide discussion

Figure 4: Post- lesson design from the geometry group (Student G2). The changes that Student G2 did provided with blue-colored form.

Group 2: Mathematical Applications

In the mathematical applications group, two students (M1, and M2) provided their pre- and post- lesson plans in addition to their self-reflections on the changes that they did between these plans. However, they did not follow the "lesson plan template" (Figure 1) to explain their work, and created their pre- and post- lesson plans on an essay based structure. Therefore, the analysis of the changes that they did is provided narratively.

In their group pre- lesson plan, they planned to have 10 minutes "opener", 10 minutes "quadratic review", 20 minutes "battleship [an activity]", and 10 minutes closure activities. In the "opener" activity, they planned to ask some challenging questions about the real world applications of quadratics and parabolas, and then followed by a brief discussion video on parabolas in the real life. In the "quadratic review" activity, they designed a slide presentation on quadratic formula, quadratic form, aspects on graphing quadratic, and vertex and intercepts in the quadratics. They said this would be a good opportunity for students to ask questions to get answers in the following activity. In the "battleship" activity, students were supposed to work on a real life scenario to apply their knowledge by the use of technological graphing devices. Lastly, in the "closure" activity, they planned to have closure discussion with the whole class members on what they did during the prior activities.

In his individual post-lesson plan, M1 enhanced the "opener" activity with a "think-pair-share" activity, through which students brainstorm alone and share with the group, and then with the whole class. He also changed the brief video in this activity. He explained why he did these changes in his self-reflection:

> I want the students to engage more with their peers and work together. I thought that a think-pair-share would allow the students to brainstorm ideas privately and then discuss with a partner. … The video was not engaging to the students and was pretty drab. I added a new video with a catchy song that starts the review off in a humorous manner.

He, then, changed the time of the "quadratic review" activity to 5-7 minutes, and added an activity followed by the slide presentation that students have discussions about the problems given in the presentation. M1 also added on the "battleship" activity that students work at their own paces. For the students who finished the activity earlier, he suggested a battleship game based on firing on a missile by playing with quadratic equations. The clue on why he added some activities on the "quadratic review" in his self-reflection could be:

> No one seemed particularly bored by the activity that we were doing and it seemed to be quite enjoyable.

However, M2 only changed the time allocated for the "opener" and "battleship" activities, from 10 to eight, and 10 to 32, relatively. It was the only addition he made on the pre-lesson plan. He also eliminated the "quadratic review" activity. He explained why he changed the time allocation for the activities and eliminated the "quadratic review" in his self-reflection:

> The biggest problem with our lesson is that we did not leave enough time to wrap-up the activity and allow students to discuss their problems and solutions. … If I could teach the lesson again, I would do one of three things to make sure we have enough time at the end of the lesson to discuss. First, I would remove the quick review that took place in the opening of the lesson after the video and move into the activity sooner.

Conclusion and Implications

Lesson studies are helpful in PSTs' growth in their instructional abilities (Doig & Groves, 2011; Stigler et al., 1999). PSTs who engaged in the peer-taught lesson study gave some hints about the types of changes that they did based on the feedback they got from their classmates. This study revealed that when PSTs taught a lesson to their peers, they enhanced their teaching in various ways as previous researchers indicated (Cruickshank, & Applegate, 1981; Rubin, & Hebert, 2010; Stronck, 1976; Guarino et al., 2006; Danielowich, 2012). They did the changes by adding some new ideas, eliminating some activities, or even giving emphasize on some context that they already covered in their pre-lesson plans, and getting

positive feedback from their classmates about it.

The most common issue that PSTs reported in their self-reflections and included in their post- lesson plans is “getting all students’ attention in the classroom”. Students G1, G2, and M1 made changes on their pre- lesson plans with the special focus on students’ attention. Another important issue PSTs indicated is that the “time management” in the classroom. Students G1 and M2 reported this issue on their self-reflections and changed their pre- lesson plans based on this issue. The third important matter that PSTs struggled with is “maintaining students’ interactions”. The changes by students G2 and M1 indicated the importance of this.

PSTs stated other enhancements additionally to three cases, which were stated above, through this peer-taught lesson study that technology use in the classroom could be a better strategy to make the teacher’s work easier (G1); teachers could be engage in the students’ working groups actively (G2); and students’ exploration could be useful with the support by some teachers’ presentation (G2). Therefore, the PSTs’ enhancements through the peer taught lesson were the following:

- Getting students’ attention during the lesson,
- Using the lesson time efficiently,
- Maintaining students’ interactions with each other,
- Using technology,
- Actively engaging students’ work groups,
- Supporting students with direct presenting of the information when needed.

Additionally, one student mentioned that if the lesson she taught was with the real students, she could teach in different way. This case could be an example of a limitation of the peer-taught lesson. When PSTs present their teaching to their classmates as a real teaching practice, they confused with the audience level, and mixed the lesson based on the PSTs’ and intended real students’ level.

In conclusion, peer taught lesson study in this secondary level mathematics methods class environment enhanced PSTs’ teaching abilities in the ways that described above. All students who provided their pre-, post- lesson plans, and their reflections made changes on their pre-lesson plans, and conducted their post-lesson plans with those changes. Their self-reflections helped us to understand why they changed the parts of the lessons. However, as one of the PSTs indicated, peer taught lesson study might not be effective for some PSTs since they may think the students in the real class environments would be totally different than the PSTs who pretended as students.

For the further studies, it would be really beneficial to study on PSTs’ assumptions on the difference between the real students and the PSTs who pretended as students during the peer-taught lesson study activity. Since they teach their planned lessons to their classmates, instead of the real students who were in the intended level, PSTs’ teaching approaches may be affected by this assumption during the peer-taught lesson study, and it is also possible that PSTs could not reveal their teaching strategies to enhance through this study. Thus, it would be helpful for researchers to find out the extent to which PSTs assume their classmates as real students whom they will teach in the future while they teach a lesson as a practice to their peers.

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Research Article
Received: 15.02.2021
Accepted: 29.03.2021
First Online: 30.03.2021
Published: 30.06.2021

Citation: Larrotta, C. & Chung, H. (2021). Professional socialization of foreign-born scholars into U.S. academe: A reflective case study. *International Journal of Scholars in Education, 4*(1), 26-37. doi:10.52134/ueader.877225

Professional Socialization of Foreign-Born Scholars into U.S. Academe: A Reflective Case Study*

Clarena LARROTTA*, HeeJae CHUNG**

***Abstract*:** Utilizing a reflective case study approach and the constant comparative method, two foreign-born scholars examine their experiences through the professional socialization process in the distinct U.S. academe arenas (e.g., cultural, institutional, interactive). The research questions guiding the study include: (1) What is traditionally expected of a scholar starting an academic career? (2) What does the professional socialization of foreign-born scholars into U.S. academe entail? (3) How can emergent scholars systematically reflect and learn about the profession? Videoconference meetings, transcripts and notes, email messages, and individual written reflective journal entries constitute the data collection sources. Data were analysed following the constant comparative method: (a) comparing different people, (b) comparing data from same individual at different points in time, (c) comparing incident with incident, (d) comparing data with category, and (e) comparing category with other categories. In addition, selective coding, grouping categories to reduce data, synthesizing, and explaining the data, were also part of the data analysis process. Meaningful narratives support study findings. These are presented following the order of the three research questions. Consequently, the need to re-conceptualize the professional socialization process of emergent scholars became evident. Without a doubt, to succeed in U.S. academe, emergent scholars must prepare for teaching, research, and service expectations. However, as illustrated in the proposed matrix of professional socialization, mastering these areas requires gaining understanding of values, traditions, politics, rules, and morals that regulate the academic society.

***Keywords**:* Emergent scholars, Foreign-born scholars, Reflective case study, Professional socialization, U.S. academe.

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Introduction

> With the help of my dissertation advisor, I prepared for interviews to get a job as assistant professor. I dressed properly, had a list of questions to ask, knew how to negotiate my salary, and how to answer the search committee questions. Thus, I was hired and obtained a work-visa under the category of 'alien with extraordinary ability.' Once I got the job, I realized I didn't know so many other important things like the politics at faculty meetings, how to work with a mentor who was also a colleague, or how to react when a student in my class didn't like my accent or my feedback on a paper highlighting grammatical errors (Clarena).

> Graduating with a master's degree, I quickly learned that international faculty positions require having teaching experience in U.S. institutions. Now, while in the U.S., I want to gain such experience, but with an international student visa, we can only work on campus where teaching jobs are very competitive. Currently, I am volunteering to teach at a community-based organization. Coming from a background where volunteer work is typically not accepted, realizing its relevance has been a eureka moment for me. In fact, my mentor recently helped me organize my CV to prove all my service experienced valid! (HeeJae).

Foreign-born emergent scholars face similar challenges to those who are native to the United States. However, they also face distinctive barriers due to cultural, linguistic, and societal issues, as well as the stigma associated with their status as internationals. For example, strict immigration policies are one of the unique challenges that foreign-born scholars experience trying to obtain/keep a position in the U.S. grounds.

Furthermore, each year U.S. universities hire large numbers of international faculty and enrol even larger numbers of international graduate students. According to the 2019 Open Doors Report (The Power of International Education, 2019), in the 2018-2019 academic year, 5.5% or 1,095,299 of the total U.S. enrolment were international students. Additionally, many universities in the United States hired international scholars. For instance, during the same year, Harvard University hired the largest number (5,278) and Emory University hired the smallest number (1,095) of international scholars. These data illustrate a sizeable population of international scholars working and studying at U.S. universities, making this a topic worth studying.

The goal of the present article is to shed light into the professional socialization process of foreign-born scholars into U.S. academe and the expectations for emergent scholars to succeed. The article also aims to explore how emergent scholars can systematically reflect and learn about the profession. Research in these areas is scarce; the article addresses this gap in the literature. It documents the perspectives of two foreign-born scholars navigating U.S. academe and the higher education system. Using a reflective case study approach and storytelling, a full professor and a third-year doctoral student examine their lived experiences navigating the professional socialization process. The article describes true stories lived by the authors and proposes a conceptual matrix to guide emergent scholars for obtaining a good grasp of the politics involved while participating and becoming a member of U.S. academe. Therefore, this article aims to provide guidance to foreign-born and U.S. nationals who are emergent scholars or new assistant professors in U.S. institutions of higher education.

Professional Socialization and Expectations for Emergent Scholars

Professional socialization includes the integration of formal and informal norms, values, conduct, and expectations in relation to behaviour, relationships, and professional performance (Baz, 2016). This definition is present in the literature regarding teacher education; however, it also applies to the professional socialization of scholars in higher education. According to Baz (2016), the process of being socialized into a professional culture occurs through the transition

between institutions and cultures, the adaptation process, and other efforts trying to become an active member of a professional group.

Similarly, Lengeling, Mora Pablo, and Barrios Gasca (2017) assert that professional socialization requires learning and understanding values, actions, expectations, traditions, politics, regulations, and morals within the academic society. How the participants perceive themselves after entering the professional community is of extreme importance; becoming a professional entail more than an accumulation of skills and knowledge (Lengeling, et al., 2017). Once the participants start to feel accepted into the professional group, a new desire to move on sinks in, and they start visualizing a new identity.

Brody, Vissa, and Weathers (2010) explain professional socialization as "the process of developing a role-based identity with values, norms, and symbols that may span many organizations within or across multiple fields. It also refers to the acquisition of skills, knowledge, and attitudes necessary to fulfill the duties of a professional into a specific field" (p. 615). Colleagues, therefore, play an important role. For Jordell (1987), colleagues are a confirming source of influence as they participate in the validation of our professional experiences.

In addition, Pollard (1982) suggests three layers of social contextualization inherent to the professional socialization process: Cultural, institutional, and interactive factors. Regarding *cultural factors*, each profession has its own distinctive culture and academia is no different. It may create "positive *pressures* to act in certain ways in addition to experiencing institutionally mediated constraints" (p. 24). According to Pollard, experiencing pressures links to competence anxieties, related to ambiguities in the professional role: "Many dilemmas and role conflicts will be resolved by recourse to the knowledge of contextually appropriate behaviour which is validated and constructed within the social world of the reference group…" (p. 25). Thus, it is crucial to get to know the values, norms, and implicit expectations that characterize the institution.

In relation to *institutional factors*, Pollard states that institutional bias recognizes power relationships and the structural context of organizations. Institutional factors reflect power differentials among participants and hypothesize understandings produced by negotiation among school personnel, each with their own interests, but aiming to reach common understandings. Pollard refers to the institution's finite resources, how they are made available, and are dependent on policies for allocation of resources. Institutional policies can be constraining by setting parameters of action and enabling when applying institutional values and understandings of what is negotiable.

Concerning *interactive factors*, Pollard explains them in terms of negotiating the parameters of a working consensus. Communication strategies are refined and developed in interaction with colleagues and superiors; these strategies entail projections and reviews of the tacit agreements that are reached among participants. Since each participant has specific interests, norms are needed to regulate their demands.

To summarize, different authors have conceptualized professional socialization and have agreed to include norms, values, conduct, relationships, and performance as the main aspects to explain the process of professional socialization. The process goes beyond an accumulation of skills and knowledge; it also entails developing an identity as a professional who has agency, self-confidence, and conviction of self-worth. The socialization process is enhanced through colleagues' validation when they extend invitations to become an active member of their professional circle. Furthermore, cultural, institutional, and interactive factors are intrinsic to the professional socialization process. These factors speak to the importance of

gaining knowledge about the culture of place, institutional policies, power differentials, as well as becoming adept at building long-lasting collegial relationships.

Role of Mentoring

Mentoring is the process of influencing and fostering intellectual development of the mentee, with teaching, learning, reflecting, coaching, and sponsoring as essential components (Darwin & Palmer, 2009; Roberts, 2000). Professors, advisors, supervisors, and colleagues have traditionally served as mentors in higher education environments. As an example, German, Sweeny, and Robbins (2019) investigated the role of the faculty advisor in Ph.D. students' career goals and outcomes and discovered that students who talked to their advisors about the job market were more likely to apply for tenure-track positions and consider these positions as prestigious. However, German et al., also report that receiving advisor mentoring was not a factor when examining how satisfied these graduates felt about their job offers. As such, the findings illustrate the complexity of mentoring in higher education.

Likewise, Ku, Lahman, Yeh, and Cheng (2008) "emphasize the importance of caring advisors, friendship...and the need to remember international students' uniqueness" (p. 376). An important recommendation is to foster connections with the campus community and other international students. These researchers found that doctoral international students describe the *caring mentor* as a person who is available, works with them, and shows extra patience. Thus, Ku et al. (p. 377) recommend viewing these learners as graduate students who have distinctive needs that mentors should be equipped to help them negotiate.

Similarly, a study by van der Weijden, Belder, van Arensbergen, and van den Besselaar (2015) reports that junior faculty benefit from having a mentor since it positively affects their motivation, scholarly performance, and group management practices. These authors "suggest that mentorship could stimulate and speed up the career development of scientists" (p. 284). They conclude that junior faculty have a more positive view of their work environment and manage their research more actively when receiving mentorship support. Likewise, Franzoni and Robles (2016) report on a formal mentoring program for novice professors coming from other cultures and who were recent Ph.D. graduates. Their findings demonstrate that the mentor program helped professors to improve the quality of their instruction and adapt to the new culture and the university. Franzoni and Robles also explain that the principal causes of deficient teaching performance among novice international faculty were the absence of pedagogical knowledge and the lack of teaching experience, as well as dearth of familiarity with the country culture and the organizational culture of the university. Faculty who participated in this mentoring program received better student evaluations after that.

Methodology

A reflective case study approach (Hamilton & Corbett-Whittier, 2013) was used to analyze and report study findings. Focusing on the reflections of the researcher, reflective case study provides the researchers the opportunity to explore their past experiences and use the reflection as a learning tool to enhance their own practice (Tardi, 2019). Thus, the narratives of two foreign-born academics, a full professor and a third-year doctoral student, and their experiences in U.S. academe are the basis of this reflective case study. We have a professional relationship as supervisor/advisor and research assistant/student within the College of Education and have worked together in classes and conducting research for two full academic years. Through storytelling, we drew self-reflective data collected, first individually, and then, as a research team.

Storytelling was the strategy we used to generate the data for this article to report on our past experiences and personal knowledge. As Yow (2015) explains, stories evoke life experiences and are conducive to reminiscing and helping the narrator understand their lived experiences. Through storytelling, we aimed to transmit the meanings assigned to present and past events in academia. However, using stories to report findings can be a subjective process; Yow (2015) states that this approach "may result in a picture that is narrow, idiosyncratic, or ethnocentric" (p. 20). Even though this article presents two points of view, we looked at our journeys holistically and were mindful of the need for transferability and reflection as to benefit the reader. We monitored our biases to avoid the temptation of incurring into a false or negative narrative. We aim to share lessons learned and offer useful and positive advice to emergent scholars instead. Therefore, the research questions guiding the study were:

1. What is traditionally expected of a scholar starting an academic career?
2. What does the professional socialization of foreign-born scholars into U.S. academe entail?
3. How can emergent scholars systematically reflect and learn about the profession?

Participants

Clarena Larrotta: I was born in Colombia in a small town in the coffee region. At age 28, I left my country to pursue graduate studies. In the Unites States I experienced tremendous culture shock, which inspired my dissertation work with undocumented immigrants learning English. Obtaining a Ph.D. from a research-one-university prepared me well to start my career as university professor. However, needing a work visa limited my options and influenced my decision to accept the first job offer I received. This formidable experience lasted nine months. I got another job at a public university in Texas, where I earned tenure and the different promotions up to full professor.

HeeJae Chung: A third culture kid born in South Korea; I grew up in numerous countries around the world. Since entering adulthood, though, my academic and personal life have been split between Korea and the U.S. I completed my bachelor's in Georgia, my master's in Seoul, and am currently working on my Ph.D. in Texas. Despite two decades experiencing assimilation into new cultures, I still find myself entangled in the expectations of what I am supposed to do as an emergent scholar. In my second year of doctoral studies and working as a research assistant, I strive to successfully navigate the ambiguous contextual layers and build a core understanding of academia.

Data Collection and Analysis

For this reflective case study, data were gathered via videoconference meetings, notes and email messages, and individual written reflective journal entries during the fall of 2020. We jotted down anecdotes of our lived experiences through the professional socialization process and engaged in reflection connected to the topic, our experiences in the U.S. academe and interactions with people within academe. Therefore, the first step of the project consisted of personal reflective narratives to respond to the guiding research questions. Next, as suggested by Charmaz (2000), we examined the stories through the constant comparative method, which includes: (a) comparing different people, (b) comparing data from same individual at different points in time, (c) comparing incident with incident, (d) comparing data with category, and (e) comparing category with other categories. The following step was to engage in selective coding, grouping categories to reduce data, synthesizing, and explaining the data. As a result, we selected the most meaningful narratives to support the results of the analysis.

Findings

Study findings are presented following the order of the research questions that were formulated at the beginning of the study. Therefore, the first section presents traditional expectations of a scholar starting an academic career. The second section discusses findings related to the professional socialization of foreign-born scholars into U.S. academe. The third section proposes a matrix useful in studying the conditions supporting and hindering the professional socialization of foreign-born scholars.

1. Expectations of a scholar starting an academic career

There are three main areas required for tenure and promotion; these are: Teaching, research, and service. Experienced scholars understand the interconnectedness of these three areas. However, this may be new terrain for emergent scholars.

> After graduating with a Ph.D., it took me 13 years to achieve the rank of full professor. This doesn't mean I was successful since day one as assistant professor. Coming from a different educational system and academic tradition where obtaining a bachelor's degree was the last chance to land a career, grasping a better understanding of the new job took me a while. At first, I saw teaching, research, and service as three separate areas and that cost me a low evaluation for my second-year review. I had worked so hard the entire year, teaching, serving in committees, collecting data, and working on publications. However, in a scale of 1-4, I obtained 3 in teaching, 1 in research, and 3 in service. I was so worried and felt defeated. My whole life I had equated hard work with success, and for the first time, this formula was not working. Upset and frustrated, I retreated to reflect and plan a comeback for the following year, when I would have my third-year review! The traditional landmark when institutions decide if you are tenure material.
>
> This was my second job as assistant professor. The first one was not a good fit; I felt isolated and overwhelmed teaching, reviving a reading program, getting to know the institution and colleagues, and trying to find my place in the community. I was determined to make this new position work. Here I was teaching and working with graduate students only. The place was familiar, and I had made a few friends already.
>
> I made a list of strengths, resources, and university requirements. I reviewed the Policies and Procedures for Tenure & Promotion and promised to myself to succeed achieving the requirements for my next review. The first strategy was to stop trying to do it alone and started to invite colleagues to write with me; one of my strengths is the capacity to collaborate with others. Next, I had to combine teaching and community service activities and started to include a practical component in the classes and taking students to fieldwork with me. They got to know the community and stakeholders, this practice enhanced my teaching, plus I was building stronger community relationships and networks as well. It occurred to me that I could also combine research and service activities and in conversation with a colleague he mentioned how teaching, research, and service constituted an inseparable trinity of sorts. It all came together at that point! Succeeding as a professor required me to envision the three areas, the holy trinity of academia, as inseparable, and include as many collaborators as possible to go on this journey with me (Clarena).

Foreign-born emergent scholars may not have clear expectations and understanding of what the job entails once hired as assistant professors. Competitive by nature of the trade, they are ready to face the challenge, but at times they are underprepared and lack a good grasp or how to balance the different areas required for tenure and promotion. Excelling at teaching, research, and service, coupled with the need to acquire knowledge of the cultural, institutional, and interactive factors involved in performing the job may prove daunting.

Explicit and tacit expectations can be found in the application of Policies for Tenure & Promotion criteria. The written requirements are explicit; however, the application of the policy and the discussion by the personnel committee on how a candidate fulfils the requirements embody the tacit expectations. Some questions that may arise include: Is this colleague a team player? How do they relate to others? How much do they contribute to the daily workings of the program, the department, and the university?

Study findings bring awareness to assumptions that need to be examined and deconstructed. For example, it is expected that an emergent scholar knows all about the publication process and that they know about the cultural and interactive factors while learning about institutional factors (e.g., values, regulations, and politics). While these assumptions are debatable for native-born scholars, they are much further from the truth for foreign-born scholars, who bring with them other schemas of work and understanding of hierarchy proper to their home countries and school systems. For instance, in Colombia, in faculty meetings excuses are unacceptable, people should be direct, make decisions quickly, and keep formal meetings to a minimum. Outside campus interactions are more valuable, and decisions are made informally around a cup of coffee. On the other hand, typically in Korean culture, there is a strong presence of perfectionism. Asking questions or collaborating with a mentor or superior is extremely rare.

Another example is the contradictory nature between *faculty incivility* (Twale & De Luca, 2008) manifested in meetings and interactions with others and the politeness expected in verbal and written interactions. Following the norms of decorum, action vs. language, *do as I say, not as I do*, are contradictions that the foreign-born scholar must learn to navigate. Similarly, it is expected that the emergent scholar has impeccable communication skills orally and in writing. However, having an accent or belonging to a certain ethnic group may not sit well with everyone. In between jokes and friendly remarks, the foreign-born scholar should expect to experience microaggressions from colleagues who do not even realize they are committing these transgressions. Additionally, the value put on tradition while asking junior faculty to stay current with technology, pedagogy, and research trends constitute another contradiction.

2. Professional socialization of foreign-born scholars into U.S. academe

Professional socialization involves gaining understanding of the interconnectedness between norms, values, behaviors, relationships, and culture of place. Colleagues and mentors play an important role in the efforts to become an active member of the professional circle. Role models and mentors are present in the life of the emergent scholar and can influence their careers in a positive or negative way depending on the case.

> The moment I decided to further my education and apply for a Ph.D. program in the U.S., people around me, mainly those who were already in the academia, warned me that I would fail because I was underprepared. I was upset hearing such a comment, or more so with the word "underprepared," because I knew I did everything that was required to prepare for this. As soon as I began doctoral studies, though, I started believing that maybe they were right, and I was not prepared.
>
> In the third week of my first semester in the Ph.D., I attended a professional development event on how to get accepted for conferences and publications. I left the session clueless, puzzled, and incredibly overwhelmed. First, what is 'call for proposal'? Second, how will I be able to write proposals, conduct research, present, publish, get good grades, and write a dissertation, all at the same time? I did not want to ask the professors because I came into the Ph.D. program with a scholar of promise fellowship and an assistantship. Maybe I could lose these opportunities by asking "incompetent" questions? That evening, I reached out to a senior-colleague and sent her a long email imbued with frantic thoughts and raw emotions. I was certain that she would think I was crazy. Beyond what I expected, however, she responded with a

> long and detailed explanation of the entire process of submitting proposals, how to collaborate with professors, and how to work purposefully and efficiently. To this day, I cherish this email thread since I felt more confident and encouraged that I have the capacity to navigate the ambiguous process. Without this support I might have dropped out of the program.
>
> In my second semester, as a research assistant, I was assigned to work with my current advisor and mentor. It was with her presence in my journey that I started evolving as a scholar. Now I felt a little braver and told her that I had never presented at conferences. Immediately, she invited me to collaborate on a project to present and publish together. During the whole process, she helped me understand the differences between local and international level conferences and between peer-reviewed and non-peer-reviewed journals. I had no idea this mattered so much!
>
> It's been over a year since I have been learning from my mentor. Every week I feel more confident to ask questions and seek her advice. She treats me as a colleague when we collaborate or when she needs help, guides me as a mentor when I am faced with dilemmas or barriers, and listens as a friend when I feel lonely during this journey in the U.S. A year ago, it was hard to imagine I would publish and collaborate with colleagues or feel encouraged to succeed upon graduation (HeeJae).

The impostor syndrome (i.e., doubting one's accomplishments and fear of being exposed as a fraud) is a common feeling in foreign-born emergent scholars. Lacking knowledge about the process of scholarly productivity and how to best navigate the many responsibilities as students and emergent scholars can explain these feelings of inadequacy. The narrative above also reinforces the vital role that mentors play, providing encouragement and access to practical knowledge relevant to the profession. Building relationships with colleagues and mentors and relying on these relationships to succeed are crucial for emergent scholars.

In addition, foreign-born scholars must be conscientious about developing a new professional identity without neglecting their own cultural identity. They should be flexible and adaptive while maintaining their ethical convictions.

> Having obtained credentials from a U.S. university created a false sense among my colleagues that I am one of them. Reminding them where I am from has been necessary at times to justify a different viewpoint about certain topics (Clarena).
>
> In my culture, coming to the U.S. to be a scholar is not only a huge adventure for the individual but also a big pride for the family. In some areas in Korea, the whole town celebrates this as an important event. Everybody feels proud when someone from their community can travel to the U.S. to involve in scholarly activities. So, during my first year as a Ph.D. student, it was much more painful when I felt my cultural pride was challenged. I was constantly questioning my inner voice, "am I tainting Korean scholars' professional image?" (HeeJae).

Bringing a different viewpoint and new sensibilities to the academic world will evoke innovation and critical development. Essentially, we will grow as professionals and help others grow as people. The emergent scholars must discover hidden capacities or develop their own tools to find creative solutions. They should create healthy and reliable networks, as well as increased self-esteem and self-value to find their place in academia.

> No job meant no Ph.D. studies. Thus, after reporting to the International Office, I started looking for a job on campus. I was convinced that with 10 years of teaching experience from Colombia and Puerto Rico, I was going to find a teaching job. With letters of recommendation from previous employers and colleagues, I applied to 17 job postings and was hired as assistant instructor by the Spanish and Portuguese Department. My education and hard work from previous years had paid off (Clarena).

With increased resilience, foreign-born scholars will be more confident to navigate the challenges. Therefore, as illustrated in the different examples, we examined our assets and found support on key relationships, our human and social capital, to overcome barriers. We identified our strengths and weaknesses to learn, to grow as professionals, and to continue to navigate the professional socialization process.

3. Tool for emergent scholars to systematically reflect and learn about the profession

Emergent scholars must behave as agents of change; they are expected to make decisions and behave as reflective and ethical individuals. Therefore, building on the literature (e.g., Baz, 2016; Brody, et al., 2010; Ku et al., 2008; Lengeling, et al., 2017; Pollard, 1982) and looking closely at the data for this reflective case study, a conceptual matrix (see Table 1) useful in studying the conditions supporting and hindering the professional socialization of foreign-born scholar into academia emerged. This matrix illustrates a systematic process for reflection and decision making, so that emergent scholars self-assess the different situations and events they face while participating of U.S. academe.

Table 1.
Conceptual Matrix

	Cultural	**Institutional**	**Interactive**	**Personal**
Values	Each institution has their own cultural values	Can be regulatory or enabling	Negotiating parameters of a working consensus	Reconfiguring and claiming one's identity
Regulations	Discovered upon affiliation	Established policies and procedures	Norms to regulate individual and group demands	Personal and professional principles
Behaviors	Predetermined contextually appropriate behavior	Civility, following rules of decorum, and effective communication strategies	Emphasis on collaboration and collegiality	Self-regulated Self-driven Agent of change
Expectations	Navigating and learning ambiguities	Explicitly established written regulations	Tacit agreements among participants	Success, wellness, balanced life, and growth
Traditions	Long-established custom or belief	Understanding power relations and structural context of organizations	Transmitted from one person to the other	Based on cultural background and religious/spiritual believes
Politics	Implicit expectations	Process to obtain resources	Governance and power dynamics	All actions are political
Morals	Socially accepted values	Preestablished ethical norms	Acceptable standards of behavior	Life compass to serve the public good

The horizontal axis presents four distinct academe arenas, cultural, institutional, interactive, and personal arenas. The vertical axis presents relevant aspects that permeate the four arenas; these are *values, regulations, behaviors, expectations, traditions, politics, and morals*. Looking at the many stories that constitute our trajectories as foreign-born scholars striving to belong in the U.S. academe, we provide a working definition to explain the intersection between the horizontal and vertical axes in the matrix. For example, when looking at the intersection between the *cultural arena* and the first aspect in the vertical axis, *values*, we explain that "each institution has their own cultural values." Every new job as a faculty member involves learning the cultural values of the new institution. Another example would be looking at the intersection of *institutional arena* and the *regulation aspect* to reflect that there are already "established policies and procedures" to regulate the tenure process and other areas of academic life.

Thus far, the formula to gain understanding of what the professional socialization of foreign-born emergent scholars entailed has been a guessing game. This conceptual matrix can assist emergent scholars to reflect on and demystify the professional socialization process. Foreign-born scholars should prepare for teaching, research, and service expectations. The matrix can help them to map-out their experiences and assets as well as identify the elements hindering/supporting their processes adapting to the academic culture and finding their place in academia.

Discussion and Conclusions

The article highlights the importance of the healing experience. No matter the obstacles and setbacks, ours is not a victim's narrative. It is crucial that foreign-born scholars be highly reflective and find creative solutions to overcome difficulties navigating the different challenges of academia. Developing an ability to collaborate and create partnerships with colleagues can help to gain the necessary knowledge and skills. These findings are congruent with Baz (2016) who recommends close collaboration with colleagues to narrow the gap between the unknown and actual challenges related to the socialization process.

Examining our narratives, the need to reconceptualize the professional socialization process of emergent scholars became evident. Without a doubt, to succeed in the U.S. academe, emergent scholars must prepare for teaching, research, and service expectations. However, as illustrated in the matrix for professional socialization, mastering these three areas requires learning and gaining understanding of values, traditions, politics, rules, and morals that regulate the academic society (Lengeling et al., 2017). For foreign-born scholars, adapting to the culture is important as well as reminding themselves and others to value who they are and where they come from. As Brody et al. (2010) explain, professional socialization implies developing a role-based identity with the values, skills, knowledge, and attitudes required to carry out the duties of a professional into a specific field.

Mentors and colleagues play a vital role in the socialization process. Advisors and mentors can guide foreign-born emergent scholars and advocate for their unique needs (Ku et al., 2008); they can support or hinder their success. Our narratives illustrate the impact that the mentor has on the intellectual and professional development of the mentee (Darwin & Palmer, 2009; Roberts, 2000). As stated by Weijden and colleagues (2015), emergent scholars benefit from having a mentor who can positively affect their scholarly performance and speed up their career development.

In summary, the professional socialization journey demands that the emergent scholar learns about explicit and implicit expectations (Baz, 2016; Lengeling et al., 2017). Therefore,

the article proposes a conceptual matrix to help emergent scholars reflect and become aware of what is involved in the process. This practice, coupled with collaboration with mentors, will assist them in closing the gap between what they know and real-life challenges obtaining and keeping a job in the U.S. academe. Conducting this collaborative research has been a powerful and satisfying experience. The stories provided aim to inspire international scholars aspiring to succeed in the U.S. academe.

Delimitations

The stories presented in this article are by no means universal or encompassing of all the experiences of foreign-born scholars and their professional socialization journeys. Study findings are drawn from the experiences and stories of two scholars from two different cultures. In addition, the authors are establishing comparisons of their lived experiences studying and working at institutions of higher education outside of the United States. The stories presented in this article are bound by time and space, as well as virtual interactions due to the COVID-19 pandemic.

Implications

Bringing clarity to the professional socialization process of foreign-born scholars into academia is a must. Study findings bring awareness to assumptions that need to be examined and deconstructed. Obtaining a Ph.D. degree does not necessarily mean that the emergent scholar is knowledgeable of the expectations of U.S. academe. Therefore, becoming aware of the different layers involved in the process and being reflective, analytical, and resourceful are important skills to cultivate.

With increasing diversity trends and a renewed value placed on multiculturalism and globalization, professionals, administrators, and policy makers in higher education must cultivate tolerance and inclusivity as to acknowledge the value and contributions of foreign-born scholars. To start, difficult topics such as expectations, traditions, and politics should be openly discussed among emergent scholars, colleagues, and mentors.

Foreign-born scholars must develop their own compass and find the path that leads to success. In the process of cultural assimilation, they should also remember the importance of nurturing their own cultural identities. They should relate their viewpoint to U.S. colleagues with conviction and confidence.

The information presented in this article should be beneficial to all emergent scholars, not just foreign-born scholars. Bringing attention to the multiple layers of the phenomenon will hopefully get the conversation started.

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Research Article
Received: 01.03.2021
Accepted: 06.04.2021
First Online: 08.04.2021
Published: 30.06.2021

Citation: Asıcı, E. & Sarı, H. İ. (2021). The mediating role of coping strategies in the relationship between cognitive flexibility and well-being. *International Journal of Scholars in Education, 4*(1), 38-56. doi:10.52134/ueader.889204

The Mediating Role of Coping Strategies in the Relationship between Cognitive Flexibility and Well-being*

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***Abstract*:** The purpose of this study is to explore the effects of cognitive flexibility on the five EPOCH well-being components: engagement, perseverance, optimism, connectedness and happiness. The study also investigates the mediating roles of coping strategies (i.e., active coping strategy, avoidant coping strategy, and negative coping strategy) in this relationship. The participants consisted of 488 high school students. The data were collected through Cognitive Flexibility Scale, KIDCOPE, and EPOCH. The results showed that cognitive flexibility was a significant predictor of active coping strategy, negative coping strategy and five EPOCH well-being variables. Cognitive flexibility positively predicted active coping strategy and five components of EPOCH well-being (engagement, perseverance, optimism, connectedness and happiness) while it predicted negative coping strategy negatively. The findings showed that both active and negative coping strategies played mediating roles between cognitive flexibility and EPOCH five-dimensional well-being variables. The practical implications for teachers, limitations and further research for the researchers are presented in the study.
Keywords: Cognitive flexibility, Well-being, Coping strategies, Path analysis, Adolescents.

Bilişsel Esneklik ile İyi Oluş Arasındaki İlişkide Başa Çıkma Stratejilerinin Aracı Rolü

***Öz*:** Bu çalışmanın amacı; bilişsel esnekliğin ergenlerin EPOCH beş boyutlu iyi oluşu (bağlılık, kararlılık, iyimserlik, ilişkililik ve mutluluk) üzerindeki etkisini araştırmaktır. Çalışmada ayrıca bilişsel esneklik ile EPOCH beş boyutlu iyi oluş arasındaki ilişkide başa çıkma stratejilerinin (aktif başa çıkma, kaçınan başa çıkma ve olumsuz başa çıkma) aracı rolleri de incelenmektedir. Araştırmanın katılımcılarını 488 lise öğrencisi oluşturmuştur. Araştırmanın verileri Bilişsel Esneklik Ölçeği, KIDCOPE Başa Çıkma Ölçeği ve EPOCH Beş Boyutlu İyi Oluş Ölçeği aracılığıyla toplanmıştır. Araştırmanın bulgularına göre; bilişsel esneklik aktif başa çıkma, negatif başa çıkma ve iyi oluşun beş öğesinin anlamlı bir yordayıcısıdır. Bilişsel esneklik aktif başa çıkma ile iyi oluşun beş öğesini (bağlılık, kararlılık, iyimserlik, ilişkililik ve mutluluk) pozitif yönde yordarken; negatif başa çıkmayı negatif yönde yordamaktadır. Hem aktif hem de negatif başa çıkma stratejileri bilişsel esneklik ile EPOCH beş boyutlu iyi oluş arasındaki ilişkide aracı rol oynamaktadır. Elde edilen bulgulara dayalı olarak, öğretmen, okul psikolojik danışmanları ve gelecek araştırmacılar için öneriler sunulmuştur.
Anahtar Kelimeler: Bilişsel esneklik, İyi oluş, Başa çıkma stratejileri, Yol analizi, Ergenler.

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* This study was presented at XIII. International Congress of Educational Research, Hatay/TURKEY, 3-6 September 2020

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Introduction

Well-being has become a popular concept with the emergence of positive psychology, which focuses on positive characteristics and strengths instead of psychological symptoms. In general, well-being means feeling good and functioning effectively, although its definition is still a controversial issue (Kern, Zeng, Hou, & Peng, 2019). Well-being arose from two approaches: *hedonic* (subjective well-being) and *eudaimonic* (psychological well-being). There have been numerous models of well-being based on these two approaches (Ryan & Deci, 2001). For example, Diener (1984) focused on hedonic approach and indicated that subjective well-being consisted of three components as the presence of positive emotions, the absence of negative emotions, and being satisfied with life. Ryff (1989), who embraced the eudaimonic approach, suggested a six-dimensional psychological well-being model. These six dimensions are self-acceptance, positive relationships with others, autonomy, environmental mastery, purpose in life, and personal growth. Seligman (2011) introduced a multidimensional well-being model focusing on both hedonic and eudaimonic approaches. In Seligman's model, well-being was accepted as a construct comprising of five components as positive emotion, engagement, relationships, meaning, and accomplishment. None of these components defines well-being; however, each of them contributes to the definition of well-being. So, well-being is a combination of these five components. The model was called PERMA, which is an acronym for these five components.

Kern, Benson, Steinberg and Steinberg (2016) pointed out that previous well-being theories focused on adults; and they developed a well-being model arising from PERMA and contributing the understanding of positive youth development for adolescents. They suggested that well-being has five positive psychological characteristics as engagement, perseverance, optimism, connectedness, and happiness; and these positive characteristics will promote various positive outcomes such as physical health and PERMA in adulthood. The model of Kern et al. (2016) is known as EPOCH, which is an acronym standing for each positive characteristic in the model. *Engagement* is related to the flow experience. It refers to individual's being interested in and engaged in life activities and tasks and focusing totally on what he/she is doing. *Perseverance* is associated with a sense of responsibility. It describes the ability to pursue goals and work hard, despite meeting with the obstacles. *Optimism* refers to being hopeful and feeling secure about the future; seeing events in a positive way; and evaluating negative events temporarily, externally, and situation-specific. *Connectedness* refers to a person's being in relationships with others that provides satisfaction; believing that there are people interested in, love, care for, respect them, and provide friendship and support. *Happiness* is a status of continuous positive mood and satisfaction with life. Well-being is a combination of each component of EPOCH.

The specific EPOCH domains are predictors of positive outcomes both in adolescence and adulthood. For example, adolescents' higher engagement predicted higher life satisfaction (Salmela-Aro & Upadyaya, 2014), academic achievement (Lei, Cui, & Zhou, 2018), and lesser likelihood of dropping out of school (Wang & Fredricks, 2014). Civic engagement in adolescence was associated with higher life satisfaction, civic participation, and educational achievement. Also, the individuals with civic engagement in adolescence had lower rates of arrest in emerging adulthood (Chan, Ou, & Reynolds, 2014). The adolescents with higher passion and perseverance for long-term goals performed better on academic performance (Cosgrove, Chen, & Castelli, 2018) and had lower levels of depression (Datu, King, Valdez, & Eala, 2019). Optimism was protective against depression, anxiety, antisocial behavior, and heavy substance use (Patton et al., 2011); and positively related to self-esteem and academic achievement in adolescents (Tetzner & Becker, 2018). In addition, a study conducted with women revealed that optimism at age 13 was an important factor predicting global life satisfaction, positive and negative affect at age 43 (Daukantaite & Bergman, 2005). Higher

connectedness predicted higher well-being (Jose & Ryan, & Pryor, 2012) and lower anxiety and depression (Malaquias, Crespo, & Francisco, 2015). Moreover, family and school connectedness during adolescence had long-lasting protective effects for adult health regarding mental health, violence, sexual behavior, and substance use (Steiner et al., 2019). During adolescence, higher happiness was related to higher life satisfaction, higher hopefulness, and lower perceived stress (Heizomi, Allahverdipour, Jafarabadi, & Safaian, 2015). Finally, positive affect during adolescence predicted adult life satisfaction (Coffey, Warren, & Gottfried, 2015).

Thus, each component of well-being is important for adolescents because they provide multiple benefits for both their present and future life. However, there are only a few studies on five-dimensional EPOCH well-being model in Turkish adolescents (e.g., Ekşi, Demirci, & Tanyeri, 2020; Ümmet & Demirci, 2017). Therefore, this study investigated five-dimensional EPOCH well-being model in adolescents and considered adolescents' well-being as a combination of each component of EPOCH.

Although well-being is important for the youth, the transition from childhood to adolescence can cause negative changes in well-being of some adolescents (Gutman, Brown, Akerman, Obolenskaya, 2010). Adolescence is a period of significant biological, cognitive, and social changes and maturation (Steinberg, 2013). When the adolescents cannot adapt to the rapid changes they experienced, various negative psychological, emotional, and behavioral consequences may occur. Stressful experiences in this period might lead to negative or depressive emotions (Moeini et al., 2019). On the other hand, adolescence can also be a period of opportunities in addition to challenges (Bálint, 2014). Some adolescents can experience growth and adjustment (Gutman et al., 2010). Hence, it is a matter of curiosity what strengths of adolescents increase well-being by encouraging them to overcome the challenges (Demirtaş, 2020a).

One of the strengths of adolescents increasing well-being is cognitive flexibility (Fu & Chow, 2017). Cognitive flexibility is the capacity of adapting to specific situations, changing from one idea to another, or using multifaceted strategies for different problems (Stevens, 2009). Cognitive flexibility consists of willingness to be flexible and to adapt to the situation, self-efficacy in being flexible, and awareness that there are available alternatives and options in any situation (Martin & Rubin, 1995; Martin & Anderson, 1998). Cognitive flexibility, which expresses individuals' ability to change their cognitions according to changing environmental conditions, includes three basic domains: (a) the tendency to perceive difficult situations as controllable, (b) the ability to perceive that there are possible alternatives of the situations and human behaviors in life, and (c) the ability to produce multiple solutions to solve difficult situations (Dennis & Vander Wal, 2010).

Cognitive flexibility was found to be positively related to higher academic, social, emotional, and general self- efficacy (Akçay Özcan & Kıran Esen, 2016; Demirtaş, 2020a), higher resilience (Güleç, 2020), better mental well-being (Demirtaş, 2020a), a greater competence with peers in social relations (Ciairano, Bonino, & Miceli, 2006), less educational stress (Kuyumcu & Kirazcı, 2020), and lower learned helplessness (Taş & Deniz, 2018) in adolescents. In addition, cognitive flexibility was positively associated with happiness (Asıcı & İkiz, 2015; Demirtaş, 2020b), life satisfaction (Yelpaze & Yakar, 2019; 2020), subjective well-being (Satan, 2014), and psychological well-being (Malkoç & Kesen Mutlu, 2019) in university students.

Fu and Chow (2017) indicated that when the adolescents with high cognitive flexibility get hurt during an earthquake, they may experience more psychological well-being than the adolescents with low cognitive flexibility; because they may better tolerate uncertainty, think in a constructive way, and deal with challenges in an effective way. Accordingly, one of the main

indicators of cognitive flexibility can be the ways that the adolescents develop to solve the problems (Tutuş, 2019). These ways which are developed to solve the problems refer to coping strategies.

Coping means the cognitive and emotional reactions that people use to overcome daily problems or stress (Freydenberg & Lewis, 2009). People use many different types of coping strategies such as problem solving, information seeking, cognitive restructuring, emotional release, physical activities, distraction, distancing, avoidance, self-criticism, blaming others, wishful thinking, humor, suppression, social withdrawal, denial, alcohol or drug use, seeking social support, or use of religion (Compas, et al., 2001). These strategies can be divided into three groups as active, avoidant and negative coping (Spirito, Stark, & Tyc, 1994). *The Active Coping* refers to the voluntary and conscious effort of the individual in order to remove the stressor and its effects (Carothers, Arizaga, Carter, Taylor, & Grant, 2016; Carver, Scheier, & Weintraub 1989; Spirito, et al., 1994). In active coping, the person uses her/his energy to change stressful event; seeks social support, spiritual pillars or professional help; and makes a great effort to resolve the problems, and to promote good relationships (Gao et al., 2019). The active coping includes the problem solving, emotional regulation, cognitive restructuring, and social support strategies. *The Avoidant Coping* refers to the individuals' blocking information about stress or choosing different behaviors in order to avoid stress. Distraction, social withdrawal, wishful thinking, and resignation are some of the examples for avoidant coping strategies. As for *The Negative Coping*, it involves the self-criticism and blaming others (Spirito et al., 1994).

Coping strategies affect well-being in multiple ways. For example, active coping is considered as the most effective and favorable coping style because it is associated with positive outcomes (Carothers et al., 2016) such as optimism (Puskar et al., 1999), positive affect (Coyle & Vera, 2013), reduced risk for internalizing and externalizing problems (Liu, Tein, & Zhao, 2004), high well-being (Freydenberg & Lewis, 2009), resilience (Bedel & Güler, 2019), and life satisfaction (Antaramian, Kamble, & Huebner, 2016). On the contrary, avoidant and negative coping were found to be associated with undesirable outcomes such as lower levels of well-being (Cicognani, 2011; Freydenberg & Lewis, 2009; Miller Smedema, Catalano, & Ebener, 2010). Avoidant coping approaches were positively related to pessimism (Puskar et al., 1999) and higher risk for internalizing and externalizing problems (Liu et al., 2004). Externalizing behaviors, as examples of avoidance behaviors, were associated with lower life satisfaction (Antaramian et al., 2016). Also, the negative coping strategies were related to the decrease in resilience (Bedel & Güler, 2019) and the increase in depression, anxiety, anger, hostility, and aggression (Sun, Sun, Jiang, Jia, & Li, 2019). To sum up, assisting adolescents in developing coping styles that discourage avoiding problems, self-criticizing or blaming others, but that encourage problem-solving, emotional regulation, cognitive restructuring and seeking social support can improve well-being.

Coping process includes cognitive actions in addition to behavioral actions. In this process, the person uses a range of complex cognitive abilities and skills (Bedel & Ulubey, 2015). According to Compas et al. (2001), during adolescence, with increasing metacognitive skills of adolescents, greater diversity and flexibility develop in terms of coping strategies. Also, the previous studies showed that cognitive flexibility had positive direct effects on active coping strategies (Bedel & Ulubey, 2015; Demirtaş, 2019; Muyan-Yılık & Demir, 2020) and negative direct effects on avoidant (Muyan-Yılık & Demir, 2020), and negative coping strategies (Bedel & Ulubey, 2015). Koesten, Schrodth, and Ford (2009) pointed out that individuals who are cognitively flexible are more qualified in managing their personal problems and stress; hence they feel more physical and mental well-being. Individuals with cognitive flexibility are more likely to cope effectively with difficult situations because they tend to try different solutions. These features can make them more successful, happy, and satisfied (Asıcı & İkiz, 2015). To sum up, increasing cognitive flexibility may contribute to development of effective coping

skills, and in this way, it may affect adolescents' well-being. In other words, the effect of cognitive flexibility on adolescents' well-being can be indirect through coping strategies. Coping strategies may have mediating roles in the relationship between cognitive flexibility and well-being. In this sense, this study aimed to examine the mediating roles of coping strategies in the effect of cognitive flexibility on adolescents' five-dimensional EPOCH well-being.

Methodology

Participants and Data Collection

After obtaining the permission from provincial directorate of national education, five hundred and sixty-six high school students from six different high schools, which were located in a major city in the west of Turkey, voluntarily participated in this study. After excluding the cases with too many missing responses (e.g., more than half of the survey items), the analyses ended up with 488 students. The data were collected during the spring semester of 2018, and data collection process was completed in four weeks. The form consisted of 43 survey items in total and four demographic questions. There were 270 (55.3%) female and 217 (44.6%) male students in the sample; and one student (.1%) did not answer this demographic question. The average age of the participants was 16.28 years (SD=1.11), and their age ranged from 14 to 20 years. Although all participants were high school students, the maximum age increased to 20 years. The reason for this might be that some students started school late. There were 131 9th grade (26.85%), 130 10th grade (26.64%), 142 11th grade (29.10%), and 85 12th grade (17.41%) high school students in the sample.

Measures

Cognitive flexibility scale (CFS).

The original English version of the survey was developed by Martin and Rubin (1995). The scale aims to measure students' cognitive flexibility. The survey consists of 12 items, and a single factor (i.e., all items measure the same dimension). All survey items had six response options from 1 = Strongly Disagree to 6 = Strongly Agree. The survey was adapted into Turkish and validated by Çelikkaleli (2014). In the adaptation study, it was determined that the Turkish survey had a single factor construct consisting of 11 items ($\chi 2$= 83.8, df= 43, p= 0.00; $\chi 2$/sd=1, 93; RMSEA=.059, NFI=.85, CFI=.92, IFI=.92, GFI=.95, and AGFI=.92.). The Cronbach's alpha value in the adaptation study was. 74. In our study, the Cronbach's alpha value as the internal consistency was .73.

Brief coping checklist survey (KIDCOPE).

The English version of this survey was developed by Spirito, Stark and Williams (1988). The survey aims to measure students' coping styles. The survey is comprised of three subscales as active coping with four items, negative coping with three items and avoidant coping with four items, for a total of 11 items. All survey items had four response options from 0= Not at all to 3= Almost all the time. The scale was adopted into Turkish and validated by Bedel, Isik and Hamarta (2014). In the adaptation study, the original construct was confirmed ($\chi 2$ /df = 2.1, GFI = .97, AGFI = .95, CFI = .92, RMSEA = .047) and the Cronbach's alpha values were calculated as .72, .65, and .70 for the active coping, negative coping and avoidant coping subscales, respectively. In our study, they were .60, .61 and .31 for the three scales, respectively.

The EPOCH measure of adolescent well-being.

The English version of this survey was developed by Kern et al. (2016). The survey is comprised of five subscales as connectedness, engagement, happiness, optimism, and perseverance, with four items in each subscale, for a total of 20 items. All items in the survey had five response options from 1= Never to 5= Always. The survey was adopted into Turkish and validated by Demirci and Eksi (2015). In the adaptation study, the five-factor construct of the original survey was confirmed ($\chi 2$= 381,29, df = 16, RMSEA = .07, NFI = .96, NNFI = .98, CFI = .98, IFI = .98, RFI = .96 and SRMR = .05) and the Cronbach's alpha values were calculated as .88, .83, .88, .84 and .72 for subscales of connectedness, engagement, happiness, optimism and perseverance, respectively. In our study, they were .78, .67, .78, .72 and .63 for the five subscales, respectively.

Data Analysis

First, the theoretical path analysis model given in Figure 1 was developed based on the current literature. This model was called initial hypothesized model. As shown in Figure 1, it was hypothesized that there should be direct effects from cognitive flexibility (e.g., endogenous variable) to five sub-variables of EPOCH (e.g., exogenous variables). It was also hypothesized that there should be indirect effects from cognitive flexibility to five variables of EPOCH through three subscales of coping variables: active coping, negative coping, and avoidant coping. This means that these three coping variables play mediating roles between cognitive flexibility and five sub-variables of EPOCH. However, we found that the Cronbach's alpha value for the subscale of avoidant coping was very low (.31), and it had non-significant relations with the endogenous variable, cognitive flexibility, and all of the exogenous variables, with the exception of connectedness (Please see Table 1). Therefore, we decided not to use avoidant coping in the analysis of initial hypothesized model. The model excluding avoidant coping was called final hypothesized model, and was given in Figure 2.

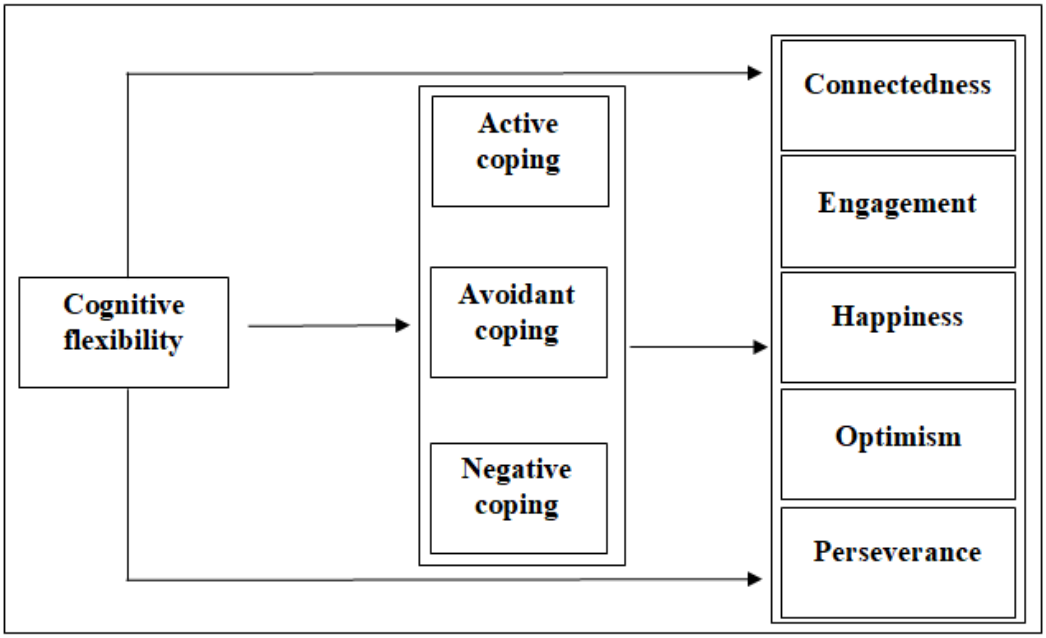

Figure 1. Initial hypothesized path model.

Due to encountering model fit problems in the final hypothesized path model (Figure 2), we modified the final hypothesized model by removing insignificant paths and adding a new path from negative coping to active coping. We called it selected model (see Figure 3). The bivariate correlations between all the variables are given in Table 1. Both final hypothesized and selected models were run in Mplus software version 7 (Muthen&Muthen, 1998-2012), and the bootstrap with 10,000 iterations was used to obtain 90% confidence intervals for the effects. There was a very small proportion of missing data in the analyses (e.g., less than %3); therefore, we did not impute missing responses. The fit indices were evaluated according to the following criteria: $\chi 2/df \leq 3.00$ (Kline, 2011), Root Mean Square Error of Approximation (RMSEA) $\leq .05$ (Browne & Cudeck, 1993), Comparative Fit Index (CFI) $\geq .95$ (Marsh, Hau, Artelt, Baumert, & Peschar, 2006), Tucker-Lewis index (TLI) $\geq .95$ (Marsh et al., 2006) and Standardized Root Mean Square Residual (SRMR) $\leq .05$ (Browne & Cudeck, 1993).

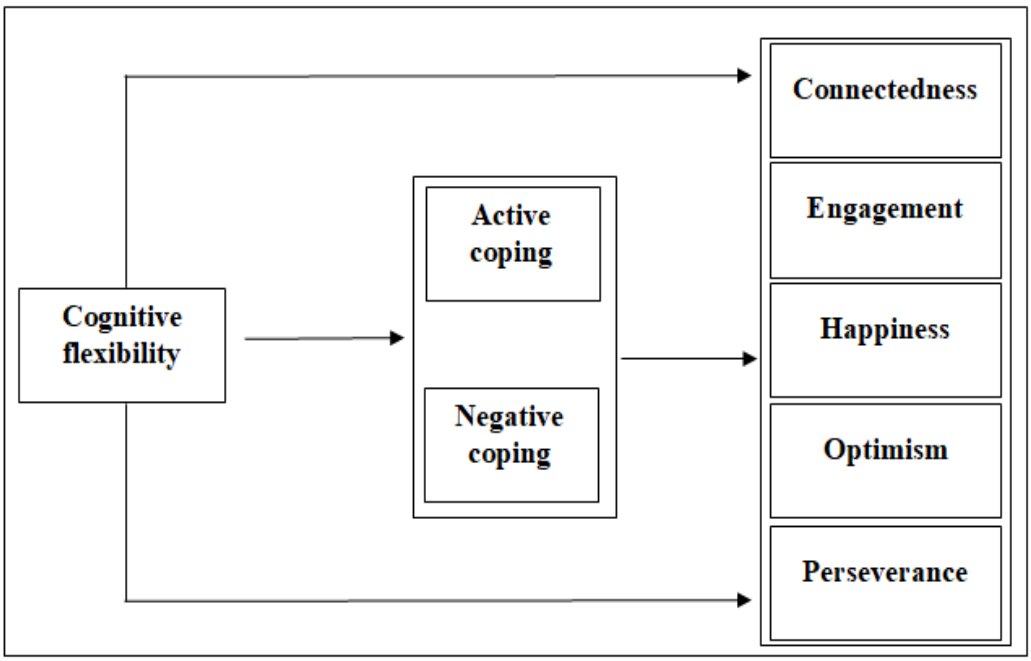

Figure 2. Final hypothesized path model.

Table 1
Bivariate Correlations, Means and Standard Deviations amongst the Observed Variables.

Variable	Cognitive Flexibility	Active Coping	Avoidant Coping	Negative Coping	Connectedness	Engagement	Happiness	Optimism	Perseverance
Cognitive Flexibility	--								
Active Coping	.26*	--							
Avoidant Coping	-.00	.20*	--						
Negative Coping	-.16*	-.20*	.15*	--					
Connectedness	.34*	.37*	.13*	-.18*	--				
Engagement	.19*	.29*	.06	-.02	.29*	--			
Happiness	.33*	.33*	.00	-.14*	.40*	.37*	--		
Optimism	.34*	.39*	-.03	-.19*	.42*	.43*	.55*	--	
Perseverance	.28*	.35*	.00	-.18*	.30*	.43*	.32*	.48*	--
Means	53.03	6.52	6.03	2.86	15.79	13.04	13.41	13.20	12.33
SD	9.09	2.68	2.05	1.74	3.81	4.07	4.63	3.87	3.48

*****p<.05

Results

Results of Model Fit

The fit indices of the final hypothesized model were $\chi 2(1) = 10.82$ and $p<.01$, CFI=.99, TLI=.67, RMSEA =.14 and SRMR =.03. Some of the model fit indices of the final hypothesized model were not acceptable. The fit indices of the selected path model were $\chi 2(4) = 7.04$ and $p>.05$, CFI =.99, TLI =.98, RMSEA =.04 with a 90% CI of [.00, .08] and SRMR =.02. These findings showed a very good model fit. The amount of explained variances for the endogenous observed variables (the variables determined by the other variables) of connectedness, engagement, happiness, optimism and perseverance were .20, .10, .17, .22 and .16, respectively. The amount of explained variances for the mediating variables of active coping and negative coping were .09 and .03, respectively. Although the proportions of explained variances were small, all of them were statistically significant. The coefficients and 90% confidence intervals of total, direct and indirect effects of variables in the selected path model were given in Table 2.

Table 2.
The Sizes and 90% Confidence Intervals of Total, Direct and Indirect Effects of Variables in the Selected Path Model

	Endogenous Variables		
Exogenous Variables	Cognitive Flexibility	Active Coping	Negative Coping
Connectedness	.11* [.08, .14] *.03** [.02, .04] **.14*** [.11, .18]	.39* [.28, .51] -- **.39*** [.28, .51]	-- *-.09**[-.15, -.04] **-.09***[-.15, -.04]
Engagement	.06* [.01, .09] *.03** [.02, .05] **.09*** [.05, .12]	.40* [.28, .55] -- **.40*** [.28, .55]	-- *-.09**[-.15, -.04] **-.09***[-.15, -.04]
Happiness	.13* [.07, .13] *.04** [.02, .05] **.17*** [.13, .20]	.47* [.34, .62] -- **.47*** [.34, .62]	-- *-.10**[-.17, -.05] **-.10***[-.17, -.05]
Optimism	.11* [.08, .14] *.04** [.02, .05] **.15*** [.11, .17]	.48* [.36, .60] -- **.48*** [.36, .60]	-- *-.11**[-.18, -.05] **-.11***[-.18, -.05]
Perseverance	.08* [.05, .10] *.03** [.01, .04] **.11*** [.08, .14]	.33* [.23, .44] -- **.33* [.23, .44]**	-.17*[-.31, -.04] *-.08**[-.12, -.04] **-.25***[-.38, -.11]
Active Coping	.07* [.05, .10] *.01**[.00, .02] **.08*** [.06, .10]	-- -- --	-.23* [-.38, -.11] -- **-.23*** [-.38, -.11]
Negative Coping	-.03*[-.05,-.02] -- **-.03***[-.05, -.02]	-- -- --	-- -- --

Total, Direct and Indirect Effects from Cognitive Flexibility to Well-being

Cognitive flexibility had significant total effects on connectedness, engagement, happiness, optimism, and perseverance, with total effects of .14, .09, .17, .15 and .11, respectively (see Table 2). Thus, the effect of cognitive flexibility on those five observed endogenous variables is roughly similar in size. All the effects from cognitive flexibility to those five well-being variables were partially direct and partially indirect. As specified in the model (i.e., in Figure 2), indirect effects were through cognitive flexibility (a) to negative

coping to active coping to five well-being variables, (b) to active coping to five well-being variables or (c) to negative coping to one component of the five well-being variables. All of the specific indirect effects were significant.

The total effect of .14 on connectedness was partially direct (.11) and partially indirect (.03). Both direct and specific indirect effects were significant. The first specific indirect effect was from cognitive flexibility to active coping to connectedness with an indirect path component of .03 ($p<.05$). The second specific indirect effect was from cognitive flexibility to negative coping to active coping to connectedness with an indirect path component of .00 ($p<.05$).

The total effect of .09 on engagement was partially direct (.06) and partially indirect (.03). Both direct and specific indirect effects were significant. The first specific indirect effect was from cognitive flexibility to active coping to engagement with an indirect path component of .03 ($p<.05$). The second specific indirect effect was from cognitive flexibility to negative coping to active coping to engagement with an indirect path component of .00 ($p<.05$).

The total effect of .17 on happiness was the largest total effect in size, and it was partially direct (.13) and partially indirect (.04). Both direct and specific indirect effects were significant. The first specific indirect effect was from cognitive flexibility to active coping to happiness with an indirect path component of .03 ($p<.05$). The second specific indirect effect was from cognitive flexibility to negative coping to active coping to happiness with an indirect path component of .00 ($p<.05$).

The total effect of .15 on optimism was partially direct (.11) and partially indirect (.04). Both direct and specific indirect effects were significant. The first specific indirect effect was from cognitive flexibility to active coping to optimism with an indirect path component of .04 ($p<.05$). The second specific indirect effect was from cognitive flexibility to negative coping to active coping to optimism with an indirect path component of .00 ($p<.05$).

The total effect of .11 on perseverance was partially direct (.08) and partially indirect (.03). Both direct and specific indirect effects were significant. The first specific indirect effect was from cognitive flexibility to active coping to perseverance with an indirect path component of .02 ($p<.05$). The second specific indirect effect was from cognitive flexibility to negative coping to active coping to perseverance with an indirect path component of .00 ($p<.05$). The third specific indirect effect was from cognitive flexibility to negative coping to perseverance with an indirect path component of .00 ($p<.05$).

Furthermore, the model specified that negative coping had indirect effects on all of the well-being variables, and both direct and indirect effects on well-being variable of perseverance. According to the model specification, the indirect effects of negative coping on connectedness (-.09), engagement (-.09), happiness (-.10), optimism (-.11) and perseverance (-.08) were mediated by active coping. The size of the direct effect from negative coping to perseverance was -.17 ($p<.05$).

The total effects of cognitive flexibility on active coping and negative coping were .08 and -.03, respectively; and both total effects were significant. This means that the increase in cognitive flexibility affected the ability of active coping positively but the ability of negative coping negatively. The total effect of .08 on active coping was partially direct (.07, $p<.05$) and partially indirect (.01, $p<.05$).

Summary of the Results

The model specified that all of the five EPOCH variables were directly and indirectly affected by cognitive flexibility. The results showed that the increase in cognitive flexibility increased the amount of all well-being components. The effect of cognitive flexibility was mediated by its effects on active coping and negative coping. The total effects were primarily due to the direct effect of cognitive flexibility, and secondarily due to the mediating effects of active coping. In other words, negative coping played a minor mediating role but the influence of active coping as a mediator was major. Last, avoidant coping played neither direct nor indirect meaningful mediating roles.

The results showed that the direct effects from cognitive flexibility to the well-being variables were greater than indirect effects. The strongest direct effect of cognitive flexibility was on both connectedness and happiness. Even though specific indirect effects were small in size, all of them were significant. The specific indirect effects through active coping were stronger than those through both negative coping and active coping.

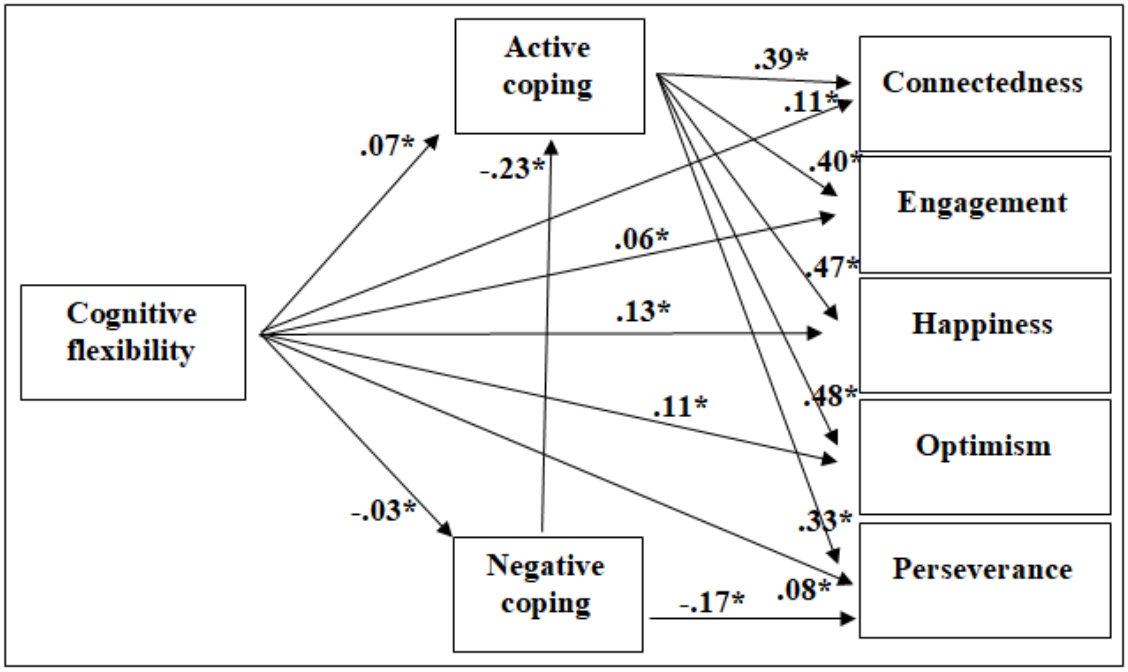

Figure 3. Unstandardized coefficients of the paths in selected path model. * p <.05.

Conclusion and Discussion

The findings of the present study showed that cognitive flexibility positively affected the adolescents' EPOCH five-dimensional well-being (engagement, perseverance, optimism, connectedness and happiness) both directly and indirectly. The results revealed that cognitive flexibility and active coping strategies are protective psychological variables for adolescents' well-being. Accordingly, a higher cognitive flexibility can be a facilitator for improving active coping skills and also assisting adolescents in developing coping strategies that encourage problem-solving, emotional regulation, cognitive restructuring, and seeking social support as examples of active coping behaviors; and that can improve well-being more than cognitive flexibility itself.

The first finding showed that the increase in cognitive flexibility increased the EPOCH five-dimensional well-being. Accordingly, the level of well-being is higher for the adolescents who succeed in changing their cognition according to environmental conditions, recognizing available options, and dealing with problems in a multifaceted manner (Dennis & Vander Wal, 2010; Martin & Rubin, 1995; Martin & Anderson, 1998; Stevens, 2009). Increased cognitive flexibility may produce well-being in adolescents by enabling them to be more interested in and committed to life activities and tasks, to be more successful in focusing attention, to work tirelessly to achieve the goals, to look at the future with hope, to see the positive aspects of events, to have satisfying relationships with others, to feel more positive emotions, and to be satisfied with life. This result is consistent with the literature showing that cognitive flexibility is positively associated with higher happiness (Asıcı & İkiz, 2015; Demirtaş, 2020b), life satisfaction (Yelpaze & Yakar, 2019; 2020); subjective (Satan, 2014), psychological (Malkoç & Kesen Mutlu, 2019), and mental (Demirtaş, 2020a) well-being.

The second finding of the study presented that the increase in cognitive flexibility was related to adolescents' tendency to use active coping more and to use negative coping less. In other words, the adolescents with higher cognitive flexibility can seek information in order to overcome the stressful situations they face (Spirito et al., 1994), to eliminate stressor and to correct the negative consequences of stress (Carver et al, 1989) more than the adolescents with lower cognitive flexibility. The adolescents who are cognitively flexible are more open and willing to try different solutions (Asıcı & İkiz, 2015). This characteristic can provide them with power for actively dealing with problems. Thus, they make a greater effort to change stressful events and to resolve the problems (Gao et al., 2019). Moreover, they can avoid the behaviors of self-criticizing and blaming others (Spirito et al., 1994). These results supported the findings of the previous studies (Bedel &Ulubey, 2015; Demirtaş, 2019; Muyan-Yılık & Demir, 2020).
In contrast to the findings of Muyan-Yılık and Demir (2020), no significant relationship was found between cognitive flexibility and avoidant coping. This is probably due to the fact that the internal consistency of the avoidant coping dimension was quite low. However, there are similar findings in the literature showing that cognitive flexibility is not related to avoidant coping (Bedel & Ulubey, 2015; Demirtaş, 2019).

The third finding of the study showed that active coping positively affected the EPOCH five-dimensional well-being of adolescents. Accordingly, making a great effort to resolve the problems (Gao et al., 2019) is an important determinant of adolescents' five-dimensional well-being. This result confirmed that active coping produced positive outcomes in adolescents (Antaramian et al., 2016; Bedel & Güler, 2019; Coyle & Vera, 2013; Freydenberg & Lewis, 2009; Liu et al. 2004; Puskar et al., 1999). Adolescents' seeking information to cope with difficulties (Spirito et al., 1994) and wanting to eliminate the stressor and to correct the negative consequences of stress (Carver et al., 1989) may prevent the emergence of negative mood and may provide them with higher well-being. The adolescents who use active coping strategies can successfully overcome adverse conditions and can easily adapt to life difficulties, because they are more resilient (Bedel & Güler, 2019). The adolescents who use problem solving, emotional regulation, cognitive restructuring, and social support strategies as examples of active coping, can manage developmental, academic, or relational difficulties more successfully. Thus, they can have more optimistic thoughts and better relations; maintain a more passionate and determined life, be interest; and feel more contented. In other words, they can experience more well-being.

In this study, interestingly, negative coping had no direct effect on EPOCH five-dimensional well-being with the exception of perseverance. Moreover, negative coping had an indirect effect on EPOCH five-dimensional well-being together with the mediating effect of active coping. Accordingly, negative strategies may obstruct the development of the ability to pursue goals and to work hard despite meeting with the obstacles. If self-critical adolescents fail

to achieve a desired goal, they may tend to give up. When the tendency to use negative strategies such as self-criticism or blaming others in a stressful situation increases, adolescents avoid consciously and willingly eliminating the stressor and its negative effects. This may prevent the emergence of well-being. The previous studies showed that negative coping caused higher depression, anxiety, anger, hostility, and aggression (Sun et al., 2019) in adolescents. Accordingly, the effect of negative coping on adolescents' well-being may change depending on indicators or components of well-being. Although using less negative coping helps to reduce psychological symptoms, it may not be sufficient by itself for the emergence of positive characteristic.

The negative relationship between negative coping and active coping is consistent with previous findings (Bedel et al., 2014). Self-critical behaviors as an example of negative coping can hamper adolescents' sense of self-efficacy after a perceived difficult experience, and for this reason, self-critical adolescents can use fewer problem-oriented strategies to deal with life difficulties (Kannan & Levitt, 2013). In addition, blaming others as an example of negative coping may prevent the adolescents from actively coping with stress, because they do not feel responsible for stressful events. The adolescents may believe that the solution must be produced by others, if they think they are not wrong. Hence, they may not want to take action to eliminate the problem or stressful event.

Finally, the findings of the research showed that active coping was an important mediator between cognitive flexibility and EPOCH five-dimensional well-being. Accordingly, being cognitively flexible contributes to well-being by affecting how adolescents cope with the challenges they face. Adolescents who are cognitively flexible are better qualified to manage their personal problems and stressful experiences; and their coping skills increase well-being (Koesten et al., 2009). Adolescents with high cognitive flexibility are better able to cope with difficult situations and make a greater effort to meet their needs, due to their tendency to try different solutions. Thus, adolescents can be more successful, happy, and satisfied with life (Asıcı & İkiz, 2015).

Consequently, cognitive flexibility is a valuable variable for assisting adolescents in developing coping strategies that discourage self-criticizing or blaming others, but that encourage problem-solving, emotional regulation, cognitive restructuring and seeking social support. Improving cognitive flexibility in adolescents helps to develop a higher sense of well-being as it encourages use of more active coping strategies. In addition, the results confirmed that active coping is the most effective and favorable coping style in order to produce positive outcomes (Carothers et al., 2016).

Implications

The results of the research can shed light on the practices aiming to protect and improve the mental health of adolescents in the school environment. Being cognitively flexible and actively dealing with stress are learnable and improvable skills. School counselors can provide information and individual studies to teach students cognitive flexibility and active coping skills. Psycho-educational (e.g., Cheng, Kogan, & Chio, 2012; Puskar, Sereika, & Kathleen, 2003) group studies may be useful in order to improve cognitive flexibility and coping skills in schools. Training programs can be developed for improving the skills of being flexible, problem solving, emotional regulation, cognitive restructuring of the students whose well-being decreased because of various reasons such as divorced parents, peer victimization, traumatic experiences, and academic, social or emotional problems. Through cognitive therapy practices (e.g., Brockmeyer et al., 2014) in schools, the cultivation of flexibility can be supported in adolescents with strict opinions and rules.

The specific EPOCH domains have positive effects on adolescent's academic life (Cosgrove et al., 2018; Lei et al., 2018; Tetzner & Becker, 2018; Wang & Fredricks, 2014). Adolescents who are cognitively flexible and use active coping skills can maintain their well-being because they can more easily overcome the problems they face in their academic lives. Therefore, school counselors can support adolescents who have poor well-being due to the difficulties in their academic life by helping them improve their cognitive flexibility and active coping skills.

The teaching methods and techniques used by teachers in their teaching process can contribute to development of cognitive flexibility. For example, it has been proved that brainstorming is effective in developing creative problem-solving skills (Al Mutairi, 2015). The brainstorming technique can be effective in understanding that students may always have different options for solving a problem.

Finally, in a school environment dominated by positive institution understanding (Furlong et al., 2014), it would be easier for students to develop positive personal characteristics. In this context, school administrators, school counselors and teachers should cooperate. In-school activities can be organized to contribute to improvement of positive personal characteristics and to increase of positive subjective lives of teachers and other staff working in the school.

Limitations

This study has some limitations. Firstly, sample of the study was the high school students in a city located in the west of Turkey. Examining the effects of coping strategies on adolescents' well-being with participants from different cultures and regions may produce different results. Secondly, in this study, only the active, avoidant and negative coping strategies were studied; and avoidant coping had to be removed because of low Cronbach's alpha value. Other coping strategies mentioned in the literature may be considered in further studies. Thirdly, in this study, well-being is generally discussed within the framework of EPOCH model. However, well-being may vary according to the different areas of life. It can be examined in further studies, how cognitive flexibility and coping affect students' well-being in school. In addition, school experiences, perceptions, beliefs and attitudes about the school and the lectures can affect the well-being of the students. In the future studies, while the effect of cognitive flexibility and coping on well-being is examined, the school-related variables like school climate, academic motivation, student burnout and learned helplessness may also be studied. Furthermore, this study was a cross-sectional study, and there likely are reciprocal relationships between the studied variables. A cross-sectional design limits the contribution of the study, and the study should be replicated with a longitudinal research. Finally, the direct and indirect relationships between cognitive flexibility, coping strategies and well-being were determined through path analysis. If the further studies are designed as a qualitative research, more comprehensive information can be obtained on how cognitive flexibility and coping produce well-being in adolescents.

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Research Article
Received: 12.03.2021
Accepted: 12.04.2021
First Online: 30.04.2021
Published: 30.06.2021

Citation: Tok Turan, Z., Altun Yalçın, S. & Çakır, Z. (2021). Use of entertaining educational materials in primary education (science teaching with games). *International Journal of Scholars in Education*, *4*(1), 57-72. doi:10.52134/ueader.895511

Use of Entertaining Educational Materials in Primary Education (Science Teaching With Games)

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***Abstract*:** The aim of the research is to examine the effect of game method made with entertaining educational materials on student's attitude towards science lesson and academic success. The sample consists of 30 (6th grade) students, consisting of experimental and control groups. The research was applied for three weeks, 12 lesson hours in total. Mixed method was used in the study. Data collection tools "Attitude Scale towards Science", "Academic Achievement Test", "Student Interview Form and Researcher Observation Form" were used. The unit of "Conduction of Electricity" in the 6th grade curriculum of primary education was chosen and the experimental group was taught with the method of play with entertaining educational materials, while the control group included a teaching method in accordance with the curriculum. As a result, a significant difference was found between the attitudes of both groups. Based on this result, it can be said that "Game Method with Entertaining Educational Materials" is more effective than teaching methods in accordance with the curriculum on students' attitudes towards science lesson. There was no difference in academic achievement test results. Interview results are; They stated that they did not have any difficulties while learning the subject, that they learned with fun, that they were happy in the lesson and that they were eagerly awaiting the next lesson. In the results of the observation form, it was seen that cooperation, responsibility, self-confidence and peer teaching among students increased.
Keywords: Academic success, Educational material, Science, Game, Attitude.

İlköğretimde Eğlendirici Eğitsel Materyal Kullanımı (Oyunlarla Fen Öğretimi)

Öz: Araştırma amacı, eğlenceli eğitsel materyallerle yapılan oyun yönteminin öğrencinin fen dersine karşı tutumuna ve akademik başarısına etkisini incelemektir. Örneklem, deney ve kontrol gruplarından oluşan 30 (6. Sınıf) öğrenciden oluşturmaktadır. Araştırma üç hafta, toplamda 12 ders saati uygulanmıştır. Araştırmada karma yöntem kullanılmıştır. Veri toplama araçları "Fen'e Yönelik Tutum Ölçeği", "Akademik Başarı Testi", "Öğrenci Görüşme Formu ve Araştırmacı Gözlem Formu" kullanılmıştır. İlköğretim 6. sınıf müfredatında yer alan "Elektriğin İletimi" ünitesi seçilmiş ve deney grubuna eğlendirici eğitsel materyallerle oyun yöntemi ile öğretim yapılmış, kontrol grubunda ise müfredata uygun öğretim yöntemine yer verilmiştir. Sonuç, her iki grubun tutumları arasında anlamlı bir farklılık bulunmuştur. Bu sonuçtan yola çıkılarak, öğrencilerin fen bilimleri dersine yönelik tutumları üzerinde "Eğlendirici Eğitsel Materyallerle Oyun Yönteminin" müfredata uygun öğretim yöntemlerine göre daha etkili olduğu söylenebilir. Akademik başarı testi sonuçlarında ise bir fark bulunmamıştır. Görüşme sonuçları ise öğrencilerin; konuyu öğrenirken zorluk çekmediklerini, eğlenerek öğrendiklerini, derste mutlu olduklarını ve bir sonraki ders için merakla beklediklerini belirtmişlerdir. Gözlem formu sonuçlarında ise öğrenciler arası işbirliği, sorumluluk, özgüven ve akran öğretiminin arttığı görülmüştür.
***Anahtar Kelimeler*:** Akademik başarı, Eğitsel materyal, Fen, Oyun, Tutum.

This article has been obtained from my master thesis (Zerrin TOK TURAN).

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Introduction

Play is an entertaining activity that affects the physical, mental and emotional development areas of the child, has its own rules, and provides a pleasant time (Gülsoy & Uçgun, 2013). It is a learning environment where the interests and needs of the child are seen in the most natural way. At the same time, cooperation is a social environment where feelings of responsibility can be developed (Gençer & Karamustafaoğlu, 2014). Children spend most of their time playing. Therefore, the educational aspect of the game is focused on today. However, it is seen that the game, which is a natural learning tool for the child, is stuck between academic activities. Structured and restricted activities replace activities that children choose themselves, make their own rules, and play freely with fun (Fırat, 2013; Aksoy & Dere Çiftçi, 2014). Play is the most natural learning tool for children to have fun, enjoy and rest (Koçyiğit et al., 2007; Gülsoy & Uçgun, 2013). Therefore, games can be used as teaching materials in order to increase motivation, attention and learning towards the lesson (Akın & Atıcı, 2015). With the games used in lesson teaching, the student takes an active part in the process, student-teacher relations increase and the lesson becomes efficient. It causes positive development in behaviors such as helping each other, establishing social relationships, thus increasing communication skills, self-confidence, decision-making and helping each other (Genç, 2014). In addition, game is a learning method in which abstract concepts are concretized, provides permanent and meaningful learning and makes teaching enjoyable for children in primary school age and who are in the period of concrete operations (Gençer & Karamustafaoğlu, 2014). Therefore, considering the age levels of students and their interest in games, educational games can be used to concretize and teach the subjects (Kaya & Elgün, 2015). At this point, abstract lessons help to make permanent learning and consequently increase academic success by concretizing especially science lesson learning (Tok, 2016).

Educational play; it is all of the planned events that have the educational value that serves the student, willingly. By doing the student, it is a teaching tool that provides learning by living. Each game that serves training instruction has the educational value and is named as an educational game (Korkmaz, 2018). Inclusion of educational games in the learning process enables the increase in interest in the subject, improving the concepts of the concepts (Sarı, 2011). Helegly age of children in school, are in school, these years of children educational games make it easy to reach targeted behaviors and gains also ensures that the subject is repeated and reinforced (Yeşilkaya, 2013). Educational games are the feature of teaching the difference from other games. Teaching gains such as learning, reinforcement, evaluation and correction in the teaching process (Aslan, 2014). It should be used to increase students' active participation of students, to increase their active participation, will increase their motivation and attention, willingly, and the fun educational material to support the school and support this method in school, and the fun (Duran, 2014). At the same time, the course materials used in educational games direct the student to think and produce more (Güven, 2006). The aim of the games with educational materials is to increase the mental activities of the students and to ensure that it is to improve the acquisition of cognitive, affective, physical, social development areas through the game, as well as to improve the mental activities of the individual and to ensure learning while having fun to learn to learn the mental activities of the individual. In addition, the spirit is to achieve the mind and body health in place of responsibility (Aslan, 2014).

Today, the importance of the importance of scientific knowledge is increasing and the technology develops in parallel to the technology, it should be given to science and technology to take part in the world to be among the countries developing in the world (Hançer et al., 2003). Sciences: Thinking of knowledge of knowledge is the process of understanding the current knowledge and producing new information (Kapucu & Çağlak, 2018). Science education is the training of the students' interest and needs, age levels, developmental levels,

taking into account the environmental conditions, using the methods and techniques according to these features (Hançer, et al., 2003). It helps the child to produce solicitous problems in daily life, to establish a relationship between events and science between the events and the science, to recognize and to love the events, to recognize and to love them (Deniz, 2005). Lead to a positive attitude to science and technology (Hançer et al., 2003). The attitude is the trends, the tendencies to the events, situations, objects and people, positive or negative emotions (Üstüner, 2006). The aim of the education of science is to improve children's positive attitudes to the fene and nature, to give them to the questions they ask in these areas and to give up to the questions they ask for the questions and to keep up with the changing world (Bedir et al., 2009). However, the concepts of the concepts of science courses are abstract and complex, physics, chemistry, biology, and difficulties in the teaching and learning of the courses due to the incorporation of disciplines such as physics, chemistry, and biology and to the scientific concepts of the course and learning. All this leads to the formation of prejudice against the course and to be moved away from the course (Saracaloğlu & Aldan Karademir, 2009). One of the units of such challenges is the İştireleri Transmission of Electricity ın in the Primary 6th Grade Science program. There are too many abstract concepts in the unit.

For this reason, it becomes difficult for students to learn this subject (Kaya & Elgün, 2015) and what is learned is forgotten in a short time, causing superficial learning and rote learning (Demir, 2012). This subject, which is taught with teaching methods suitable for the curriculum, does not attract the attention of the student enough and the lesson is boring for the child (Torun & Duran, 2014). For learning to take place, prejudices in the individual must be eliminated, interest in the lesson must be increased, motivation and attention must be maximized (Bayram, 2015). In order for science teaching to be efficient and permanent, the methods and techniques to be used should be appropriate for the student levels and appeal to more sense organs (Uslu, 2011). Therefore, primary school students should be active in the learning process instead of learning by memorization in the course of the game period they are in. Teaching methods that are, questioned, learned by research, and that improve thinking skills and materials that will support and enrich them should be included (Bedir, Polat, & Sakacı, 2009). Children between the ages of 6-14, which correspond to the primary school age, are play age children and learn best by doing and experiencing (Önen et al., 2012). According to Güneş (2012), the game method made with entertaining materials contributed to the students' attitudes towards the lesson, academic success, increased self-confidence, and research and inquiry skills in the science course. Learning becomes easier and more fun with games prepared with entertaining educational materials (Esgin et al., 2011). Hand skills and imaginations of children develop during the material and game preparation process. In addition, the child experiences the pleasure of producing something new (Ören & Avcı, 2004). Abstract concepts are concretized with games prepared using materials prepared with simple and inexpensive materials that can be found easily from the environment, lessons are carried to daily life, interest and excitement towards the lesson increases. In the lessons taught in this way, effective, permanent and meaningful learning is provided by avoiding misconceptions (Yenice et al., 2019); Yıldız et al., 2020). Thus, a successful result can be achieved in achieving the goals of the lesson.

The aim of this study is to reveal the effect of the use of play method with entertaining educational materials in the teaching of the “Electricity Conduction” unit in the 6th grade science course on students' attitudes towards science course and their academic success. In addition, this method is to determine the feelings and thoughts of children towards science lesson.

Method

Research Model

The descriptive sequential pattern of the mixed method was used in the study. The mixed method is the collection, a research approach in which the researcher integrates the two data he collects both quantitative and qualitative data to understand research problems and draws conclusions by using the advantages of integrating these two data (Sözbilir, 2017). In this design, the aim is primarily to use quantitative methods and then to use qualitative methods to explain quantitative results in more depth (Creswell, 2002). To obtain quantitative data, a quasi-experimental design with "pretest-posttest control group" was created. A quasi-experimental model with pre-test and post-test control group was used to observe the two groups under the control of the researcher and to monitor the results (Karasar, 2007). In the study, the unit "Conduction of Electricity" was taught to the students of the control group (6-B class) using teaching methods in accordance with the curriculum. For the experimental group (6-A class) students; the lesson was taught with the game method made with entertaining educational materials. The symbolic representation of this model is as in Table 1 below.

Table 1
Symbolic Representation of the Research Pattern

Groups	Pretest	Process	Posttest
Experimental Group	T_1, T_2	Game Method with Entertaining Educational Materials	T_1, T_2, T_3
Control Group	T_1, T_2	Teaching Methods in accordance with the curriculum	T_1, T_2

T1 = "Electrical Unit Academic Achievement Test"
T2 = "Attitude Scale towards Science"
T3 = "Interview Form"

Teaching Methods Suitable for the Curriculum in the qualitative part of the study, semi-structured interview technique was used to get students' opinions about the use of Game with Fun Educational Materials in the science lesson. The researcher determined eight questions, but after taking the opinions of the expert researchers in the reliability section, they were reduced to four questions. In addition, students' participation in the lesson, teacher-student relations, classroom interactions, difficulties and negativities experienced in the process, the situation of the environment and the highlights were observed by the researcher during and after the research.

Universe and Sample

The study was conducted with 6th grade students from a secondary school in the district of a city with a medium-sized population in the Eastern Black Sea Region. Two easily accessible groups were formed, the sample being an experimental group and a control group. It was paid attention to have a homogeneous structure in both groups in terms of important points such as the academic success of the classes that make up the experimental and control groups, and the same teaching teacher. In addition, attention was paid to ensure that variables such as the environmental conditions of the classes and the duration of the course are the same. Thus, class 6-A formed the experimental group and class 6-B formed the control group. The experimental group students (6-A) were taught during the "Electricity Transmission" unit (3 weeks = 3x4 = 12 lesson hours) by applying games with entertaining educational materials appropriate to the course outcomes, while the control group (6-B) students were taught in accordance with the National Education Curriculum. Curriculum-based methods were used.

The number and gender of students in the experimental and control groups are presented in Table 2 below.

Table 2
Distribution of Experimental and Control Group Students by Gender

Class Name	6/A (Experimental Group)	6/B (Control Group)
Girl	7	8
Male	4	11
Total	11	19

Data Collection Tools and Evaluation

Achievement test

In the study, "Electricity Conduction" unit Academic Achievement Test, which was developed by the researchers, was used to measure the changes that may occur in the achievement of the students in the groups where the Game with Entertaining Educational Materials method was applied.

While developing the test in order to measure the success of the students in the unit of "Electricity Conduction", attention was paid to its applicability in existing secondary schools. For this reason, care was taken to adhere to the "Electricity Transmission" unit subjects specified in the science program prepared by the Ministry of National Education for the 6th grade secondary school, and the acquisitions in the unit were examined. For this purpose, before the test items are prepared, books, magazines, etc. The sources were analyzed and the questions were created by using the sample of questions in online tests, different test books, and acquisition screening tests. In the scoring of the Academic Achievement Test, which consists of 38 multiple-choice questions with four options;

- Correct answer …… .. 1 Point
- Wrong answer …… .. 0 Points
- A blank question …… .. is rated as 0 points.

The test was evaluated over 38 points by giving 1 point to each correct answer in the test. For the content validity of the test, an indicator table was created in accordance with the subject gains and it was determined that the content validity of the questions in the test was sufficient by referring to expert opinions. Expert opinion was sought to determine whether the questions selected for the pilot application measure the behavior they aimed to measure, and the approved questions were put to the test. The prepared test was applied to 7^{th} grade students who learned the subject before. Based on the data obtained as a result of the application, the difficulty and discrimination index of all items in the test were calculated; the items deemed necessary were removed from the test and the test was finalized with 32 questions. Pilot application test results regarding the reliability calculation of the "Electricity Transmission" Unit Success Test are given in the Appendix.

Item discrimination power, item difficulty, and reliability coefficients were examined in data analysis. Item discrimination index shows to what extent an item distinguishes between an unknowing and an unknowing. The discrimination of items in a test varies between -1.00 and +1.00. Questions with a discrimination index below .20 are items with low discrimination. Therefore, they must be excluded from the test. Questions with a discrimination of .30 and above are questions with excellent discrimination (Güler, 2011). According to the results obtained from the "Academic Achievement Test", the general discrimination degree of the

achievement test applied was found to be .36. The correctness of the questions in an achievement test gives the test the difficulty. In an ideal achievement test, the average difficulty index of the questions should be around .50 (Güler, 2011). The average difficulty of the "Electricity Conduction Academic Achievement" test was calculated to be approximately .55. According to the results of the analysis made at the end of the application, the reliability coefficient KR-20 of the success test was found to be approximately .88. The reliability coefficient calculated for a success test is .70 or higher, showing that the test is reliable. (Büyüköztürk 2004). Therefore, the result obtained from the success test prepared shows that the test is reliable and sufficient for use in research.

Science Attitude Scale

In the study, "Science Attitude Scale" with 20 items and 5-point Likert type prepared by Mertoğlu (2000) was used to determine the attitudes of the students in the groups where the game method made with entertaining educational materials was applied. The reliability of the scale was determined as a = .89. Science attitude scale was applied to the students in the experimental and control groups before and after the application. By comparing the results of the application, it was aimed to determine whether there is a meaningful change between their attitudes towards the science course.

Interview and Observation Form

At the end of the study, questions were asked to the students to get their feelings and thoughts about the teaching process with the game method made with entertaining educational materials and to determine how this affects the lesson. Categories and codes were obtained by subjecting the data obtained here to content analysis. The observation technique that was not structured by the researcher was used during the science lesson, which was carried out by applying the game method made with educational materials. Throughout the game activities used in the course, students' participation in the lesson, teacher-student relations, interesting and different situations, classroom interactions, problems and negativities experienced during the process, the situation of the environment and points of interest were observed. In particular, it was tried to observe the interests and desires of the students in the science lesson, which was carried out by applying the game method made with entertaining educational materials. Observation records were made after the activity in order not to distract the class and not to disturb the teaching of the lesson.

Data Analysis

MANOVA, one of the statistical analyzes, was used in the analysis of quantitative data in this study, in which the mixed method was used. If there are more than one dependent variable and two independent (group) variables, two-way MANOVA is used to test whether there is any difference between groups (Can, 2016).

Content analysis method was used in the analysis of qualitative data (interview and observation data). Content analysis is a scientific approach that allows for objective and systematic examination of verbal, written and other materials (Sert et al., 2012).

Application Steps

First, experimental and control groups were formed in the research. Before the subject of "Conduction of Electricity" was taught, success and attitude scales were applied to the students in the experimental and control groups.

In the experimental group, by using games made from entertaining educational materials in a constructivist approach, the subject of "Conduction of Electricity" was taught according to the time in the weekly course schedule. In other words, the research was carried out in 3 weeks, 12 course hours. In the study, education in accordance with the curriculum was carried out with the students in the control group. After the experimental procedures were completed, the same two scales were applied to the experimental and control groups as a post-test. In addition, at the end of the study, students 'opinions about the game method and the application process made with entertaining educational materials were taken in writing and it was tried to investigate the students' interest in the method. The data obtained were tried to be supported by the observation notes that the researcher kept about the behaviors and attitudes of the students before, during and after the lesson.

Process (Selected Games for Electricity Transmission Unit and its achievements)

Different games and materials were included in the research process in order to teach the key concepts, to make the subject grasp, to reinforce what has been learned, to evaluate the subject, to increase the interest and participation in the course. Games were prepared in accordance with the 6th grade "Electric Unit" achievements.

Games used in the research "Fish Catched to Electric Game (Classifies materials according to their state of conducting electricity using the electrical circuit he designed), Wheel of Fortune (Wheel of Fortune), Angry Science (Grizzly), Information Worm, Labyrinth, Bil-Boiler Drawer, Light Bulb, Bulb Mystery Book, Puzzle (Lists the precautions to be taken against electric shocks for the safety of himself and those around him), Match Card Receive Score (Expresses the difficulty of the items against the transmission of electrical energy as "resistance". He concludes that the resistance of a conductor varies depending on the length, cross section and type of the conductor), Electric Surprise Egg (He realizes that the bulb is also made up of a conductive wire and has a resistance. Classify materials according to their conductivity and insulating properties), Bowling (Electring) (Lists the precautions to be taken against electric shocks in terms of the safety of herself and those around her), Science Bala (Explain the purposes for which the electrical conductivity and insulating properties of materials are used with examples from daily life.), The Ring Game (He designs and makes a simple rheostat model to change the brightness of the light bulb in the circuit. Builds a simple electrical circuit and observes), Electro dart (Classify materials according to their conductivity and insulating state), Science This, Shorten The Cushion Duplicate Ball (He realizes by experimenting that the brightness of a light bulb in an electrical circuit can change by changing the length, cross section and type of the conductor in the circuit. It expresses the difficulty that materials show against the transmission of electrical energy as "resistance".), Science Rings (Predicts what the brightness of a light bulb in an electrical circuit depends on. He designs and sets up an experiment that will test his predictions about the brightness of the bulb. It expresses that the resistance of insulators is much greater than that of conductors.), games such as "Pop Balloon Find the Truth" were prepared and applied in line with the unit gains. Some of these games are games taken from various sources and generally used in other lessons. Some of them are games designed together with teachers and students. The most important feature of the games prepared is that they are created from cheap materials that can be easily obtained from the environment, and that the student is included in the process in the process of creating the game, increasing the fun and motivation, developing the imagination of hand skills, creating a new product and increasing the feelings of success and pleasure. Some of the games were prepared by the teacher before the lesson. The games were adapted to the learning outcomes of the lesson and applied. At the same time, it is aimed to increase the creativity of the students in the process of creating games together with the students.

It was aimed to bring the games they play in daily life to the lesson, to make them a teaching tool and to carry the lesson to their outdoor games. The game names were also determined by the students. In the science applications lesson, the games played in other educational levels and lessons as well as the games played by the children in the past were shown on the smart board. In the later science applications lessons, the students were given time to design games and materials that they can use in science lessons. In this process, it was aimed for them to use their imagination and creativity by being free to choose the materials they used. The concepts of the 6th grade "Electric Conduction" unit that are taught with games are: "Conductor, Electrical Conductivity, Insulator, Electrical Insulation, Electric Shock, Circuit, Rheostat, Resistance, Electric Current, Electrical Resistance, Resistance Meter, Battery, Ohm, Electrical Resistance Depends Factors (Cross Section, Length, Type of Conductor)", Concepts to be given directly Filament, Tungsten (wolfram).

Findings

Findings and comments regarding the attitudes of the students towards the science lesson of the game method made with entertaining educational materials are as follows:

For the analysis to be applied to the quantitative data obtained, the correlation coefficients and significance levels between the dependent variables were calculated to find out whether there are significant statistical correlations between the dependent variables. As a result of this calculation, it was seen that there were statistically significant high correlations at the 0.01 level among the dependent variables. Accordingly, taking into account these statistical relationships between dependent variables, it was decided to conduct repeated measures, repeated measures MANOVA. After this stage, it was checked whether the data provided the MANOVA assumptions.

It was determined whether there are multivariate extreme values by calculating Mahalanobis distances. It was observed that no distance exceeded 16.2, which corresponds to 0.001 significance level. This means that there is no multivariate extreme value (deviation value). Another MANOVA assumption, Variance Covariance matrices, was found to be violated by the Box test (Box 'M = 37.449; f = 3.11; SD_1 = 10; SD_2 = 2586.5; p = .001 <.05). In addition, by looking at the results of the Box test, it was determined that the homogeneity assumption of the covariance matrices was not met. In the interpretation of the obtained results, Greenhouse-Geisser statistics were used due to the violation of the assumption of homogeneity of covariance matrices. If you have more than one dependent variable and two independent (group) variables and you are wondering whether there is any difference between groups, you can use two-way MANOVA (Şen, 2016). Levene's test, which is conducted to find the equality of variances of dependent variables, shows that the variances of the variables can be considered homogeneous. Below is the MANOVA results of the attitude.

Table 3
MANOVA Test Results for Each Level of the Experimental and Control Groups

Dependent Variable (Tests)	Grup	$\overline{X}$	Ss	n	F	p	η2
Success Pretest	Experimental group	49.99	10.14	12			
	Control Group	36.45	11.69	18	3.827	.060	0.120
Success Posttest	Experimental group	91.92	2.47	12			
	Control Group	64.92	17.46	18			
Attitude Pretest	Experimental	66.25	7.65	12			

	group						
	Control Group	66.61	6.12	18	66.92	.000	0.705
Attitude Posttest	Experimental group	93.83	4.10	12			
	Control Group	66,94	5,81	18			

As seen in Table 3, when the Attitude dependent variable is examined, it is seen that there is a significant group interaction and the attitude towards science lesson creates a statistically significant difference ($f = 66.92$, $p = .000$, $\eta 2 = .705$). While the pre-test average of the attitude dependent variable towards the science lesson was 66.25 in the experimental group, it was 66.94 in the post-test, and it increased from 66.61 to 66.94 in the control group. It is seen that the effect of the application on the attitude towards science variable was statistically significantly greater in the experimental group compared to the control group.

The answers given to the questions asked by the students, who were taught using entertaining educational material, in order to obtain their opinions about this method, are given below in tables after being subjected to content analysis.

Table 4
Experimental Group Students' Views on the Question "What do You Think About Teaching Science Lesson with Games"

Mental	f	Affective	f	Teacher	f
Permanent	5	Good	5	Advice	1
Recall	2	Excitement	1	Helper	1
Understanding	3	Fun	2	Labor	1
Learning	1	Useful for Me to	1		
Understanding style	1	Difficulty	1		
Topic repetition	1	Game	1		
Game	1				

Table 4 includes the answers of the students regarding the question and three categories were created. In the mental category: students think that this method is better learning, more permanent learning, easier remembering and understanding, learning by having fun, increasing their success, providing subject repetition, learning and learning style through play.

In the affective category; students in general; this learning method is a very good method, the students are excited for the lesson, they wait impatiently for the lesson time, have a lot of fun, do not have difficulty learning the subject, it is useful and learning with games is fun.

In the category of teacher: students advise other teachers to use this method in their lessons, they state that teachers put a lot of effort into using this method and it helps teachers with their teaching.

Table 5
Experimental Group Students' “Should Games be Used in Other Lessons? Why is That?" Opinions on the Question

Cognitive	f	Affective	f	Other	f
Helper	1	Fun	4	Age suitability	1
Permanent	5	Liking	3	Learning by practice	1
Recall	1	Claim	1		
Easy answer	1	Interest	1		
Learning	6	Not being bored	2		
		Happy	1		
		Wonder	1		

Table 5 includes the answers of the students regarding the question and 3 categories were created. In the cognitive category; the reasons why students want them to be used in other lessons are the thoughts such as learning the subject, even better learning, retention in learning, easy remembering of what they have learned through games, and being able to answer questions easily.

In the affective category; making the lesson fun with games, loving the lesson, being eager to the lesson, not getting bored in the lesson, waking up curiosity about the lesson, making the students happy with games and increasing interest in learning life are the thoughts. In the other category; in general, students think that the use of games in lessons is appropriate for their age and that they learn in practice by becoming more active in the lessons.

Table 6
Experimental Group Students' "Did the Teaching of the Science Course with Games have any Benefits for You? If so, What are They? " Opinions on the Question

Cognitive	f	Affective	f	Method	f
Better Understanding	1	Interesting	1	Teaching Lessons with Games	1
Learning/ Understanding	3	Funny	1	Applied	1
Easy Answer	2	Beautiful	2		
Benefit	2	Nice time	2		
Permanent	2	Gratefulness	1		
Not to mix	3	Claim	1		
Again	1	Increased Interest	2		
Success	1				
Understanding-Not	1				
Understanding	1				

The answers of the students regarding the question are given in Table 6 and three categories have been created. In the cognitive category; the thoughts of the students were to understand the subject better, to be able to answer the questions easily, not to confuse the subjects, that teaching with games helps to repeat the subjects, increases their academic success and lecture grade, benefits themselves and the teacher sees who understands the subject or not.

In the affective category; the students have the thoughts that this method is interesting, the lessons become more fun, the lessons are beautiful with games, they have a good time in the lesson, their interest and desire increases, and they feel grateful to their teachers for the teaching of the lesson.

In the category of method; it includes the thoughts that students want their teachers to use the teaching method with games, so that they learn by applying the lesson and the subject.

Table 7
Experimental Group Students' "Did You Like Teaching Science with Games? If You Liked Why? " Opinions on the Question

Cognitive	f	Affective	f	Method	f
Academic success	1	Love	9	Play a game	1
Recall	1	Have fun	7	If only there were games in other lessons	1
Understanding	2	Like	1	Teaching Request	1
Game to Mind	2	Nice Time Not To Be	2	Learning by Game	1
More Lasting	5	Bored	1		
Better Learning	2	Taste	1		

In Table 7, students' answers regarding the question are given and three categories have been created. In the cognitive category: it was stated that the students' use of games in the lessons made what they learned more permanent. In addition, the students' thoughts were given

that this method improves their academic achievements and lecture grades, and remembers the games they played and the subjects learned while answering the questions.

In the affective category: it was stated that the students liked the games played in the lesson, as a result, they liked the lesson, they were not bored, they had a pleasant time with fun and that they caused them to love their teachers more.

In the category of method; the students emphasized that they like to play games and that this method should be used in the teaching of other courses. They stated that they had fun with this method, their interest increased, they participated in the lesson, and therefore their teachers' desire to teach increased. In the code of learning with games, students stated that their learning is better with games, and at the same time, they both play and work.

Unstructured observation technique was used during the research in science lessons. Observations made were noted by the teacher at the end of each lesson. Obtained observation results are as follows.

It was observed that the students came to the next lesson voluntarily and the excitement, interest, participation in the activities and desire increased while the games were played. It was seen that the students wanted to take and play a role in every game. There was competition between the groups. It has been observed that cooperation and peer teaching among students in the same group have increased in order to win competitions with games. However, it was noticed that during the games in the form of a competition, the noise in the classroom increased and classroom management became difficult. It was observed that the whole class and especially the students with low academic achievement increased the willingness to answer the questions asked during this method.

It was observed that even indifferent students increased their motivation to the lesson they liked the games played, and they came to the lesson with ideas that would adapt the games they played in daily life to the lesson. At the end of the lesson, they asked what game they would play in the next lesson. It was observed that they came to the next lesson with curiosity. It was observed that they came to class in order to win games in the style of competition between groups and to play more games. It has been observed that they are eager to use the fun educational materials used in games. In other lessons taught by the same teacher, it was noticed that the students adopted and wanted to use this method.

It has been observed that extra course hours are needed in the process of producing and preparing games and materials, especially for students preparing for the exam, and they want to work for the exam and test solving.

In the process, it was observed that students displayed the behaviors of helping each other, giving ideas to each other, and producing by having fun. As a result, it has been realized that they compete with each other to create new products, which they see is not very difficult to produce something. It was noticed that the ideas about science applications course, science and project making changed positively. It has been observed that they establish a bridge between the science applications course and the science lesson and thus, they better grasp the place and importance of science and science lessons in our lives.

During the exhibition of the fun educational materials and games they produced at the TÜBİTAK science fair held at the school, it was observed that the students experienced the honor and pleasure of exhibiting the materials and games they produced and it was noticed that their sense of self-confidence increased. There were some problems in the first stage of the game. However, as the games were played, the game rules were adopted. They even learned to

obey the rules and respect each other's rights at the end of the application. As a result of the observation made during the break, it was seen that the students approached the problems they encountered in daily life without fear and looked for solutions.

Results and Discussion

A significant difference was found in favor of the experimental group in the results of the attitude scale towards science applied to the experimental group in which the game method made with educational materials was applied and the control group in which the method in accordance with the curriculum was applied. In other words, it has been concluded that the game method made with entertaining educational materials is more effective than the methods suitable for the curriculum on the attitudes of the students towards the science course. In studies supporting the results, Demir (2012) and Akın &Atıcı (2015); They found that training with the game method caused a significant increase in science attitude scores. Korkmaz (2018) investigated student achievement and attitude on science teaching based on educational game development. As a result, it was seen that science teaching supported by developing educational games had a significant effect on the increase of students' attitude and academic achievement levels.

In the other quantitative result obtained from the findings of the study, it was observed that the post-test success scores of the experimental group and the control group increased according to the pre-test success scores. However, no statistically significant difference was found between the success scores of the experimental group in which the game method made with fun educational materials was applied and the control group where the methods suitable for the curriculum were applied. The reasons for the lack of significant difference between the posttest success scores of the groups may be as follows: Including activities that are suitable for the constructivist approach in both groups in the teaching process and that enable the student to be actively involved in the process may have caused the academic achievement scores of the learners to come out close. Gürol (2003), Balım et al. (2008), Akyol & Fer (2010) 'research results have been found to support this idea. It may be due to the fact that the academic achievement test used to measure the success of students consists of multiple choice questions. Akyol & Fer (2010) support this view in their study. Multiple choice questions increase luck success and the likelihood of cheating. It is also inadequate to measure high-level behaviors (partially analysis, evaluation, and especially the level of synthesis). The reasons mentioned above affect the reliable and accurate measurement of success by multiple choice questions. According to Gagnon & Collay (2001), these tests are aimed at measuring what is not known rather than what is known. According to Yıldız (2010), because only the correct result is graded in such tests, reasons such as test anxiety, excitement, carelessness affect the test results. Therefore, in this study, learners may not be able to fully reflect what they have learned. For all these reasons, the academic achievement scores of the groups in the study may have been similar. Bektaş (2020) examined the effect of educational games on first-grade literacy skills in his study. As a result, it has been determined that educational games have a positive effect on student success.

Considering the results of the semi-structured interview technique conducted with the students in the qualitative dimension of the study, the majority of the students in the experimental group expressed positive thoughts about the game method with entertaining educational materials. They wanted all subjects and lessons to be treated with games. In line with the students' opinions, it was concluded that the method used in the study enabled repetition of the subject, helped remember, and enabled learning and enjoying with fun. They stated that learning was fun, they came to the lesson willingly, they were excited about the lesson, they became more curious about the lesson and they were impatiently waiting for the

lesson time to make them happy with the game, they did not have difficulty learning the subject, they were excited about the lesson. Looking at the studies that support the qualitative results of the study: Kavşut et al. (2011), Önen et al. (2012), Demir (2012), Aral et al., (2012) stated that the use of the game method in the lesson enables learning by having fun, Yurt (2007), Saracaloğlu and Karademir (2009), Demir (2012) stated that it provides the pleasure of the lesson. In parallel with these results in the studies in the literature, Gülsoy and Arslan (2011) stated that it ensures not getting bored with the lesson: Coşkun et al. (2011) aroused curiosity about the lesson, Kavşut et al., (2011), Torun and Duran (2014) stated that games increase the excitement in the lesson and make students happy. These aspects of these studies are in line with the findings in our study mentioned above. In addition, they stated that they had fun because they were playing games, they were not bored in the lesson, they participated in the lesson more actively because it increased their interest in the lesson, they learned while having fun, helped them to repeat the topic, and what they learned was more permanent, they remembered what they learned more easily, and they were able to answer questions easily. Demir (2012), Gençer & Karamustafaoğlu (2013), Kaya & Elgün (2015) stated in their similar studies that the play method made with the materials increased the active participation of the student in the lesson. Kavşut et al. (2011) emphasized that it helps with topic repetition, while Gökbulut & Soft (2014) emphasized that it helps to remember the subject. Tezel & Aksoy (2020), eighth grade periodic system ‘containing scientific story they investigated the effect of educational game activity. As a result of the study, it was determined that students had positive effects on their learning, attracted their attention and students liked these activities. Findings in these studies support the findings obtained from student opinions.

According to the researcher observation notes of the study, it was observed that cooperation, responsibility taking and peer teaching among students increased. It was observed that they came to the next lesson with curiosity. During the exhibition of the fun educational materials and games they produced at the TÜBİTAK science fair held at the school, it was observed that the students experienced the pride and pleasure of exhibiting the materials and games they produced, and it was noticed that their sense of self-confidence increased. Looking at the studies conducted in parallel with these results, similar results support it. Yıldız et al. (2020) investigated the effect of educational games and cooperative learning, and as a result, they found that the educational game method was more effective in improving students' social skills and motivation. Yenice et al. (2019) investigated the effects of educational games on fifth grade students' motivation to learn science. As a result, it was determined that the educational game application has a positive effect on science learning motivation. Erdal and Erdal (2003), Ayan & Dündar (2009), Aral et al., (2012) stated that educational games increase the creativity of students, Bayram (2015), Karamustafaoğlu & Kaya (2013), Akın & Atıl (2015), Bayırtepe & Tüzün (2007) stated that it increased pleasure, Coşkun et al. (2011) aroused curiosity, Karamustafaoğlu & Gençer (2013) stated that they helped to cooperate and also teach obeying the rules. There is a similarity between the findings of Dağbaşı (2007), Demir (2012), Kaya & Elgün (2015) that it increases motivation in their studies and Torun and Duran (2014) makes it possible to love the lesson and the findings obtained from the observation results of our study. The findings of Yurt (2007), Dağbaşı (2007), Genç (2014) that caused an increase in students' interest in the course and the results obtained from the researcher's observation notes are similar.

In accordance with the constructivist education theory, the results of the attitude scale towards science obtained for the application of the 6th grade "Electric Conduction" unit with the entertaining educational material used in the teaching of the Game with Entertaining Educational Materials, the results of the observations and the students' opinions after the application can be listed as follows. As a result of the evaluation, it was seen that the concepts were learned and the gains were achieved. It was noticed that the behaviors of comprehending

the logic of the subject and commenting instead of learning by memorization increased. A positive attitude towards the lesson was developed and participation in the lesson was increased.

The game method with entertaining educational materials is remarkable and entertaining, but also contributes to permanent and meaningful learning. students have fun while learning, and learn while having fun. They willingly come to the lesson and actively participate in the teaching process. They want to do the activities over and over again. Thus, this method prevented them from getting bored in the teaching environment and enabled them to do activities willingly and fondly. Teaching with this method enabled the student to associate the lesson with daily life, to reinforce the lesson by carrying it into his daily life with games. The reason why the applied teaching method is intertwined with the game in accordance with the development level of the child and that concrete entertaining materials make the lesson more interesting are the reasons for increasing the interest and motivation of the student.

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Research Article
Received: 18.01.2021
Accepted: 21.04.2021
First Online: 30.04.2021
Published: 30.06.2021

Citation: Özbey, Ö. F. & Sarıkaya, R. (2021). An investigation of the critical thinking skills of fourth grade students in real-life situations. *International Journal of Scholars in Education*, *4*(1), 73-96. doi: 10.52134/ueader.864030

An Investigation of the Critical Thinking Skills of Fourth Grade Students in Real-Life Situations

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***Abstract*:** The aim of this study is to examine to what extent and how fourth-grade students use their critical thinking skills in real-life situations. The method of the research is instrumental case study, which is one of the qualitative approaches. Typical case sampling was used in the study and 30 fourth grade students from 11 different schools in Ankara were included in the study. Fake news and semi-structured interview form prepared by the researcher were used as data collection tools. During the implementation phase, the students were shown fake news and asked whether this was true or not. Afterward, interviews were made using the Socratic inquiry method over the comments created by the researcher. Six elements of thinking developed by Paul and Elder (2013) on critical thinking approach [(a) knowledge, data and experience, b) concept, c) perspective d) assumption e) inference, f) implicit inferences and results] used. During the data analysis, the codes were reached in line with the research problems, and the themes were reached by finding common aspects between the emerging codes, that is, by collecting them under categories. In this study, the data were subjected to content analysis by two researchers independently and the consistency between researchers was calculated as 87.5%. As a result of this study, it was determined that 92% of the expressions of primary school fourth-grade students were in the weak critical thinker category.
Keywords: Critical thinking state, Primary school, Instrumental case study, Fake news.

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Introduction

As the line between "what is real" and "what is not" has started to disappear, the phenomenon of lie, the concept of post-truth (trivializing the truth) has started to enter our lives more and more. Post-truth populist discourse prevails over “reality”, the irrational find more supporters over objective facts; emotions and personal beliefs take precedence over objective facts in the formation of social views (Levitin, 2017; Oxford Dictionaries, 2016). The abandonment of rational approaches such as logic and reasoning and making decisions based on beliefs threaten not only the society in which we live but also future generations. In the face of such a threat, raising individuals who can approach events critically instead of individuals who accept everything as they are and obey without question, has become the primary educational goal of countries (Alpay, 2017; Ten Dam & Volman, 2004). With this purpose, critical thinking skills have been added to the goals of curricula in many countries (Griffin, McGaw, & Care, 2014; National Research Council, 2011; Trilling & Fadel, 2009). It is also seen that critical thinking is one of the most sought-after skills in the 2022 business world (World Economic Forum, 2018) and is one of the essential life skills in the 21st century (Partnership for 21st Century Skills, 2019). In fact, critical thinking skills are found in all people according to Paul and Elder (2013). However, people either do not use this skill at all, or "use it weakly" or "use it strongly". People who have never used critical thinking are full of prejudices and approach events with stereotypes, generalizations, and oversimplifications. Weak critical thinkers can use critical thinking but use it to defend their own views and manipulate individuals who never think critically. In addition to all these, strong critical thinkers prefer to be impartial and view events from different perspectives. They are not self-centered because they seek what is good for humanity (Noddings, 2017). The goal of education is to enable individuals to use critical thinking at a strong level. In order to achieve this, it is necessary to define well what critical thinking means.

In defining critical thinking skills, philosophers have treated it as reasoning and reflective thinking, while psychologists have treated it more as problem-solving skills (Lewis & Smith, 1993). In this study, critical thinking was considered and used as a reasoning skill. For this reason, definitions in philosophical views were included. Ennis defined critical thinking skill as “reasonable reflective thinking focused on deciding what to believe or what to do” (Ennis, 1985). According to Lipman, critical thinking is “skillful, responsible thinking that facilitates good judgment because it (1) relies upon criteria (2) is self-correcting, and (3) is sensitive to context” (Lipman, 1988). As can be seen from the definitions of Ennis and Lipman, critical thinking is high-level thinking that enables us to control our own thinking. Researchers who have worked on critical thinking have agreed that a number of cognitive skills (analyzing arguments, making inferences by induction or deduction, reasoning, evaluating, making decisions, problem-solving, etc.) and tendencies (openness and fairness, curiosity, flexibility, tendency to seek reasons, desire to be well informed, desire to respect various different points of views, etc.) need to be developed continuously in order to acquire this critical thinking skill (Bailin, Case, Coombs, & Daniels, 1999; Ennis, 1985, 1989; Facione, 1990; Halpern, 1998; Paul & Elder, 2013).

Researchers who have worked on critical thinking state that the skills and dispositions mentioned above can be taught (Lai, 2011). However, the current education system is thought to be inadequate to develop critical thinking skills (Halpern, 1998; Paul, 1992; Sternberg, 1985) and studies are conducted to increase this skill. When the literature is examined, it is seen that researchers focus on young people and adults (Azar, 2010; Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2009; Fischer, Spiker, & Riedel, 2009; Koray & Köksal, 2009; Noohi, Karimi-Noghondar, & Haghdoost, 2012; Oja, 2011; Tümkaya, Aybek, & Aldaş, 2009). However, Willingham (2008) states that critical thinking can be seen even in a three-year-old child, Bailin et al., (1999) show that children start to think critically before coming to school, and Paul and Elder (2013, 27) also show that people have innate critical thinking skills, but this can be improved through education. In the APA Delphi report, it was stated that critical thinking education should

not be limited to secondary schools and high schools, but it should be included in all levels of education (Facione, 1990). In Turkey, it is emphasized that individuals need to be critical thinkers from primary school as an educational destination. This emphasis is made both by the item "Having critical thinking skills as individuals who know the ways to reach correct and reliable information" in the Social Studies Curriculum (Ministry of National Education-MoNE, 2018), and by including critical thinking skills under the basic skills in the same program.

Despite all the measures taken and efforts made, it is seen that the critical thinkers targeted in the curriculum (domestic and international) experience problems in the face of real-life situations (Organization for Economic Co-operation and Development, 2016; Sternberg, 1985). One of the biggest reasons for this is that problems do not arise directly in a structured way in real-life situations. Generally, students need to realize that there is a problem. In addition, these problems have different aspects such as defining, complex structure, not having a single answer, requiring formal and informal information (Sternberg, 1985). For these reasons, curricula should focus not only on developing critical thinking but also on its transfer to real-life situations. Because individuals should be able to transfer their critical thinking skills to real-life situations and solve the problems they encounter. Fake news shared on social media can be shown as an example of the problems in the mentioned real-life situations. Since 2016, the rate of people encountering fake news on social media has increased (Newman, Fletcher, Kalogeropoulos, Levy, & Nielsen, 2017, 2018; Newman, Fletcher, Kalogeropoulos, & Nielsen, 2019). For example, in a recent report published by the Reuters Institute at Oxford University, the people, who participated in the survey from Turkey, claimed that 49% of the news they encountered was fake news (Newman et al., 2018). In addition, according to the Turkish Statistical Institute's (TSI) data in 2018, 90% of individuals aged 16-24 use the internet (TSI, 2018), it can be said that future generations will face the problem of fake news the most. Critical thinking skills, which are aimed to be developed from the fourth grade of primary school, should be aimed to be used effectively in real-life situations such as fake news. For the realization and development of such a goal, evaluation studies that can determine the level of the current situation are needed.

In the literature, there are two studies in which a measurement tool has been developed to determine the critical thinking skills of primary school students. One of these is the critical thinking scale for primary school 4th and 5th-grade students developed by Demir (2006) within the scope of the social studies course. The other is Gelerstein, Río, Nussbaum, Chiuminatto, and López (2016)'s critical thinking test for 3rd and 4th-grade students within the scope of the language arts course. These two studies are aimed at determining the level of critical thinking through a discipline. However, there is no study in the literature to determine the extent to which students transfer the critical thinking skills provided by curricula to daily life.

This study aims to examine to what extent 4th-grade students transfer and use the critical thinking skills to real life. For this purpose, the following questions were sought in the study:

1. To what extent can fourth-grade students use their critical thinking skills?
2. How do fourth-grade students use their critical thinking skills in the face of sample situations presented to them?
3. How do fourth-grade students transfer their critical thinking skills to daily life situations?

Methodology

In this study, instrumental case study, one of the qualitative approaches, was used. Instrumental case study is used to provide a better understanding of a curious problem or a subject (Hancock & Algozzine, 2006). According to Stake (2005), in the instrumental case study, a specific case is used to reveal the subject of interest. Thus, researchers can examine the existence

of a phenomenon through a specific situation. While the subject of interest in this study was to discover students' critical thinking skills in daily life, the fake news phenomenon was used to investigate the subject in depth. There are several reasons why fake news is suitable for in-depth investigation in real-life situations. These can be listed as; a) contains more than one discipline, b) has a complex structure, c) contains different interpretations, d) the content is interesting for students, e) suitable content for the application of critical thinking skills processes, e) has context to enable students to use their formal and informal knowledge.

Participants

According to the MoNE social studies curriculum, critical thinking skill is included in the basic skills that should be acquired at the 4th grade level for the first time (MoNE, 2018). As a result, it was deemed appropriate to select primary school 4th-grade students as participants in the study, since they are expected to have basic critical thinking skills when they finish the 4th grade.

Since the aim of the study is to explore students' critical thinking skills in daily life, the participants were selected from purposeful sampling methods according to the typical case sampling method. In typical case sampling, the aim is to conduct research on average to gain information about a particular situation (Patton, 2015; Yıldırım & Şimşek, 2006). 30 students studying in Ankara central districts (Yenimahalle, Çankaya, Keçiören) in 2019 were included in the study. Also, to minimize the school differences in the study, interviews were conducted with two students (one boy, one girl) from each school and 10 students from each district.

While choosing the students to be included in the study group, first the necessary permissions were obtained from the Ministry of National Education, later the researcher went to the schools to be familiar with them and created a list of volunteer schools. Finally, an average of two students from among the volunteer students at each school were included in the study under teacher consultancy. After recruiting 10 students from each district, it was concluded that the answers given were repetitive and the data satisfaction was reached.

Data Collection Method

In the study, the semi-structured interview method was preferred as the data collection method. In this interview method, the researcher asks the questions that he has prepared before, depending on the subjects he is based on. This method also provides the researcher with the opportunity to ask improvised questions to dig deeper (Yıldırım & Şimşek, 2006). In this context, firstly, 4th-grade students were given the situations that they may encounter in their daily life; afterwards, they were asked questions about how they interpreted these situations. The flow monitored during the study is given below:

Preparation before Application

1) In order to discover students' critical thinking skills in daily life, fake news that they can easily encounter on social media have been selected. It has been deemed appropriate to receive fake news from Facebook, Instagram, and Twitter social media networks that students can access directly or indirectly.

2) While selecting fake news, the verification platform, **Teyit.org**, was used. The reason why **Teyit.org** is preferred is that it has joined the "International Integrity Check Network" and is a reliable source that makes objective evaluations (Erkan & Ayhan, 2018).

3) As a result of the research conducted on the Teyit.org website, seven fake news that are suitable for the level of primary school 4th-grade students and useful for the study to be conducted. Selected news are given below:

    a. **The news of a drug brought from Africa and sold in schools:** This fake news spread as a result of being shared on social media by writing an article that it is an African drug under an image. There is also a contradiction in the content of the news that the police are unaware of the subject and that if it is seen, the nearest police station should be visited. The alleged image in the fake news is the seed of the plant known as cannabis (Acanerler, 2019c).

    b. **The news that when water is added to a liquid, which is illegally brought from China, the water turns into milk.** This fake news is a video about a person changing color by adding water to boron oil. Based on the fact that its color resembles the color of the milk, this fake news has been shared on different social media accounts (Acanerler, 2019b).

    c. **The news that mince in the market contains food coloring:** In this fake news, it was shared on social media that the minced meat in the market gave the water a pinkish color and that it was food coloring. The truth of the fake news is that the myoglobin protein changes its color as a result of mixing with water (Acanerler, 2019a).

    d. **The news that 5-liter oil bottles were underfilled:** This fake news spread on social media after it was claimed that a 5-liter-oil-bottle in the market was weighed less than five kilograms and that the material was stolen. The error leading to fake news is the confusion of the concepts of liter and kilogram (Silsüpür, 2018).

    e. **News about the farmer admitting that he used to grow peppers using nitric acid:** In this fake news, a farmer claimed that he was growing his crops using harmful chemicals and posted it on social media in video form. It was stated by the filmmaker that the fake news was actually a reaction video shot for irony. In addition, it is impossible for plants to grow with the mentioned chemicals (nitric acid, mercury, etc.) (Çavuş, 2018).

    f. **Video news showing fake meat production in China:** Fake news spread on social media after the claim that individuals in a video were secretly recorded while making fake meat. The video that led to the fake news is actually due to the fact that the rubber dough looks like meat (Arabacı, 2019)

4) The original sharing style of the selected news was adhered to, but the names and pictures of private individuals were changed in order to avoid ethical problems (see Appendix 1).

5) Sample comments that students may encounter on social media platforms have been prepared. While preparing the comments, the fraudulent thinking methods stated by Paul and Elder (2013) in their book were used (see Appendix 1).

6) In order to determine the suitability of fake news and written comments to student level, three experts in the field of educational sciences were consulted and inappropriate expressions were removed.

Application

1. Since the aim of this study is to explore the critical thinking situations of primary school 4th-grade students, the Socratic inquiry method was used to reveal the current critical thinking skills. Socratic questioning is a discipline of inquiry that can be applied for many purposes and many directions. Among the purposes of this inquiry: exploring complex ideas, getting the truth of things, examining issues and problems, revealing assumptions, analyzing concepts, distinguishing what we know from what we do not know, and following the logical implications of our thinking. Socratic questioning differs from normal questioning in that it is systematic, disciplined, and profound. It also focuses on the foundation of problems, problems, theories, principles, or concepts (Paul & Elder, 2006; 2014).

2. In this study, for the practice schools, necessary permissions were obtained from the Ministry of National Education and approximately 40 minutes of individual interviews were conducted with 4th-grade students during school hours, without interrupting their lessons.

3. During the interviews, the fake news image or videos were first shown to the students, and then, various questions were asked to the student in order to reveal his/her thoughts about the news. Students' answers were recorded by the reporter. Sample questions are given below:

    - What do you think was the cause of this case?
    - Why did you say that?
    - Can you explain more?
    - Let's see if I understand you correctly; _____ is that what you mean?
    - I see your assumption is ___. Well, how would you defend yourself against someone with an opposite opinion for that?
    - What would someone say who disagreed with this situation?

    4. Upon the student's thought of the news as true or false, comments supporting his / her opinion were shown to the student. Sample questions used after reading the comments are given below:

    - What do you think about ___'s comment?
    - Can you summarize the comment posted by ___?
    - Could there be more logical implications for this situation?
    - Can we trust the accuracy of this information?

    5. After the student expressed his / her opinion on the comments that were close to his / her own, comments that did not support his / her thoughts were shown. Sample questions used after reading the comments are given below:

    - How would you respond to the objection made by ___?
    - How are the perspectives of ____ and perspectives of ___? What do they mean?
    - Why are you based on an idea ___and not an ___?
    - D. If this is true, how can we check?
    - e) How can you respond to the objection made by ____?
    - Why are there different opinions? What could be affecting them?

    6. After reading two different comments, the student was given time to review the comments once more if he wishes. Then, questions were asked to enable the student to state his conclusion. Sample questions used are given below:

- What conclusion did you come to about this case?
- Is this information enough to come to a conclusion? If not, what would you do?
- I see you approach the subject in terms of ___. Why did you approach it from such an angle when there was that angle?
- Could someone else come to a different conclusion about this situation?
- What if you would be convinced on the contrary? (Who would say?)

Analysis of Data

This study was developed and applied to Paul's (1993) critical thinking approach. Therefore, the six out of the eight thinking elements considered appropriate for the application to be made were used. These categories are; a) knowledge, data, and experience, b) concept, c) perspective d) assumption d) inference, e) implicit inferences and consequences (Paul & Elder, 2013). These categories formed the basis for the analysis of the study. Such as, in the sample comments presented to the students, in the questions directed during the interview, and in the analysis of the interviews. Information on what each category is, how it is processed and what is expected in this category is given below.

Knowledge, data, and experience: In order for individuals to reason, they should be based on knowledge, data, and experience. In order to complete the reasoning in a healthy way, individuals are expected to inspect regularly the source of this foundation. The foundation is expected to be strong, as in buildings. What is expected from students; First of all, they should question the source of the information given in the fake news or they shouldn't reach a decision without learning all the information about the subject. Subsequently, students should be able to distinguish between relevant and irrelevant information after reading the information given in the comments. When the student sees information that is contrary to his / her opinion regarding the accuracy of fake news, he/she should take it into consideration (Paul & Elder, 2014).

Concept: Individuals explain the issues they reason about through certain concepts. The place and meaning in which these concepts are used often directly influences reasoning. Under this category, the concepts used by the students in their comments on fake news were examined. Students are expected to realize the concepts they know when they are used outside of their scope, and to be able to explain the concepts they used or what meaning the used concepts have. (Paul & Elder, 2014).

Perspective: It is very important for critical thinking that individuals are open to thoughts other than their own. In this way, individuals can stop thinking self-centered and approach events from different angles. Under this category, students' reactions to different perspectives were analyzed. What is expected from students; It is the ability to evaluate objectively when he/she sees a point of view that is opposite to the point of view he/she originally put forward (Paul & Elder, 2014).

Assumptions: All inferences to be made in critical thinking are based on assumptions. Assumptions are ideas that we believe to be true and which are found to be right or wrong. What is expected from critical thinkers is to be aware of the assumptions that lead to inferences and to be able to evaluate them. Under this category, students are expected to make defensible and logical assumptions or be able to realize their assumptions that are illogical (Paul & Elder, 2014).

Inferences: Critical thinkers make inferences from assumptions to make sense of data. These inferences are built on the fact that something else is right and may end up as right or wrong, logical or illogical, right or wrong. Under this category, students are expected to express

their inferences clearly, able to make these inferences on evidence and reasons, make reasonable inferences and make consistent inferences (Paul & Elder, 2014).

Implications and consequences: Critical thinkers know that the inferences they make in a situation have consequences. Being aware of this and avoiding possible misunderstandings is an important issue for critical thinkers. In this category, students are expected to consider and be aware of the possible consequences of their inferences from fake news. For this reason, students were given different examples of results through comments on the fake news, and the question was asked how we can check the accuracy of the fake news and comments (Paul & Elder, 2014).

The data collected in the study were analyzed using content analysis. For the analysis of the case study, which is used as a method, it is necessary to fully understand the situation. Since many different aspects of the situation can be encountered in this process, the complexity of the structure requires content analysis (Merriam, 2013). In the content analysis, the hidden meanings in this complex structure are revealed. It is aimed to reveal students' critical thinking processes in a holistic structure.

The interviews were recorded by a reporter and then transferred to the computer environment. When each interview was to be recorded, codes such as T1, T2… were used for the students. As stated in Yıldırım and Şimşek (2006) in their book, data were analyzed in four stages while analyzing:

1. Coding of data: The data were coded by two researchers. During coding, possible differences of opinion were shown to the consultant and two more experts in the field. Re-coding was considered appropriate in line with the feedback given.

2. Creating themes: Themes have been reached according to the similarities and common aspects between the codes. While revealing the themes, attention has been paid to the fact that the codes under the theme are a meaningful whole and the created themes explain the obtained data.

3. Arranging and defining data according to codes and themes: The obtained codes and themes were transferred to the Excel environment by the researcher and classified in a clear and understandable manner.

4. Interpreting the findings and creating a report: The necessary comments were made according to the defined codes and themes, and then the results were reported.

In order to ensure internal validity (credibility) in the study, the researcher trilogy (Guion, Diehl & McDonald, 2011) was made and participant confirmation was used. For external validity (transferability), descriptions of participants are made and their direct statements are included. For internal reliability (consistency), each person in the data analysis was audited by the consultant and two experts in the field. This similarity, which is called internal consistency in Miles and Huberman model and conceptualized as a consensus between coders, was calculated using the formula: $\Delta = C \div (C + \partial) \times 100$. In the formula, Δ: Reliability coefficient, C: Number of subject/terms agreed upon, ∂: Number of subject/terms on which there is no consensus. According to the coding control, which gives the internal consistency, it is expected that the consensus between coders should be at least 80% (Miles & Huberman, 1994). In this study, internal consistency was calculated as 87.5% in total. Internal consistency in the sub-categories was calculated as 90%, perspective 81%, assumption 86%, inference, and interpretation 86%, and implicit inferences 88%. Later, the coders came together and reached a compromise for the expressions in disagreement. The consistency of the student in the expression was taken into account in resolving the disagreements. In order to ensure external reliability, rich and intense

descriptions were included. During the research, all data were systematically classified in the digital environment.

Results

Semi-structured interviews were conducted with the students in this study, which aims to discover to what extent fourth-grade students transfer and use the critical thinking skills provided by educational programs to daily life. The findings regarding the sub-problems investigated are presented below. In addition, students' critical thinking situations were discussed in six categories: (knowledge, concept, assumption, perspective, inference, implicit inference, and conclusions (Paul & Elder, 2013).

Sub problem 1: To what extent can fourth-grade students use their critical thinking skills?

In order to find an answer to the first sub-problem of the study and to determine to what extent fourth-grade students were able to use their critical thinking skills, the students were first shown a fake news image or video. Later, the student was asked various questions about the news. As a result, the critical thinking situations of the students according to the critical thinking approach of Paul (1993) are given in Figure 1.

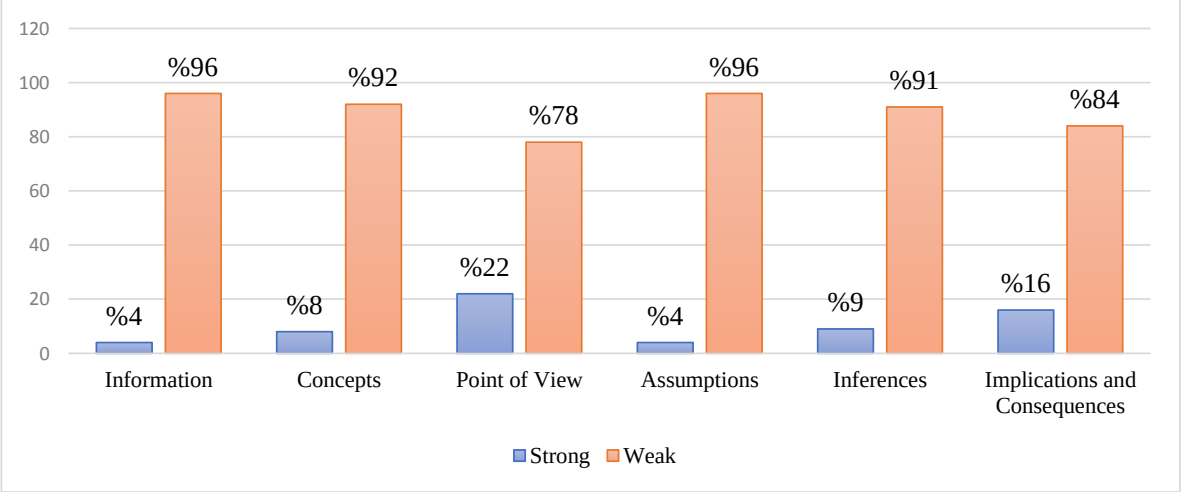

Figure 1. Critical thinking distributions of fourth-grade students according to Paul's (1993) critical thinking approach

When Figure 1 is examined, it is seen that students remain at a weak level in terms of critical thinking skills (CTS) in all six categories. Following statements were found to show weak CTS; 96% of 122 statements (117 weak CTS) in the information category; 92% of 40 statements in the concept category (37 weak CTS); 78% of 60 statements in the perspective category (47 weak CTS); in 96% of 235 statements in the assumption category (226 weak CTS); in 91% of 222 statements in the inference category (202 weak CTS); In the category of implicit inference and conclusions, 84% (37 weak CTS) of 44 statements were found to exhibit weak CTS. It is seen that students showed stronger CTS to the point of view category compared than other categories.

Sub problem 2: How do fourth-grade students use their critical thinking skills in the face of sample situations presented to them?

The findings obtained for the second sub-problem of the study were discussed under the sub-categories determined in the study. These sub-categories are based on Paul's (1993) critical thinking approach. Examples of weak CTS cases are presented below sub-categories due to the high quantity of statements with weak CTS (as seen in Figure 1) and in order to examine those problematic areas.

Knowledge: Students should be based on knowledge, data, and experience in order to reason. When the interviews with the students were examined, it was seen that there were 122 statements that could fall under this category. Looking at the findings, it was found that 96% of these 122 statements showed weak CTS and 4% strong CTS. Below are four examples of problems common in interviews with students that cause them to be shown weak CTS.

Example 1
[Researcher] - Do you think these are boron oil or milk?
[Student 4] - I think Chinese people drink boron oil.
[Researcher] - Then how do they drink it if it tastes bad? (the comment says it tastes bad)
[Student 4] - Everyone's taste is different. What is good for them is not good for us.
[Researcher] - Do you say: "boron oil is used for different purposes in different countries."
[Student 4] - Yes, the knickknackery can be used as something different here.

In Example 1, there is an interview with the student about the accuracy of fake milk news. The student encountered a comment claiming that the product referred to as fake milk is actually boron oil. When he learned that this boron oil was used in industry, he inferred that it was drunk as fake milk in China and supported his argument by stating that the goods had different purposes in different cultures.

Example 2
[Researcher] - Well, I'll ask you something. What do you think of this comment?
(Comment: "I don't believe China produces fake meat. If it were, America would have produced and sold it first.")
[Student 2] - It comes to America from China, and it is impossible for them to produce.
...
[Researcher] - How did you learn this information? How do you know these products came from China?
[Student 2] - Because it says China is behind everything.

Example 2 includes a conversation with the student in which one of the comments in the fake meat news is evaluated. The student claimed that China sending fake meat to America and America cannot make fake meat. The reason for this was that he supported his argument by claiming that all products are of Chinese origin.

Example 3
[Researcher] - Has China produced fake milk?
[Student 11] - I don't think so, but it's not impossible.
[Researcher] - Why don't you think?
[Student 11] - They make the cheap version of most things anyway; I don't think they can do that. They don't have such technology.

Example 3 includes the interview with the student about the accuracy of fake milk news. The student claimed that fake milk cannot be produced in China. He explained this claim by the fact that China produced cheap goods and they did not have such technology.

Example 4

[Researcher] - I got it. Can you read the comments on this side, let's talk later? What are they saying?

[Student 11] - Here, too, someone said, "Native to India… popularly known as cannabis in Turkey". I think of what they said the Indian in the previous milk topic (talking about the fake milk news). Our teacher was also telling us in the lesson that India was… the country where more crime happened than most countries. He said the same about Chinese people too, child abduction or something."

In Example 4, the student was asked to examine the comments written on the fake drug news. As seen in the example, the student evaluated a final comment. The student supported the comment in a negative sense, claiming that India has a higher crime rate compared to other countries.

One of the problems that can be categorized as a weak critical thinker is information that is not related to the subject, as can be seen in Example 1. In this example, the student first put forward the argument that there are different cultural tastes, and then put forward the knowledge of differences in cultural use of items unrelated to the subject. Similarly, When asked about the fake milk news to another student, ("Do you think we are drinking this?") student replied ("I don't know, but I think Atatürk Orman Çiftliği's daily milk is of good quality.") with unrelated experience or when asked fake news about drugs, ("Is it sold around schools?") and the student stating that was sold but he shared (".. For example, there was a cotton candy shop in my old school. He came and sold cotton candy at the exit of every school. ") unrelated experience with the subject. The most important source of this problem may be related to the students' desire to share information via association, regardless of whether it is related or unrelated. Another problem is incorrect information. Paul and Elder (2013) define this type of knowledge as active ignorance. In particular, misinformation including overgeneralization directly affects students' approach to events. As seen in Example 2, there is misinformation that has previously taken place in the student's mind ("Because China is written behind everything."). Naturally, his/her further inferences from this false information will also be wrong.

Similarly, stereotypical, erroneous generalization statements such as "they already do most things cheaply", "Chinese people often pollute the air like this" are encountered in other interviews. Another problem observed during interviews is that students tend to accept the information given to them without questioning the accuracy. It was observed that the students used this information to form their own arguments but did not know its meaning when asked what it meant. This situation is closely related to the next concept category.

Concept: In this category, students explain the topics they reason about through certain concepts. What is expected from students; to recognize the concepts they know when they are used outside their meaning, and to explain what the concepts they use or used mean. When the interviews with the students were examined, it was seen that there were 40 statements that could fall under this category. Looking at the findings, it was found that 92% of these 40 statements showed weak CTS and 8% strong CTS. In this study, as a result, it was determined that the fourth-grade students were at the weak critical thinker level under the concept category. Below are four examples of problems common in interviews with students that cause them to show weak CTS.

Example 1
[Student 8] - So how can I say? Because they say, it was a harmful thing to eat.
[Researcher] - Do you think what they eat is harmful?
[Student 8] - So, looking at the chemicals in it, it looks like harmful.
[Researcher] - Do you think we eat them in our homes?
[Student 8] - Yes
…
[Researcher] - I got it so how do we understand the difference between this and that. Can you think of a way to understand the difference?
[Student 8] - We have to check quickly before the marketer puts it in and ties the bag.
[Researcher] - How can we check it?
[Student 8] - So we should choose ourselves, we should not ask from the market.

In Example 1, there is an interview with the student about fake news of the plant with nitric acid. In this interview, the student uses the term "chemical" in various places. In the example, he claims that he can solve the problem by defining this concept as a concrete situation that can be noticed by the eye and using the method of "checking quickly". Before that, he claimed that chemical products were eaten at home.

Example 2
[Researcher] - What do you say about the comment at the end?
[Student 25] - I think it seemed like a seed, not a plant. If it was grass, I think it would look a little green.

In the interview in Example 2, the student was asked to evaluate the last comment on fake drug news. The student interpreted the expression "the product is a plant called castor oil plant" as the image cannot be a plant and claimed that it looks more like a seed. He also drew attention to the grass part in the comment of castor oil and added that the product must be green in order to be a weed.

Example 3
[Researcher] - One more thing? Can anyone say the opposite?
[Student 2] - It doesn't resemble meat anyway; it looks like pastrami.
[Researcher] - Could someone say the opposite?
[Student 2] - May be.
[Researcher] - What do you think the person who claims this can say?
[Student 2] – He / She says this is real meat.
[Researcher] - Well, can he/she prove that it's meat? Can he provide information to confirm?
[Student 2] - Yes, because the guy there is putting minced meat in it.

In the interview in Example 3, the student was asked to evaluate the people who could claim that the showed (fake) news was not true. The student first corrected the researcher by arguing that the product was like pastrami, not meat. Later he claimed that they could prove “this is the real (not fake) meat” and the proof could be found in the video (thrown ground meat into the machine).

Example 4
[Researcher] - I want you to read this comment, what does it say?
[Student 20] - She says that weighing with a scale is unreasonable. She says there is a simple solution to this.
[Researcher] - What kind of a simple solution?
[Student 20] - So it says you pour it into a liter container.
[Researcher] - Do you agree?

[Student 20] - I do not agree because weighing it with a scale makes more sense.
[Researcher] - Why is it more logical?
[Student 20] - Because the scales show it right in my opinion. The scales have no margin of error.

In Example 4, the comments on the missing sunflower oil fake news were evaluated during the interview with the student. One of these interpretations is that the correct method of measuring oil is with a volumetric container. The student, on the other hand, disagreed with this view and claimed that it would be more logical to measure the number of liters by putting five liters of sunflower oil, which is claimed to be lacking in volume, on the scale.

Different examples indicate the problems that students experience with concepts. Based on these examples and the available data set, students often do not realize the meaning of the concepts they use. Subsequently, they use these concepts within the same context in a way that may mean different things or conflict within themselves. In addition, although the use of concepts in the text given to students for interpretation is handled consistently, it was observed that students preferred to act independently from the texts.

Point of view: Under this category, students' reactions to different perspectives were examined. What is expected from students; it is the ability to evaluate objectively when he/she sees a perspective that is opposite to the point of view he/she originally put forward. When the interviews with the students were examined, it was seen that there were 60 statements that could fall under this category. Looking at the findings, it was found that 78% of these 60 statements showed weak CTS, and 22% of them showed strong CTS. It has been observed that students performed better in this category than other categories. However, the problems experienced in point of views (such as prejudice, narrowness, indifference to the subject) constitute the majority. Below are four examples of problems common in interviews with students that cause them to be shown weak CTS.

Example 1
[Researcher] - I get it; similarly, can you read these comments again?
[Student 3] - This person said, "I could not understand that it was a drug from here, how could you get it out of it, but the person knows that he probably talks, he uses Facebook (student mentioned about who posted this news) I guess there are many Facebook users in here. If anyone knew that, (he meant people on Facebook) they could react in an angry way. Cops, narcotic police, or something, can see your Facebook (post). Everyone in here (on Facebook), I think there are several million people in Turkey. Everyone uses it.

In Example 1, the student evaluates the comment of a person who does not support his/her opinion. He tried to prove that the comment was not correct. He also tried to prove that the person who shared it was aware of the incident and that there was no reaction from social media.

Example 2
[Researcher] - Let's read these comments and talk afterward. What are they saying?
[Student 18] - Here Kader (commentator) ... holding ... says that we should not decide without evidence...
[Researcher] - So what do you think?
[Student 18] - I think everyone can be right in their own way or everyone may think differently because we do not know exactly. So, I think all of them may be true.

In this example, the student evaluates the comment on the fake news that food coloring was added to minced meat. The student confirmed that comment about there was not enough evidence (for proving) and claiming that all comments might be justified in some way.

Example 3

[Researcher] - I understand that there were other comments after these comments. I want you to read them. Can you read that part? What are they saying?
[Student 10] - Someone here says, "Don't believe everything that is said. If you look carefully, you'll realize that it's not about meat." I think it has to do with meat, it looks like meat. And here said, "don't come to a conclusion immediately. Wouldn't it be alarmed to other countries if something like this happens?". I think if he was doing it secretly, they might not have taken action. If it is something like why only we hear it, it may be that a (only) citizen of the Turks has attracted and threw it here. For this reason, we may only be hearing. Somebody here said, "As someone who lives in China, I can easily say. This video is not correct". I think it's true. "Just like in our country, controlling product is very strict in here," he says. Maybe they have a deal with the president. Maybe this is the reason why they don't be controlling them from it. Someone said, "If there was such a thing, America would hear and do it first." I think they could do that in other countries too.

In example 3, the student evaluates the comments against her own opinion in fake meat news. She puts forward her own rebuttal argument for each opposing comments.

Example 4

[Researcher] - I'll also have you read the following. What do you think?
[Student 5] - There are a lot of people here who say this is incorrect, but there are also a few who say that this is true. I think those who think like I said are thinking right.

In example 4, the student was asked to read and evaluate the comments against his own opinion on the fake meat news. The student claimed that only the comments supporting him were correct.

When the problems in the point of view category were examined, it was seen that students did not give credit to opposing views. This situation restricts students from finding possible correct answers (in this case, one answer). Answers such as "those who think like me are right" or "everyone is right" is another problem that students experience in evaluating their perspectives. The students who thought that only their views were right, they tried to rebut the correct comments by making unreasonable explanations (example 3). Another issue, "the views that everyone is right" may be related to the concept of post-truth. Not choosing rational and reasonable answers or not giving any credit to other point of views can be associated with these situations.

Assumption: Under this category, students are expected to make arguable and logical assumptions or become aware of their assumptions that are illogical. When the interviews with the students were examined, it was seen that there were 235 expressions that could fall under this category. Looking at the findings, it was found that 96% of these 235 statements showed weak CTS and 4% strong CTS. When the interviews with the students were examined, it was determined that they displayed weak CTS in the majority of the answers. Below are four examples of problems common in interviews with students that cause them to exhibit weak CTS.

Example 1

[Researcher] - Can you read these comments too?
[Student 4] - The last comment sounded a bit correct.
[Researcher] - Why?
[Student 4] - They don't sell it to other countries, they drink it themselves. Because Chinese people and our bodies are separate, their bodies functions differently than that of our bodies. So, they may add additives to make their body more resistant.

In Example 1, the student proceeds by accepting one of the sample comments as correct. The correct interpretation can be summarized as China produces fake milk for its own citizens. The student added his own assumption on this comment and assumed that our body and the body of people living in China functions separately.

Example 2

[Researcher] - I want you to imagine this scenario, you entered the class one day and the teacher showed you this and said that 5 liters should be 4,675 grams. Would you believe your teacher?
[Student 14] - Yes, I would.
[Researcher] - Well, on the contrary, imagine he said, "5 liters should be 5 kilos". Would you believe it again?
[Student 14] - Yes, because I thought our teacher knows everything.
[Researcher] - Well, can the teacher know wrong?
[Student 14] - Every person could be wrong, but I would still believe him because he teaches us.

In example 2, the student expresses the assumption that the teacher knows everything. However, just after the question of the possibility of the fact that the teacher also knows wrong, he/she continued the dialogue by changing her assumption. Now he/she has created the new assumption that the teacher should be trusted, even if he/she knows it wrong.

Example 3

[Student 7] - It's about milk. One chemical substance tasted milk. He also says be careful.
[Researcher] - I want you to watch the video shared about this now. What do you think about it?
[Student 7] - I think they deceived a lot.
[Researcher] - Like how?
[Student 7] - So they are deceiving in everything. They also started to deceive in milk.
[Researcher] - For example, where are they deceiving?
[Student 7] - For example, chocolates are not real chocolates.
[Researcher] - Which chocolates do you think are not real chocolates?
[Student 7] - Poor quality brands.
[Researcher] - Did you hear that somewhere?
[Student 7] - No, it is my opinion.

In Example 3, the student read the headline of the fake milk news and watched the video. Later, she assumed that they were deceiving people and continued by adding the assumption that they were deceiving people in other products too.

Example 4

[Researcher] - Read the other comments as well, then let's talk about it. What are they saying?
[Student 11] - "I will buy milk from people I trust," he says. Someone says after that, "We can't trust anyone." Someone says, "nobody wants to live in the village and does not want to have cows." After that, a chemist says something, confirms it, he says I'm a chemist ... "China got it done because it has a lot of workers".
[Researcher] - What do you think of what you read?
[Student 11] - What the chemist said may be true, so it is probably true.

In Example 4, the student states his/her opinion on fake milk news. After that, while considering the comments one by one, the student claimed that the comment stating that he was a chemist was acceptable. This is based on the assumption that the person's nickname is a chemist.

During the interviews, it was observed that the students started by accepting some subjects as they were. The first is the assumption that fake news is true. Instead of questioning the accuracy of the news, the students questioned the ethical values of the practice (such as fake

milk is harmful). The second is the assumption that people who comment on fake news are reliable sources. However, in order to enable students to comment on it, fake nicknames are also attached next to the fictitious names (Taxi Driver, Kader, Laleli, Butcher, etc.). It has also been observed that they put forward and talked about untenable assumptions. Another problem is that students often change their assumptions and are unaware of this.

Inference and Interpretation: Under this category, the student is expected to express his inferences clearly, base these inferences on evidence and reasons, make reasonable inferences and make consistent inferences with each other. When the interviews with the students were examined, it was seen that there were 222 statements that could fall under this category. Looking at the findings, it was found that 91% of these 222 statements showed weak CTS and 9% strong CTS. When the statements of the students were examined, it was seen that they were mostly in the position of weak critical thinkers in inference. Below are four examples of problems that are common in interviews with students and cause them to exhibit poor CTS.

Example 1
[Researcher] - Finally, which of these comments came to you most reliable?
[Student 15] - The most reliable is the boron oil comment.
[Researcher] - Why?
[Student 15] - Because the majority said boron oil.

When Example 1 was examined, it was seen that the most reliable answer to the student was boron oil and the reason for this was that many people said boron oil.

Example 2
(Continues to talk about comments)
[Student 21] - "Like the boron oil we use in industry, this happens when you mix water with it. If you want, I can show it. "Now they didn't believe it very much; because one person liked it and so I didn't believe it, how can I say it. Because everybody writes the same thing, I wanted to write similar."

In Example 2, the student examined the comment on boron oil and commented that the person was not believable based on the number of likes.

Example 3
[Researcher] - I'm going to ask one more thing, do you think they produced fake milk?
[Student 7] - It happened because countries started to develop quite a lot.
[Researcher] - Which countries do you think developed?
[Student 7] - Japan.
[Researcher] - Did Japanese people do this?
[Student 7] - Japanese people did it.
[Researcher] -But here he says that the Chinese people did it. Do you think China has developed too?
[Student 7] - Chinese people always do such bad things. The toys made by Chinese people on the news or something are bad.

In example 3, the student initially associated fake milk production with the development of the countries. Later, when he learned that it happened in China, he changed his approach and reconciled evil with fake milk.

Example 4

[Researcher] - Does anyone believe this is not fake milk? or does anyone can say "this is not fake milk"?
[Student 15] - There is, I mean, just like the people of India still believe that the world is in the horn of a cow, people can believe it ...

In Example 4, when the student was asked about the possibility of people who do not believe in the news of fake milk, he inferred that it would exist by supporting it with another example.

When the data obtained from the interviews were examined, it was seen that the students made superficial and illogical inferences by advancing their arguments over weak evidence. In Example 1, other logical explanations were ignored, and the idea was carried out only on the number of respondents. In addition, it was realized that he ignored the majority of the comments stating that fake milk was actually produced. In Example 2, it implies that the number of students likes is an important factor in checking the accuracy of the comment. On the other hand, it has been observed that he only uses the number of likes in the accuracy of this comment. When Example 3 is examined, he did not continue his inference when it came to China and started to make inferences from scratch with an erroneous generalization. Finally, Example 4 made inferences supporting his view with an erroneous generalization that is not relevant to the subject.

Implications and consequences: Students are expected to consider and be aware of the possible consequences of their inferences on fake news in this category. When the interviews with the students were examined, it was seen that there were 44 statements that could fall under this category. Looking at the findings, it was found that 84% of these 44 statements exhibited weak CTS and 16% strong CTS. When the answers from the students were examined, it was seen that there was less data than other categories in terms of quantity. Apart from this, it has been determined that the majority of the responses are comments that fall into the category of weak critical thinkers. Examples of general problems on this subject are given below.

Example 1

[Researcher] - If what happened, you would be convinced that it was or was not?
[Student 5] - If there was evidence.
[Researcher] - What kind of evidence, for example? ...
[Student 5] - Is it about meat?
[Researcher] - Yes, proof that will convince you for sure.
[Student 5] -... examination with a microscope. See if it's real meat with my eyes. If there is a volunteer for him, feed him and supervise him. Does it hurt, poison, nausea? "

In Example 1, the student was given a (fake) news called fake meat and he was unsure about the accuracy of the news. At the end of the interview, the researcher asked what was required to make a final decision. The student came with a microscope proposal. In addition, the student stated that it should be tried on a volunteer too.

Example 2

[Researcher] - So what do we do if there are marketers we do not know when we enter the market?
[Student 6] -... we have to be very careful there too, but ... my opinion is, one can be taken and tried. You know, when an experiment is done on animals or objects, not on humans, they come to a conclusion, or we can try it once on ourselves. We can come to the conclusion and not take it from there again.
[Researcher] - What do you think will come out when we try it on us?
[Student 6] - What if it's toxic, for example, something that could harm us, then it can poison us.

In Example 2, the student was shown fake news about the plant with nitric acid and in the following interview; the researcher asked to the student what measures could be taken for this. The student claimed that the results should be seen by trial and error method in order to be protected from the plant with nitric acid.

Example 3

[Researcher] - Are the ideas here enough to make a final decision about what it is?
[Student 9] - I do not think the information here is sufficient. We cannot consider this to be a seed or a drug without a fully adequate analysis.
[Researcher] - What kind of analysis are you talking about?
[Student 9] - ... First, it must be proven whether it is real ... it must be found where it is sold. Whether this is a drug or not can be understood by testing what it is.
[Researcher] - What kind of testing are you talking about?
[Student 9] - I couldn't tell exactly what it was by touching and tasting it. I wouldn't touch it anyway; I'd think it was something harmful. If I looked at it right in front of me, like this one, I could make a conclusion from the look. Maybe, I am not saying that this is a seed or insect for sure.

In Example 3, the student was given fake drug news and their opinions were taken on it. Towards the end of the interview, the student was asked to make a final decision. The student claimed that "experiments" should be done on the object in order to eliminate the contrast in the interpretations.

Example 4

[Researcher] - So are this video and these comments enough to say that this is fake meat?
[Student 30] - It is not.
[Researcher] - What do you need?
[Student 30] - Of course you need the meat itself.
[Researcher] - Can we understand if they bring the meat here?
[Student 30] - I can understand.
[Researcher] - How can you tell?
[Student 30] - Because I like meat so much, I think I can understand.
[Researcher] - Can you explain in more detail?
[Student 30] - Of the taste.
[Researcher] - So do you think it is harmful?
[Student 30] - It is harmful.
[Researcher] - Then if you taste it, wouldn't it be harmful?
[Student 30] - Yes, but if it is real to distinguish between real or fake, if it is real then nothing will happen, otherwise it will be harmful.

In Example 4, the student was shown fake news about fake meat and at the end of the interview, he was asked whether the available data was sufficient to decide its accuracy. The student claimed that in order to be sufficient, he had to eat a piece of the alleged fake meat product. In this way, he states that he can understand whether the product will be fake.

The students were asked if they needed anything else before making a judgment about the accuracy of fake news. In general, the answers to this part fall under the category of implication and consequences. It was observed that most of the answers to the questions asked were in the category of weak critical thinker. Especially for students, the first solution that comes to mind for unknown situations is to try. When asked what further consequences could be related to the situation, the students talked about intoxications easily and as a natural condition. This may be due to the fact that the concept of intoxication remains abstract for fourth-grade students. However, students are expected to have learned this concept in the third grade within the scope

of the science course. In addition, it is understood that terms such as experiment, laboratory, and microscope that can be examined under the concept category do not have the exact equivalent. Because when the students are asked to what they mean with the “look through a microscope" or "let's experiment or send it to the laboratory” and students general elaboration focused on testing with five senses (I will observe, will be using my hands, my taste, my smell, etc.). It is seen that another problem with doing research. Students prefer searching through search engines on the internet rather than searching which institutions and individuals are knowledgeable on such a subject.

Sub problem 3: How do fourth-grade students transfer their critical thinking skills to daily life situations?

Within the framework of this sub-problem, firstly, the category of knowledge was discussed. It has been observed that there is more than one problem under this category. First of all, after examining the video or image about fake news, students put forward their arguments about fake news without needing any other information. Except for two students, all students believed that the fake news was real and tried to eliminate opposing comments. Students often questioned the accuracy of comments containing accurate information on the topic (as if he was lying or she is her friend, so she wrote that). They also often used irrelevant information as supporting arguments to justify their point of view (like my brother goes to middle school or chocolate is harmful). All these imply that students show poor critical thinker performance in the category of knowledge.

Similarly, it was found that students had problems in the second category, "the concept category". While choosing the news and preparing the comments, attention was paid to the students' level. But in the meantime, concepts that students could not know were also excluded. None of the students interviewed asked the researcher the meaning of a concept he/she did not know.

On the other hand, it was noticed that there were misconceptions in the sentences they made, and it was observed that they had difficulty expressing themselves when asked about them. For example, "when asked what fake-meat meaning might be" to a student who frequently uses the term "fake meat", the student defined it as "killed human meat". In addition, when the students were asked to evaluate the comments, it was noticed that they proceeded by ignoring the different concepts in the comments. This has led to the ignoring of comments that are especially true, and the inability of students to evaluate the data obtained from comments in a healthy way.

"Point of view" took place in the third category. Point of view is the area in which students are more successful than other categories. In particular, some students noticed the overgeneralization fallacies in the comments and expressed their arguments against it, and they preferred to remain neutral by stating that some students could not comment because they did not know such generalizations. This shows that students are sensitive to frequently used fallacies. Although they stand against the fallacies in the counter-arguments, it has been observed that they are unaware of their own prejudices. Students' critical handling of these prejudices is much higher than other categories. It was experienced during the interview moments that Socratic questioning was particularly effective on some students.

As the fourth category, assumptions are considered. Assumptions are often used inadvertently. But inferences gain meaning according to the assumptions they are based on. It was observed that most of the students had difficulty in this area, both in recognizing the erroneous assumptions in the interpretations and in paying attention to the contradictions in their assumptions. In particular, it was observed that they could not make a clear and unambiguous assumption, and this directly affected their conclusions. For example, the assumptions that the students put together by gathering the data on fake news are illogical and unrelated.

Inference and interpretation were discussed as the fifth category. This category is directly related to the previous category. As a result of this, untenable and illogical assumptions lead to erroneous inferences. This was the main reason why the students' inferences in this category were incorrect. Apart from this, it has been observed that they have difficulty in detecting the erroneous or superficial inferences in the comments.

As the sixth category, implications and consequences are evaluated. It was found that when students implied an action about learning the truth or falsehood of fake news, they did not think about the consequences. In these cases, it was observed that some students did not change their opinions even when the researcher asked questions about possible results. One reason for this is that students attribute different meanings to concepts. For example, students often use the terms "chemical", "harmful" and "poisonous", "toxic" together, but they think that they will only experience stomach pain or not have a negative result when they eat a poisonous product. On the other hand, it was determined that the students preferred the sensible implications in the comments and repeated that such behavior would be more correct.

Discussion, Conclusion, and Suggestion

In this study, it was tried to determine to what extent and how 4th-grade students use their critical thinking skills in real-life situations. The data in the study were obtained through interviews conducted with 30 students. As a result of the study, it was observed that the students displayed the weak critical thinker skills stated in the book of Paul and Elder (2014) in their daily life problems.

When the literature is examined, it is stated that the critical thinking levels of the students are high (Demir, 2006; Ulaş, Koçak, & Karabacak, 2012) and medium level (Akar & Kara, 2016; Korkmaz & Yeşil, 2009) in Turkey. These results are in contradiction with the research findings. The reason for this may be that the multiple-choice measurement tools stated by Norris and Ennis (1989) have limited information access to measuring critical thinking (e.g., the reasoning process of the student while choosing the answer is not known) and likert-type measurement tools are inadequate in practice. On the other hand, there are studies supporting the results of the research in the literature (Demir & Aybek, 2014). In addition, in this study, it was observed that all students exhibited strong critical thinking skills throughout the interview, but they could not continue this as the interview progressed.

In another study, Gelerstein et al. (2016) stated that critical thinking skills differ significantly according to socio-economic levels. Since the aim of the study was to reveal the critical thinking situation of the students, a homogeneous purposeful sampling was used. No difference was observed between individuals with different socio-economic levels in different regions within this sample. However, since it is outside the purpose of the research, a definite comment cannot be made on this subject.

As a result of this research, it can be said that fourth-grade students generally show weak critical thinker skills in their daily life problems, and they are at the non-reflective thinker level in the classification system made by Paul and Elder (2013). Individuals at this level are unaware of the correct or erroneous reasoning they use in the face of events. However, in the MoNE (2018) curriculum, the students who will graduate from the fourth grade are aimed to be active critical thinkers.

Considering that more students are surfing on the internet with the increase of distance education in recent years, the importance given to critical thinking education should be increased.

Students will not be vulnerable to potential dangers, especially thanks to critical thinking, which can be considered as a self-defense mechanism. In order to do this, it is thought that the current primary school education program is insufficient. Especially since MoNE does not give any instructions about teaching critical thinking skills in fourth-grade social studies course, it is thought that the indirect teaching method is preferred. Abrami et al. (2008) stated in their meta-analysis study that the critical thinking teaching method given indirectly had the least effect. Similarly, Paul and Elder (2013) state that the more an individual exercises the critical thinking skill, the more efficiency will be gained.

In this study, the critical thinking situations of the students in the face of an event were examined in depth. Based on this study, it can be said that students have problems; in questioning the accuracy of the formal and informal information around the students; perceiving and using concepts; in evaluating individuals with different views; in recognizing explicit or implicit assumptions individuals use; in making inferences using the available data; in considering the consequences that follow the actions. In addition, students exhibiting non-reflective CTS makes it difficult to explore areas where they have problems. As a result of this study, it is thought that critical thinking situations of students can be discovered more easily in the face of case studies.

This study is limited to general critical thinking skills, and it may be suggested to be compared by looking at the situations in other disciplines in future studies. With the study, it was determined that primary school fourth-grade students' critical thinking levels were at a weak level. Considering that critical thinking can be developed with education, it is possible to overcome the problems experienced in real-life situations by using different methods. However, more in-depth studies are needed for the source of this problem. In future studies, the determination of this source and possible solutions can be investigated. Considering that the last study only deals with students, it can be expanded to work with participants such as teachers and families in future studies.

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Research Article
Received: 06.04.2021
Accepted: 19.05.2021
First Online: 26.05.2021
Published: 30.06.2021

Citation: İncikabı, S. & Biber, A. (2021). Process of designing model eliciting activities in mathematics teaching. *International Journal of Scholars in Education, 4*(1), 97-118. doi:10.52134/ueader.910493

Process of Designing Model Eliciting Activities in Mathematics Teaching

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***Abstract*:** The aim of this study is to analyze prospective mathematics teachers' (PMT) process of designing model eliciting activities. Case study was preferred in this study. The study group of this research consists of 15 mathematics prospective mathematics teachers studying at Kastamonu University Faculty of Education Primary Mathematics Teaching Undergraduate Program during the academic year of 2019-2020. In this research, learning environments designed based on a holistic approach and based on "theoretical knowledge" were created. The research process took 10 weeks which are planned as mathematical modeling training process and model eliciting activity (MEA) design process. Data of the study were collected through MEA design process worksheets. The data obtained from the data collection tool were subjected to content analysis. As a result of the research, it was determined that PMT groups included similar processes although there were some differences in the MEA design stages. The writing stages proceeded as determining the context of the MEA, deciding on variables and assumptions, writing the scenario and adding visual elements. In the control phase, the elements that the groups pay attention to include compliance with MEA principles, text control, visual editing, performing solution steps (model and data compatibility).
Keywords: Model eliciting activities, Mathematical modelling, Prospective mathematics teacher education.

Matematik Öğretiminde Model Oluşturma Etkinlikleri Tasarım Sürecinin İncelenmesi

***Öz*:** Bu çalışmanın amacı, matematik öğretmen adaylarının model oluşturma etkinlikleri tasarlama sürecini incelemektir. Bu çalışmada örnek olay incelemesi tercih edilmiştir. Bu araştırmanın çalışma grubunu Kastamonu Üniversitesi Eğitim Fakültesi İlköğretim Matematik Öğretmenliği Lisans Programında 2019-2020 eğitim öğretim yılında öğrenim gören 15 matematik öğretmeni adayı oluşturmaktadır. Bu araştırmada, bütüncül bir yaklaşımla tasarlanan ve "teorik bilgi" esas alınarak tasarlanan öğrenme ortamları oluşturulmuştur. Matematiksel modelleme eğitim süreci ve model oluşturma etkinlikleri tasarım süreci olarak planlanan araştırma süreci 10 hafta sürmüştür. Araştırmanın verileri model oluşturma etkinlikleri tasarım süreci çalışma yaprakları aracılığıyla toplanmıştır. Veri toplama aracından elde edilen veriler içerik analizine tabi tutulmuştur. Araştırma sonucunda, model oluşturma etkinlikleri tasarım aşamalarında bazı farklılıklar olsa da, grupların benzer süreçleri içerdiği tespit edilmiştir. Yazma aşamaları gene olarak model oluşturma etkinliklerinin bağlamının belirlenmesi, değişkenlere ve varsayımlara karar verilmesi, senaryo yazılması ve görsel unsurların eklenmesi şeklinde ilerlemiştir. Kontrol aşamasında grupların dikkat ettiği unsurlar arasında model oluşturma etkinlikleri tasarım ilkelerine uyum, metin kontrolü, görsel düzenleme, çözüm adımlarının gerçekleştirilmesi (model ve veri uyumluluğu) yer almıştır.
Anahtar Kelimeler: Model oluşturma etkinlikleri, Matematiksel modelleme, Matematik öğretmen adayı eğitimi.

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Introduction

The concept of mathematical modeling and related skills have been found important from the past to the present, and teaching programs have been included in their general goals (Blomhoj & Kjeldsen, 2006; NCTM, 1989, 2000; Niss, Blum, & Galbraith., 2007). National Council of Teachers of Mathematics (NCTM) emphasized the importance of using mathematical modeling in problem solving and stated that mathematical modelling contributes on making sense of the relationships between the concepts (NCTM, 2000). The concept of modeling entered the general objectives of mathematics education in 2005 for the first time in the mathematics curriculum in Turkey, and it was aimed to equip students in a way to "establish models and associate models with verbal and mathematical expressions" (Ministry of National Education-MoNE, 2005). Moreover, the importance of starting the teaching process of learning mathematics with concrete experiences and using mathematical models in this process was pointed out. Mathematical modeling was considered as a basic mathematical skill in the Turkish mathematics curriculum of 2017. The current mathematics teaching program in Turkey also emphasizes the ability of students to make mathematical modeling through the implementation of activities that improve the mathematical modeling competencies of teachers in the mathematics teaching process (MoNE, 2017). The development of mathematical modeling skills of students, which is emphasized in national and international programs, is only possible if teachers have modeling competencies. In this direction, it is important to carry out modeling competence practices in faculties that train teachers and to plan undergraduate / graduate level courses. In addition, it is important to check the prospective teachers' ability to develop their modeling competence in the planned practices and to examine the potential of pre-service teachers to use these competencies in classrooms.

Despite the emphasis on the importance of mathematical modeling in curricula, both national and international studies show that students cannot use their mathematical knowledge at the desired level in real life contexts (Arcavi, 2002; Baki & Aydın-Güç, 2014a, Busse, 2005; Umay, 2003; Vinner, 2007). Mathematical modeling competencies should be developed in order for students to produce solutions to real life problems they encounter with their mathematical knowledge (Baki & Aydın-Güç, 2014b; Busse, 2011; Maaß, 2006). Studies show that mathematical modeling can be taught and learned, and individuals who receive training for mathematical modeling are more successful in mathematical modeling (Ferri & Blum, 2013; Özer Keskin, 2008). In this context, in order to improve students' mathematical modeling skills, the teaching in teacher education should be designed to develop these skills, and activities should be prepared accordingly (Vorhölter, Kaiser, & Ferri, 2014). Therefore, learning environments should be designed in in-service and pre-service programs to improve the mathematical modeling competencies of teachers and pre-service teachers (Aydın Güç, 2015). When the literature is examined, although there are many articles and theses on teacher education in studies on mathematical modeling, there are a limited number of studies examining the design processes in which these skills turn into practice with the education given to prospective mathematics teachers. In these studies, instead of examining the MEA processes, the conformity of the MEAs prepared with the basic principles of MEA was evaluated (e.g., Tekin Dede & Bukova Güzel, 2013a, 2013b).

In line with the above explanations, the aim of this study is to examine the model eliciting activity (MEA) design processes of elementary mathematics prospective mathematics teachers upon enrolling in the mathematical modeling training. For this purpose, the research problem was "Which stages did the prospective mathematics teachers follow in the process of designing MEA?" determined as.

Model Eliciting Activities in Mathematics

The definition of model eliciting activities is influenced by the perspectives on the intended use. For this, first of all, it is necessary to discuss the difference between practice and mathematical modeling activities. The so-called practice activities are focused on the transition from mathematics to the real world. The model has already been learned and built. In such activities, the answer to the question "Where can I use this part of mathematical knowledge?" is sought (Stillman, 2012). In mathematical modeling, the focus is on mathematics from the real world. The mathematical model is built through the mathematization and specification and idealization of the real life situation. In such activities, the answer to the question "Where can I find the math that can help me solve this problem?" is sought (Stillman, 2012). Both types of activities find their way into the classroom. Since the aim of this study is to provide students with the competencies that can solve the problems they will encounter in real life, the current study discusses the mathematical modeling activities to find an answer to the question "Where can I find the math that will help me?" to seek for a solution of problems encountered in real life.

Although the definitions of mathematical modeling made by different researchers are handled within the same framework, mathematical modeling has different interpretations when used in curriculum discussions and applications (Stillman, 2012). Therefore, mathematical modeling activities are also affected by different perspectives. While one perspective considers mathematical modeling as a tool that shows the relationship of certain mathematical content, develops it and provides motivation (Chinnappan, 2010), another perspective considers mathematical modeling as a goal rather than a tool for the realization of mathematical learning (Blomhoj & Jensen, 2007). While the model and modeling approach defined by Lesh and Doerr (2003) is directly related to the first point of view, it provides a wider perspective to mathematical modeling by including the elements of the second perspective in the content. In other words, while mathematical modeling is a tool for teaching mathematical concepts, there are some mathematical modeling competencies that need to be acquired. Lesh and Doerr (2003) call such activities "model eliciting activities (MEA)" that include both process and model. Stillman (2012), on the other hand, takes his own point of view as the second perspective that includes the first point of view. That is, mathematical modeling is a goal, but while achieving this goal, some mathematical concepts can be taught. In this study, the perspective defined by Stillman (2012) was adopted. In this context, in this study, mathematical modeling was considered as the purpose of mathematics education and opportunities were provided for the learning or expansion of some mathematical concepts without moving away from the concepts to be learned in mathematics education. These types of activities can be called MEA because they are both process and model oriented.

For the first time, Lesh, Hoover, Hole, Kelly and Post (2000), instead of being an activity in which real-world problem scenarios are presented and students need to create a model that solves the problem situation, they are also defined as math-based activities that require them to develop a model that can be generalized to other contexts (Lesh & Harel, 2003). Similarly, modeling activities are defined as problem-solving activities created by using certain principles of instructional design in which students make logical inferences, invent, expand and develop their own mathematical structures (Kaiser & Sriraman, 2006). MEAs provide two different opportunities for students. The first is to apply the information they have already learned, and the second is to enable them to understand mathematical subjects more deeply by mathematizing real-life situations (Yoon, Dreyfus, & Thomes, 2010). In this study, mathematical modeling activities were accepted as activities that allow students to go through the whole process of mathematical modeling by using the knowledge they have already learned, and to expand or make sense of their past learning by mathematizing the real life problem.

MEAs are defined as math-based activities that require students to develop a model that can be generalized to other contexts, rather than being an activity in which real-world problem scenarios are presented and students need to create a model that only serves to solve the problem situation (Lesh & Harel, 2003). Similarly, modeling activities are defined as problem-solving activities created by using certain principles of instructional design in which students make logical inferences, invent, expand and develop their own mathematical structures (Kaiser & Sriraman, 2006). MEAs provide two different opportunities for students. The first is to apply the information they have already learned, and the second is to enable them to understand mathematical subjects more deeply by mathematizing real-life situations (Yoon et al., 2010). In this study, MEAs were accepted as activities that allow students to go through the whole process of mathematical modeling by using the knowledge they have already learned, and to expand or make sense of their past learning by mathematizing the real life problem.

Methodology

The case study approach, one of the qualitative research methods, was used in this study. According to McMillan (1996), this type of research is a method used to examine in depth the ties between one or more events, settings, programs, social groups or other interconnected systems.

Participants

The working group of this research consists of 15 mathematics prospective mathematics teachers studying in the fourth grade of the Kastamonu University Faculty of Education Elementary Mathematics Education Undergraduate Program in the fall and spring terms of the 2019-2020 academic year. The study was conducted within the scope of Elective II and Teaching Practice courses. The reason for choosing senior prospective mathematics teachers who are studying in the Primary Mathematics Education Undergraduate Program is that the students have completed the courses on the mathematical concepts and pedagogical processes required to complete the MEAs discussed in this study. Mathematical modeling training process included working in groups. It was stated to the groups that it was important for the research to attend the courses, and that their group work during the lesson would be evaluated within the scope of the research.

Procedures of the Study

The training process took 10 weeks. This process was planned as mathematical modeling education and MEA design process. This process was carried out in the fourth grade Elective II (3 lessons per week and 45 minutes per lesson) in the fall semester of the primary school mathematics teaching program. The activities in the designed learning environment are presented within the guidelines in the process of providing theoretical information. The guidelines are designed to give students experience of modeling competencies and organize their work. After the completion of the theoretical knowledge courses, students have been started to work with free MEAs that do not contain any instructions for the mathematical modeling process. In the designed learning environment, prospective mathematics teachers worked on MEAs in groups. Afterwards, each group was asked to enter the MEA design process. There were no restrictions regarding the content of the said MEA, only they were asked to pay attention to the MEA to be suitable for a selected grade level in secondary education and to be directed to the subject / subjects they chose from this grade level.

At the end of the group work, each group presented the MEA design they formed, class discussions were held and their designs were edited when deemed necessary by the groups. In

the learning environment, students are provided with the opportunity to go out of the classroom to do research whenever they want, to do the research they want using a computer in the classroom, and to consult an expert. In this research, the learning environment designed with a holistic approach is aimed at improving mathematical modeling competencies. In this learning environment, in order to guide the participant's process of developing mathematical modeling competencies, MEAs, which are embedded in the instructions of mathematical modeling competencies that are expected to occur and direct the actions that require competencies, were used. MEAs that do not contain these instructions in their design have also been re-designed. In the selection of MEAs, attention has been paid to the fact that prospective mathematics teachers include contexts that they are familiar with but are not very involved in.

Table 1
Application Processes of the Study

Week	Objective
Week 1	Getting acquainted and explaining the process
Week 2 & 3	Theoretical knowledge process
Week 4 & 5	Solution of modeling problems under Borromeo Ferri cognitive perspectives according to modeling competencies o Bed problem (Borromeo-Ferri, 2014) o Adenuar problem (Herget, Jahnke, & Kroll, 2001) o Population forecast (Ural, 2014) o Giant's boat (Ural, 2018 o Big foot problem (Tekin Dede & Bukova Güzel (2011), adapted from Lesh and Doerr (2003)) o Height-foot length problem (Hıdıroğlu & Bukova Güzel, 2014) o Pisa tower problem (Bukova Güzel, Tekin Dede, Hıdıroğlu, Kula Ünver, & Özaltun Çelik (2016), adapted from Dede, Hıdıroglu & Güzel (2017)). o Fuel problem (Bukova Güzel et al. (2016), designed from Tekin (2012)) o Ancient theatre problem (Tekin, Hıdıroğlu, & Bukova Güzel, 2010)
Week 6	Defining and discussing the basic principles of mathematical modeling problems: o Reality principle o Model Construction Principle o Self-Assessment Principle o Construct Documentation Principle o Model Generalization Principle o Effective Prototype Principle Examination and discussion of theses and articles that evaluate Mathematical Modeling Activities in terms of principles
Week 7	Group decision process on determination of groups and subject of MEA
Week 8	Continuation of the MEAs design process - Application of worksheets
Week 9	Continuation of the MEAs design process - Application of worksheets
Week 10	Presentation of MEAs

Data Collection Tool

In the study, worksheets of designing MEA were used as data collection tools. During the preparation of the worksheet, related literature was analyzed, and expert opinions were collected in order to ensure validity. Worksheets were provided to the groups to explain the modeling activities design processes. In the worksheet, explanations were requested for the process of creating a modeling activity, planning, decision-making and criteria, problem posing and control / verification stages (Appendix 1).

Data Analysis

Content analysis was used in the analysis of the data obtained from the MEA design process worksheets. Content analysis is an analysis process that requires a more detailed examination of the collected data and reaching the concepts, categories and themes that explain these data (Bengtsson, 2016; Crabtree & Miller, 1999; Merriam & Grenier, 2019). Data obtained through interviews, observations or documents in content analysis are analyzed in four stages: (1) coding the data, (2) finding codes, categories and themes, (3) organizing codes, categories and themes, (4) defining and interpreting the findings. (Eysenbach & Köhler, 2002; Miles & Huberman, 1994). The data obtained through content analysis from the worksheets were used to detail, record and analyze the design processes of modeling activities. Content analysis was used in the worksheet to analyze the explanations for the process of creating a modeling activity, planning, decision-making and criteria, problem posing and control / verification stages. Findings are tabulated as themes and sub-themes and supported with sample quotations.

Validity and Reliability

There are different definitions, perspectives and control processes regarding validity in qualitative research. For example, Creswell and Plano Clark (2011) defined validity as an attempt to evaluate the accuracy of the findings. In research, external audit ensures that the research process is controlled from outside (Glesene & Peshkin, 1992; Guba & Lincoln, 2004; Merriam, 1988). In this research process, the validity of the process was increased by asking examinations from different studies (field experts and peer researchers) during the decision-making process of the research, during the analysis and the interpretation of the findings. According to Creswell (2013), it is important to encode the transcribed data by multiple coders and to provide consensus among coders in order to ensure reliability. Coding was done by one of the researchers of this study and an expert who conducted research on the mathematical modeling competencies process. The percentage of agreement between the analyzes was determined using the calculation proposed by Miles and Huberman (1994). Re-analyzes were made on the topics that were not compatible, and consensus was reached as a result of the discussions.

As a result of the coding of the data obtained from the worksheets, the compliance percentage was calculated as 81%. Miles and Huberman (1994) emphasize that for a good qualitative reliability, the reliability of the coding should be at the level of at least 80% compliance. In this context, it was seen that the reliability between coders was sufficient in the study. While presenting the findings of the study, the themes (and sub-themes, if any) obtained in each data collection tool were explained in detail, supported by relevant quotations (Patton, 2002).

Ethical Issues

All participants volunteered to participate in the study. In the research, there was no harmful practice in any way for the participants. During the research, the same information was provided to each participant about the research processes and their personal information was kept confidential.

Findings

PMTs' process of designing a MEA

Findings regarding the PMTs process of designing MEAs were analyzed in line with the planning, activity determination, writing and control processes and the findings are presented below.

Walking death (WD) group MEA design process

WD group activity is given in Appendix 2. The stages of the WD group for the MEA design process are given in Figure 1. They emphasized that the planning of such a design process should focus on being related to daily life, attractiveness, MEA steps and basic principles of MEA. It is understood that the ÖY group is planning to enter into the research process for such an activity with the statement "… We will take care to make the problems that we will research and write more interesting, such as current issues and games that may be of interest to current generations". They stated that the activities should show problem features and should be "confusing and complicated" in their own words. In line with this, they stated that they wanted an activity that included "the story part is clear [understandable] but having a little word crowd with small details ". They also pointed out the importance of small details to be included in the activities.

They stated that the WD group focused on the subject first when the MEA writing process was examined. WD group focused on determining the subject and the relationship between daily life contexts. "We thought of writing a PIZZA question, which we decided to be suitable for the interests and tastes of children, in order to reconcile it with real life." After that, the market research process started as a group. "We made material and product analysis as a group. ... We determined the price of the ingredients for pizza from the markets. " After the market research process, the process of determining the variables that will detail the problem and make it "complicated" in its own terms and visualizing these variables with the table in the MEA expression were realized. Afterwards, they stated that they shared their own solutions to the problem in the online communication environment they created and that they corrected the deficiencies. After this writing stage, the control process as a group started. In this process, the elements they focused on included compliance with MEA principles, student relativity, text control, developing / adding visual elements. "During the control phase, we evaluated our question according to the principles. … We examined the difficulty level for the student. … We took out some sentences. We added visuals and ended our control. " The statement summarizes the control process of the WD group.

When the MEA activity, names as Let's Eat Pizza, prepared by the WD group is analyzed in the context of modeling principles, the lunch determination scenario (Appendix 2) between the mother and the child in the problem situation was evaluated as a situation that students may encounter in their real lives. However, in order to make the problem more complicated, it has damaged the compliance of the concept of "gluten-free pizza", which is not encountered in Kastamonu context, with the reality principle. Accordingly, this activity was found partially appropriate in the context of the reality principle. According to the model construction principle, the statement in the problem situation of MEA should be used to create a model and the model should be used in the solution process. Although there is no expression such as "create a model" in the MEA activity, "Can make the right decision in terms of both cost and compliance with the criteria, which option he chooses?" The statement requires students to use a model in the solution. It was therefore considered partially suitable.

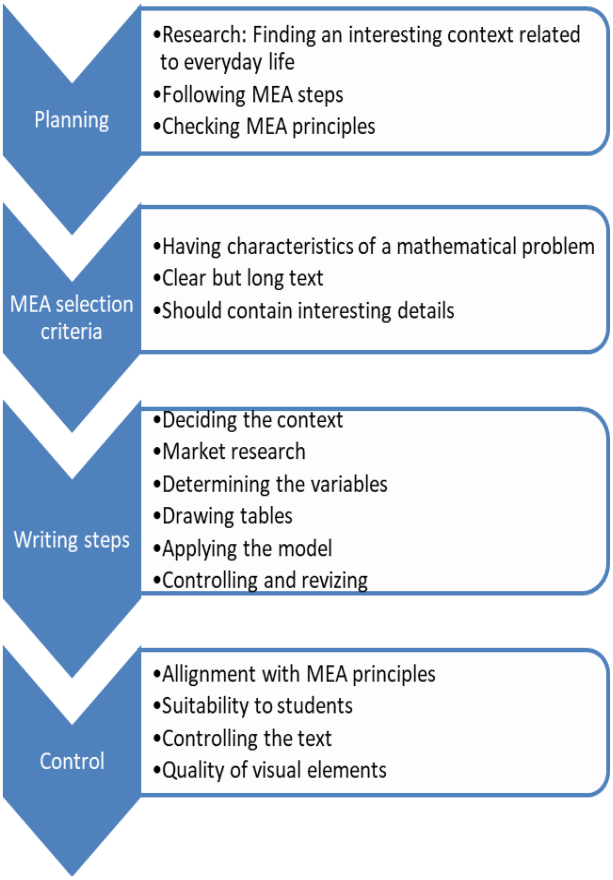

Figure 1. The walking death group MEA design process

It is a deficiency that there is no statement that will enable students to evaluate their own thinking approaches in the situation that is designed as a result of examining the compliance of MEA activity with the self-assessment principle. On the other hand, expressions in the problem situation of MEA have been provided with clear and sufficient data to enable students to make decisions about the process within the group without getting support from their teachers. In this regard, pizza MEA design has been considered appropriate to some extent in the context of the self-assessment principle. In the principle of construct documentation, it is expected that the statements of MEA in the case of a problem will present all the thoughts of the students regarding the solution process in a way that the client / client can understand. In the design of the WD group, one of the students' ... makes the right decision? Explain" statement is found, but since it is not requested to be written so as to present a document to the relevant unit or person, it has been evaluated to be somewhat appropriate in the context of the construct documentation principle. The model generalization principle involves the fact that the statements in problem situations of MEA lead students to create a generalizable model. Since the model to be used in the problem can be used by others in similar situations, the model is completely compatible with the generalization principle.

Infinite / infinite (II) group MEA design process

II group MEA design process stages are given in Figure 2. II group, one of its expressions about planning processes, focused primarily on researching the internet and other printed (such as science journals) sources and then preparing a question pool consisting of problems in different styles. Their next plan is to select a problem from this problem pool according to the conditions of the region where they will implement the MEA activity. It was stated that the issue they will pay attention to in this process will be " o create a problem that

children will encounter in their environment". In the last stage of the plan, it was considered to apply the MEA according to the context decided, evaluate the result, make the arrangement, and if the desired effect is not achieved, a new MEA process will be started.

II group members emphasized that modeling activity should include high-level thinking processes such as "critical thinking, questioning and decision making". The characteristics of the activity questions were defined with the statement "The roots of the questions should be prepared in a way to question the solutions of the students, to verify and check the results". However, the importance of MEA's suitability to real life was determined by the expression "The first and most important of our criteria in the context of modeling efficiency is the principle of reality." In addition, II group members stated compliance with other MEA principles, such as self-assessment, was among the features that activities should have.

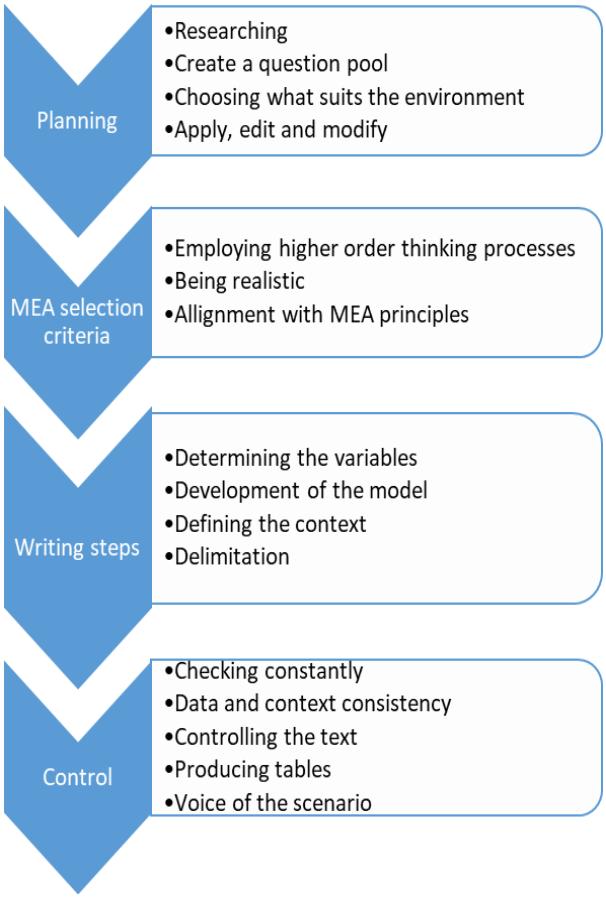

Figure 2. Infinite / infinite group MEA design process

When the process of writing MEA of the II group was examined, first of all, within the context of the problem in the MEA, they considered "the lighting problem as a subject and [They] went to K .. S ... [a business] in Kastamonu." Then they decided which variables to consider when writing questions. In the next step, group studies were carried out on how a model (formula) should be used for the solution process of the MEA created: "We wrote a formula that includes variables such as lighting, types of light bulbs, the size of the space". In addition, they included definitions of concepts such as “lumen, lux”, which students thought they would not know, in the problem scenario. In the last stage, MEA activity was created within certain limits, taking into account the variables and solution processes.

Regarding the post-writing control phase, II group members said, “Actually, our controls were constantly performed at every stage. In our preliminary research, while we were writing and using the model, the controls were made by each of us and arrangements were added” and they provided the information that the control phase was carried out continuously, not at the end point. However, the compatibility of the data they will provide and the results to be achieved in the problem with their real life equivalents was considered by the II group members as one of the control criteria. At this stage, it was thought that presenting the data in a table would contribute to the students to be more understandable and the arrangement was made. They also stated that by making arrangements in the text to ensure the student's interest, "we tried to create a warm atmosphere as if we were chatting with the student" and that they changed the communication tone of the story. Finally, the controls in the text were made and the expressions causing the complexity were removed and a language expert was helped in this direction: "We also had a middle school Turkish teacher have the text checked."

When the MEA activity, named Lighting Cost, of the II group is analyzed in the context of modeling principles, the lighting problem of a local enterprise in Kastamonu is emphasized and the problem situation is defined with real life data (Appendix 2). In this context, it has been found suitable for the principle of reality. In the II group activity, there was no statement for students to review what they did in the process, and expressions included in the problem were not found clear and understandable for middle school students: “Lumen: Total light output emitted by a bulb (the higher the lumen the bulb, the brighter the light), Watt: The amount of energy consumed by a bulb. (That is the value reflected in the electricity bill.)”. Therefore, the MEA is considered as "not suitable" for the self-assessment principle. Real-life data and different variables were used in this activity, and asking for help in “choosing which bulb type with low cost” contributes to conformity with the modeling principle. However, there is no statement that reveals the expectation of creating a model. In this context, lighting cost MEA design has been evaluated partially in accordance with the model construction principle. Moreover, this activity did not include an expression explaining the process, except for the students' requesting an e-mail for the result. In this direction, the efficiency has been evaluated partially in accordance with the construct documentation principle. Considering the usability of the model to be employed in the solution of this problem in problem solving including similar situations, the model was evaluated in accordance with the generalization principle.

Pythagorean group MEA design process

Pythagorean group MEA design process stages are given in Figure 3. As the primary target in MEA design planning, the Pythagorean group aimed to find an activity that “the student can encounter” in real life. In this direction, they pointed out the need for research from different sources such as the internet and textbooks. At the planning stage, group members aimed to carry out this activity over a certain data set. At the last stage of the plan, they expressed their thoughts on an activity design that would include the purpose of “using data and improving processing skills” during the MEA.

Pythagorean group members emphasized the principle of "reality" as an indispensable element of such activities as "the student does not want to be in a scenario and does not get busy". They also stated modeling activities should be suitable for the readiness of the students in terms of both cognitive and affective domains. The statement of “Sometimes we cannot see the math in the next generation questions [for the high school placement exam]. It is not clear which achievement he wants. Mathematics in daily life should be seen clearly in such activities” explains the necessity of questions to reveal the relationship between daily life and mathematics in the program. Finally, Pythagorean group members stated that the questions should be versatile, including universal values such as honesty, truthfulness, and responsibility, and different level intellectual processes, apart from emphasizing mathematics and real life.

When the process of writing MEA of the Pythagorean group was examined, they first stated that they entered the research process after they decided to connect (Facebook): “We conducted research from local and foreign sites”. Following their research, they entered the process of creating and editing the data set, as determined in their design plans: "We reached Facebook data between 2013-2019." Afterwards, the act of writing an MEA scenario by running the data set in accordance with the context they decided on was realized. Regarding the post-writing control phase, the Pythagorean group members stated that “we made changes in a few of the data in order to comply with the MEA principles”, it is understood that they checked the compliance of the activity they designed in the control phase with the MEA principles and made adjustments in the data accordingly. In the control phase, the solution process of the MEA was also realized and the deficiencies related to the variables were eliminated, if any. Finally, data and context-related controls for validation of the model employed in the MEA were carried out by the group members.

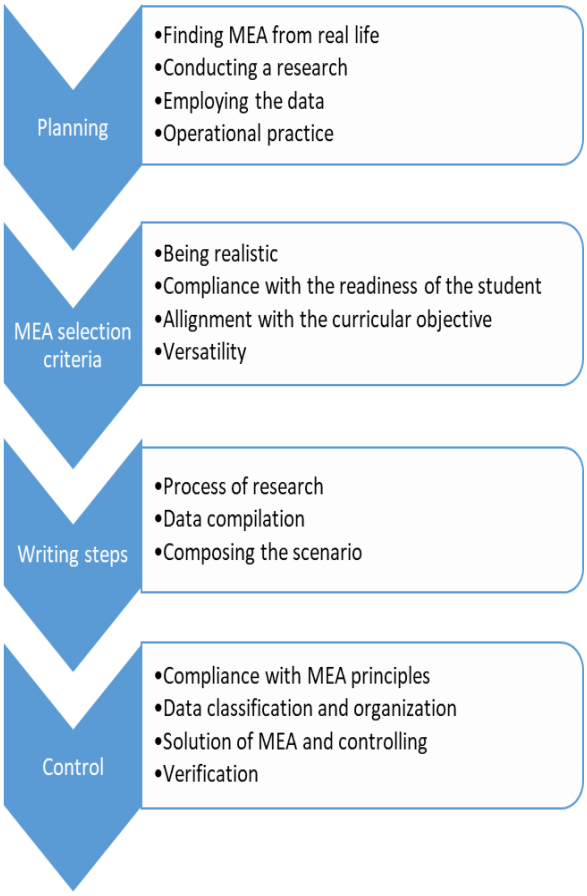

Figure 3. Pythagorean group MEA design process

When the Facebook use activity prepared by the Pythagoreans group is analyzed in the context of the MEA activity modeling principles, the problem situation is related to a social media organization that students frequently encounter in real life, and real data were used in 23 of 25 quarters. Minor changes were made by the Pythagorean group considering the student level in 2 quarters. In this case, the problem situation has been slightly removed from the real data (Appendix 2). In this context, it has been found partially in accordance with the principle of reality. In the Facebook activity, the data were expressed clearly and in accordance with the students' levels. However, there is no statement for students to review what they have done in this process. Therefore, this activity is partially in line with the self-assessment principle. In this

activity, the way (model) used in the process of finding the annual average user increase amount by using the data of Facebook user numbers in 2029 is requested. However, the statement "… they want you to create a table giving the number of Facebook users similar to the table above" directs the students to create a model. In this direction, the efficiency has been evaluated in accordance with the model construction principle. Also, "Please inform our researchers by e-mail which way you used in your studies." With the statement, the students were asked to express their opinions about their solutions and to write a document to the relevant unit. Therefore, the activity fully complies with the principle of construct documentation. Since the model to be used in the solution of this problem can be used by others for similar purposes, the model has been evaluated in accordance with the generalization principle.

Selective Permeates (SP) group MEA design process

SP group MEA design process stages are given in Figure 4. As in other groups, SP group members also prioritized research in their planning for MEA design processes: "We planned to do research first in order to decide on the modeling activity. We decided to do the research on the contents of the lessons we took, the resources [in these lessons] and the internet. In the next step, they planned to write questions. "We planned to create alternative scenarios while writing questions." It is understood that SP group members plan to make a decision from a pool of questions. However, they made it their next goal to determine what kind of model they will use based on the decided question. In addition, SP group members included the improvement of the MEA design with solution-control-regulation cyclic phases in the planning process.

SG group members emphasized that among the features of the modeling activity was inclusion of the high-level intellectual processes such as making comparisons to the student, choosing among possible situations and making decisions. However, with statements such as "Modeling activities should include different representations, care about using mathematical tools such as a ruler, and provide the opportunity to make associations between units and real lengths", it was pointed out that the MEA activities work out mathematical skills. As emphasized by other groups, it is very important that the MEA is taken from the student's real life context: "It is very important that the student presents a section from his own life." However, it was stated that MEA should provide students with different solution options with different data: "We thought that problems that present only one solution and one type of data in mathematics did not benefit. The modeling activity should allow for different solutions. "

The first step of MEA writing of SP group was to find the draft scenario idea and create the lines by determining the borders of the activity with the statement "When we found a house design that is interesting to design, has a structure that we can accept as a unit and has geometric shapes that will facilitate the calculation." as they have realized. Afterwards, they made researches in order to determine the variables that will take place in the context of the problem and to determine the values of these variables: "As a result of the research we conducted on the internet and from the tradesmen, we determined various variables such as climate, quality and decoration, we reached data showing the relevant costs and values." In the last stage, the writing stage of the MEA activity was completed by bringing together the scenario context, variables and values of these variables.

SP group members' control of MEA design included MEA principle compliance, context-concept compatibility, compliance with modeling steps and text compliance. The given expression emphasized compliance with modeling principles: "[Referring to the modeling competence training process] We learned the basic principles of modeling in our lesson. We checked the compliance of the activity we wrote with these principles. " Moreover, the following statement was given as an example of the arrangement they made in this direction

"… The place where the triangle house was built was determined as a warm place in winter. However, since we learned that it should be from their own environment and in a way to increase the student's interest in the modeling activity in our lesson, we changed our scenario. Thus, students will choose glass according to the climatic characteristics of their environment. This situation made it a realistic modeling activity. "

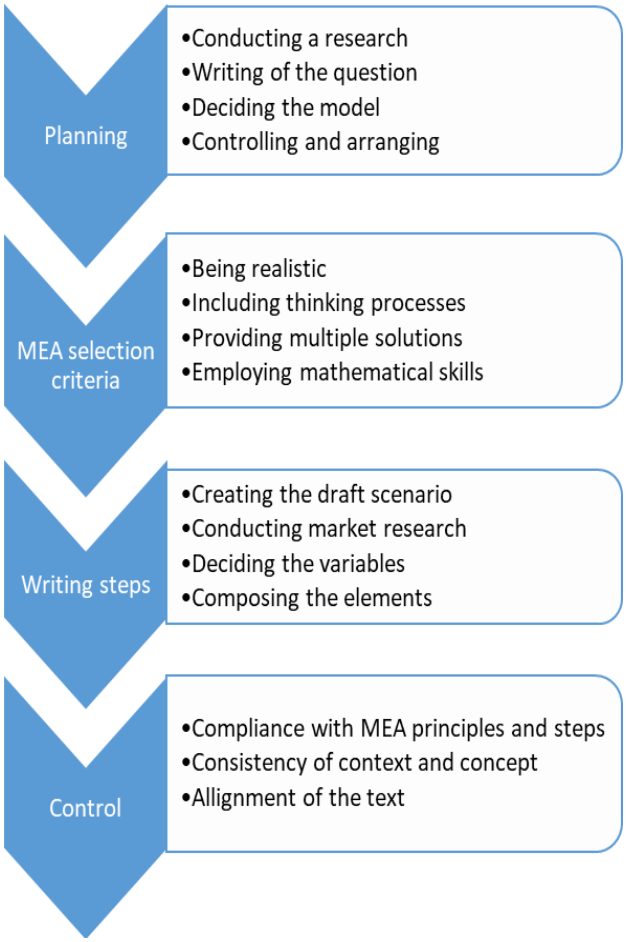

Figure 4. Selective permeable group activity design process

The SP group also reported that they checked the harmony between the context, the variables and the mathematical situation, and that they saw everything compatible. "MEA activity should contain questions appropriate to the modeling processes we handle in our course. The student must identify important variables, write, solve and check the model. We made sure that each of these topics was covered at the modeling event. " At this stage, finally, controls and arrangements were made for spelling mistakes and comprehensibility of the expressions used in the text: "These are secondary school students and when the activity is long, the sentences should be well expressed and understandable. So we read it over and over, made some minor changes and finalized it. "

When the glass house MEA prepared by SP group is analyzed in the context of modeling principles, the problem situation is an activity prepared in line with the home design context used and the cost data obtained from real life researches (Appendix 2). At the same time, the fact that the problem will be solved in the context of Kastamonu allows students to add an element from their own lives. In this context, it has been found in accordance with the principle of reality. In the Glass House activity, the data were expressed clearly and in accordance with the students' levels. However, there is no statement for students to review what

they have done in this process. Therefore, this activity is partially in line with the self-assessment principle. At the event, "… using the table data below, you will make a suggestion that will give the most appropriate glass option and issue a cost report." Although the statement does not emphasize the students' creating models, problem solving requires the use of a model. In this context, the SP group design has been evaluated partially in accordance with the model construction principle. In addition, in this activity, students are asked to document how they think about the solution process and to send their "suggestions to Mehmet Master in letter". Therefore, the activity fully complies with the principle of construct documentation. Since it is taken into consideration that the model to be employed in the solution of this problem can be used for similar purposes, the Glass House activity was evaluated in accordance with the generalization principle.

Results and Discussion

PMTs' MEAs have been analyzed within the design processes planning, activity determination, writing and control stages. According to the results obtained, there are differences in the modeling processes of prospective teachers in general. Berry and Houston (1995) listed the mathematical modeling process in a linear fashion: understanding the problem, choosing variables, setting up the mathematical model, solving the mathematical problem, interpreting the solution, validating the model, developing the model for other problems and preparing a report. On the other hand, Doerr (1997) defines a nonlinear mathematical modeling process and handles the components cyclically in the form of encountering and defining the real-life problem situation, obtaining data and information, deciding and evaluating the model and process, making interpretation and reconstruction. Özer Keskin (2008) re-adapted the mathematical modeling processes defined by Berry and Houston (1995) and Doerr (1997) and included the stages of understanding the real-life problem, choosing variables, creating a mathematical model, solving, interpreting and verifying it. Although the stages determined by Özer Keskin (2008) do not include the necessity of linearity, it was stated that the process should be reviewed at the points of difficulty and the relevant stages should be repeated when deemed necessary. As can be understood from the explanations above, it is striking that there is no rigid chain of processes in order to achieve the goal in activities related to the mathematical modeling process (Blum & Niss, 1991; Crouch & Haines, 2004; Lesh & Doerr, 2003). In this respect, the differences that occur in the ways PMTs follow in MEA design processes can be considered normal.

The conducting research process draws attention first in the planning of MEAs. PMTs emphasized the necessity of researching different sources (internet, textbook, etc.) in order to determine the correct activity in this direction, that MEAs are activities involving different types of intellectual and cognitive processes. The necessity of MEAs to be related to daily life is one of the highlights in planning. In addition, planning different scenarios and question contexts was also taken into account in order to reach the right design. The following stages are also taken into of controlling the conformity with the basic principles of modeling, whether the determined model is provided and its applicability in different situations. Considering the modeling cycle, the elements that PMTs have included in their planning should be considered important. Lesh and Doerr (2003) emphasize the necessity of starting the mathematical modeling process with an activity related to real life. In this step, it starts with the process of defining a problem that can be solved in the real world, and variables and their importance are determined in line with this context. The next steps include setting up the model, executing the solutions, and evaluating the significance level of the solution for the problem situation. In the last stage, the evaluation of solutions and predictions in the context of the real world is done in the context of the validity and usefulness of the model (Lesh & Doerr, 2003). In this direction, the fact that PMTs take modeling processes into account in their planning, planning the most appropriate activity

(creating a pool of questions, offering different solutions, including different intellectual processes) reveals the usefulness of the training process.

The next stage of the MEA design process, the phase of determining the features of the activity, PMTs emphasized inclusion of high-level thinking processes (such as problem solving, critical and creative thinking). Mathematical modeling competencies are a complex structure that includes different intellectual processes in the process of transition from real life to a mathematical model and then validation of the model in real context (Borromeo-Ferri, 2010). It is expected that the modeling activities that will be included for the development of these competencies in the student include high level intellectual processes (Blum & Kaiser, 1997). Similarly, PMTs emphasized the necessity of providing modeling principles in modeling activities. According to Stillman (2012), the difference of modeling activities from application activities is the process of discovering mathematics that can help in solving the problem. Long-term studies have defined the basic principles representing real life situations (Lesh et al., 2000) and it is emphasized that these teaching-oriented principles should be adopted in the process of designing MEAs (Lesh et al., 2000).

Another issue emphasized by the groups of PMTs regarding the activity characteristics in the modeling process is the compatibility of modeling activities with the curricular outcome. Modeling activities provide a depth of mathematical knowledge through mathematization, as well as using previous learning (Yoon et al., 2010). However, there are different opinions between mathematical modeling activities and the relationship between learning mathematics. While Chinnappan (2010) considers MEAs as a tool that demonstrates and develops the relationship of a certain mathematical content, Blomhoj and Jensen (2007) consider mathematical modeling activities as a purpose for realizing mathematical learning. Although the relationship between mathematical achievements and models is important in both perspectives, it is expected that mathematics course outcomes in MEA designs should be examined in terms of harmony (Stillman, 2012).

The groups also discussed the relativity of the activities to the student, including visual elements, offering multiple solutions and having a mathematical problem nature. According to Fox (2006), mathematical modeling activities should be prepared around themes that are important for children and that are of interest. Thus, it is possible to establish a link between the problem and their personal interpretations. However, MEAs should contribute to the explanation and comprehensibility of the problem with external representations (pictures, diagrams, etc.) and include understandable expressions (Borromeo-Ferri, 2014; Fox, 2006; Lesh et al., 2000). Among the qualifications of MEAs, it has been emphasized in the literature that these activities should create mental complexity in the student, that is, they should show a real problem feature (Borromeo-Ferri, 2014). Based on these results, it can be said that the activity characteristics that pre-service teachers determined in the MEA design process are compatible with the relevant literature.

Future Trends

The results of the current study determined that the groups used similar processes, although there were some differences in the design writing stages of the MEA. The writing stages proceeded as determining the context of MEA, deciding on variables and assumptions, writing the scenario and adding visual elements. In the control phase, among the factors that the groups paid attention to were compliance with MEA principles, text control, visual arrangement, and realization of solution stages (model and data compliance). According to the results obtained, there are differences in the modeling processes of prospective teachers in general. In the literature, different processes regarding modeling processes have been discussed

and a complete consensus has not been achieved. It is striking in other studies that there is no rigid chain of processes to achieve the goal in activities related to the mathematical modeling process. Considering the suitability of the pre-service teachers' designs with the modeling principles and their own modeling competencies, it is recommended that the differences in the MEA design processes are met as usual.

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Appendices

Appendix 1: MEA Design Process Worksheets

Hello friends, you are expected to design a MEA with your group at this stage of the training process. What I want from you is to detail your MEA design process by answering the questions given below. Before you start writing your design, formulate your answers to questions 1 and 2. Then, as your processes progress, answer the remaining questions at the end of each process. You can ask me if you have a thought or a question you want to ask while giving your answers.
Group Name:
Group Members:
Explain your modeling activity creation processes in the following headings.

1. What is your plan?
2. What kind of activity should it be? What are your criteria in the context of modeling effectiveness?
3. How did the writing phase take place? How did you decide the context of the problem?
4. How did the control take place?

Appendix 2: The Groups' MEA Designs

MEA Design of Selective Permeable Group: Glass House

Mehmet Usta, who lives in Kastamonu, saw the picture of the house in England while surfing the internet and liked it very much. The front and rear facades of this house, which was built underground, were covered with glass and the left and right facades were covered with concrete walls. He thought that he could build such a house with small changes. Mehmet Usta planned to cover the left, right and back facades of the house with stone walls and the front façade, which he considered as the entrance to the house, with glass. However, the glass-covered entrance wall has been requested to have many features such as strength, security, privacy, not being affected much by the weather changes outside, sound insulation and decorative appearance. He thought that having all of these features on the glass wall would force him financially. Mehmet Usta, who allocated a budget of 5200 TL for glass wall covering, made a cost research and discussed this situation with his friend who is interested in glass sales. His friend showed the glass types with their prices and gave him a brochure to help. Your task is to make a proposal to give the most appropriate glass option using the weather conditions of Kastamonu, the area of the glass wall, other possible factors and the table data below, and to issue a cost report. In the form of a letter, you are asked to send your suggestions to Mehmet Usta.

Tile Between Heat Glass	
White Tile	16,00 TL per m^2
Flower Tile	8,00 TL per m^2
Golden Yellow Tile	22,00 TL per m^2

Brand	Price (m^2)
Heat controlled (Synergy) (In climates where winters are cold and summers are mild)	250 TL
Heat Glass (Comfort) (In climates where winters are warm and summers are hot)	280 TL
Heat Glass (Classic)	190 TL
Laminated insulating glass (heat insulation, safety, security, soundproofing, blocking UV rays transmission)	480 TL
Jalousie insulating glass (privacy)	360 TL
Jalousie insulating glass Synergy (privacy)	425 TL
Insulating acoustic (soundproofing, safety, security)	435 TL

MEA Design of the Pythagorean group: Use of Facebook

Facebook, which was established in February 2004, shows a rapid increase in the number of users worldwide. A group of scientists worried about this situation wondered about the number of Facebook users 10 years later and decided to write an article called Facebook and Family Links. Accordingly, they examined the change in the number of users from 2013 to 2019, but they ask for your help, since these results are not sufficient. The researchers want you to calculate the number of Facebook users in 2029 using the table above, and create a table that gives the number of Facebook users between 2019-2030, similar to the table below. You are kindly requested to inform our researchers by e-mail which way you used in your studies.

Year	Quarters	Number of users (million)
2013	First	269
	Second	272
	Third	276
	Fourth	282
2014	First	289
	Second	292
	Third	296
	Fourth	301
2015	First	307
	Second	311
	Third	315
	Fourth	322
2016	First	327
	Second	332
	Third	336
	Fourth	343
2017	First	348
	Second	354
	Third	358
	Fourth	363
2018	First	370
	Second	378
	Third	379
	Fourth	385
2019	First	389

Note: A quarter year consists of 3 months. January, February and March is the 1st quarter; April, May, and June is the second; July, August, and September is the 3rd quarter; October, November, December is the 4th quarter.

MEA Design of the Infinite / Infinite Group: Lighting Cost

Hello there,
I am Fatih, the owner of a business called Kahve Sokağı in Kastamonu. By popular demand, I decided to open a second branch in Kuzeykent. The pictures you see below are the photos of this cafe. Our cafe, which has been renovated, will be illuminated. Since the renovation process is very costly and I have to keep the lights on for 12 hours a day, I want to make the most cost-effective choice that will illuminate all sides adequately and equally as much as possible without consulting any lighting specialist. That's why I have been doing research on the internet for a long time. This job was harder than I thought. I had to know the concepts of lumen, lux and watt in order to decide on the type of bulb. Fortunately, I managed to create a table of these concepts.

Watt	Lux	Lumen	Relationship
The amount of energy consumed by a light bulb. (That is, the value reflected in the electricity bill.) 1kw energy = 0,7 kuruş 1kw=1000 watt	Lighting level Indoor lighting level should be at least 100 lux.	Total light output emitted by the bulb (the higher the lumen bulb, the brighter the light)	Lux = lumen / area (m^2) Area (m^2) = lumen / lux In other words, the relationship between lux and lumen is related to the area to be illuminated.

In the table below, I have created the information on the 3 most suitable LED bulb types for my business:

Brand	Watt	Price for a Light Bulb	Lumen value
Philips	10 watt	4,25 tl	1200
UFO	20 watt	6,50 tl	1800
Lighty	28 watt	8,45 tl	2800

Which bulb type do you think I should choose with the lowest cost for the lighting I will do in my cafe? I would love to help me with this. Tables will help you with this. I will be glad if you send the result to my e-mail account.

MEA design of the walking death group: Let's eat pizza

Cem, who lives in Olukbaşı with his family, preferred watching a cooking program rather than reading a book before going to bed and saw pizza in his dreams. When he waked up in the morning, he run to his mother and told his dream to his mother. Gülten Hanım offered him to eat pizza for lunch. Gülten gives Cem the task of ordering pizza and tells him that the pizzas should be ready to reach lunch and that he should decide on the following options considering the budget. In addition, when ordering, you should take into account that "I have an allergy to gluten, you have an allergy to olives, I have a vegetarian type of diet, and you like pizzas with sausage, do not forget to consider these criteria and the cost" and offers the following options:
1) He can buy pizza from the market near the house according to his criteria and cook himself when he brings it home,
2) He can buy or order pizza from PIZZA 37 in the city center according to their criteria,
3) He can buy all their ingredients from one of the 3 grocery stores close to their home and make pizza at home.
4) He can evaluate two of the three options above, which are the most appropriate in terms of cost and criteria.
Cem do various researches on his phone and access the following information. Which option does Cem choose to make the right decision in terms of both cost and compliance with the criteria? Please explain.

Ingredients and market prices

	A101	BİM	ŞOK
Floor	2 kg 9,25 TL	10 kg 19,95 TL	5 kg 13,50 TL
Water	5 lt 2,50 TL	5 lt 2,25 TL	5 lt 4,90 TL
Cheese	700 gr 17,75 TL	600 gr 19,95 TL	500 gr 17,25 TL
Sausage	290 gr 7,25 TL	270 gr 7,76 TL	500 gr 5,75 TL
Salami	250 gr 9,95 TL	700 gr 15,95 TL	250 gr 7,95 TL
Olive	950 gr 11,95 TL	1 kg 12,45 TL	800 gr 12,95 TL
Salt	1500 gr 1,80 TL	750 gr 2,99 TL	750 gr 0,90 TL
Tuna Fish	125 gr 9,95 TL	100 gr 5,95 TL	320 gr 9,95 TL
Mushroom	400 gr 3,95 TL	300 gr 3,45 TL	300 gr 5,00 TL
Sesame	120 gr 2,95 TL	75 gr 6,99 TL	90 gr 3,35 TL

Tomato	1 kg 4,99 TL	1 kg 5,90 TL	1 kg 6,99 TL
Pepper	1 kg 5,90 TL	1 kg 5,50 TL	1 kg 5,95 TL

PİZZA 37	Menu	Gluten Free Pizza Option	Price (TL)
P371 Attractive pizza for one person (Come and buy campaign)	Sausage Lovers Supers (Has a Vegetarian Option) Classical	NA	20,99
P372 Special pizza for one person (ordered home)	Sausage Lovers Supers (Has a Vegetarian Option) Classical	NA	28,95
P373 Buy 1 single, buy 1 free! (Come and get it)	Sausage Lovers Supers (Has a Vegetarian Option) Classical	NA	39,95
P374 Buy 1 single pizza, 2nd single pizza with 50% discount (Come and get it)	Sausage Lovers Supers (Has a Vegetarian Option) Classical	NA	Price for one pizza 30.99
P375 Buy 3 single pizzas, pay for 2 single pizzas! (Order at home)	Sausage Lovers Supers (Has a Vegetarian Option) Classical	YES	66,95

(There is no charge to extract ingredients from pizza)

Frozen Pizza Prices

Brands	Ingredients	Small	Medium	Gluten-free option
A	Cheddar + sausage	One for 20.99 TL	29.99	Yes
B	Salami + Pepperoni + tuna + cheese + mushroom + pepper	One for 29.99 TL	39.99	Yes
C	Broccoli + tomato + pepper + cheddar + black olives	One for 29.99 TL	NA	Yes
D	Tomato + mushroom + pepper + cheddar	One for 21.99 TL	NA	NA
E	1. single person (small) pizza: corn + mushroom + green pepper + red pepper + jaleponi pepper + mushroom 2. single (small) pizza: Sausage + cheddar + salami	1+1 for 49,99 TL	NA	Yes

The oven burns 30-kurus worth of electricity in 1 minute (Pizza cooking time 15-20 minutes).

Research Article
Received: 03.27.2021
Accepted: 28.06.2021
First Online: 28.06.2021
Published: 30.06.2021

Citation: Agaj Avdıu, T., Qamılı, S., & Avdıu, A. (2021). The impact of the faculty of education in preparing its graduates for the implementation of the new school curriculum. *International Journal of Scholars in Education, 4*(1), 119-132. doi: 10.52134/ueader.904388

The Impact of the Faculty of Education in Preparing its Graduates for the Implementation of the New School Curriculum

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Abstract: The implementation of the curriculum is expected to give a push to an increasing quality of managing and processing educational efforts towards betterments at every unit of learning and education. Applying a new curriculum, namely implementation of 2017 Curriculum at schools in Kosova has been commenced in September 2017. This study examined the impact of the Faculty of Education in preparing its graduates for the implementation of the new school curriculum with reference to University "Kadri Zeka" in Gjilan, Kosova. The purpose of this study is to investigate the graduate students' preparedness to implement the new school curriculum. The quantitative method has been employed for this research. A questionnaire for graduate students has been used to collect data. 81 graduate students filled out the online questionnaire. The results from this research indicate that the graduates of the University "Kadri Zeka", respectively the graduates who were prepared in primary and preschool programs felt significantly prepared across most dimensions of teaching. However, there is room for improvement regarding the new school curriculum implementation.

Keywords: "Kadri Zeka" University, the New curriculum, Teaching, Implementation, Preparedness, Graduate students' responses.

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Introduction

A country with quality education has the strongest weapon of the XXI century, based on this fact large investments for the development of this field are present not only in Kosova but in all countries. The education sector in Kosova is characterized by continuous efforts towards reforming all sub-sectors that address the key challenges of increasing participation and improving quality in education. We are witnessing various developments that have been made in the curricula, so that our education is comparable to the education of developed countries. The first step in reforming pre-university education is the drafting of the Curriculum Framework.

In 2011, the MEST approved the Pre-University Education Curriculum Framework in Kosovo in order to establish a regulatory framework for pre-university education reform. In 2016, after the second phase of the pilot, MEST issues a revised version of this document entitled Curriculum Framework for Pre-University Education in Kosovo. (Boshtrakaj, Rraci, & Bajrami, 2018)

The innovations of the new curriculum are: access to competencies and learning outcomes, reorganization of curricular areas and main levels of the curriculum, teaching and learning methodology, assessment of student achievement, reorganization of the elective curriculum, and other aspects of organization at school level. (MEST, 2017)

Literature Review

Education is the process of human formation, universal formation of the positive, intellectual and emotional qualities of the human. It is the process of building positive character traits and shaping the personality of the free man and comprehensive development. If we look at it more broadly, education involves the whole process of developing and shaping the personality of the young person. This means that the function of education includes not only educational work in school and in the family, in organizations of children and youth and in social organizations, but also the influence of lifestyle, social views, literature, media, cultural institutions and other factors (Shimillesha,1988).

The curriculum as a field of study is characterized as incomprehensible, fragmented and confused. Of course, it can sometimes have all of these, but we need to be aware that the curriculum as a field of study is crucial to the well-being not only of schools but of society as a whole. If we evaluate the curriculum in a narrow sense of the field as a list of subjects that should be taught in school, but also in a broad sense of the experiences that individuals require for full and real participation in society, it is not denied that the curriculum affects everyone, that is, both those who deal with this field, teachers and curriculars of different fields, as well as society in general (Dervodeli, 2010).

To facilitate the process of understanding this notion, we will start with the etymology of the word Curriculum. The word curriculum derives from the Latin word ‘Curricullum’ which means life program (Hyseni, 2005).

The curriculum can be defined as an action plan or a written document that includes strategies for achieving the desired objectives or goals. This point of view spread by Tyler and Taba represents a linear view of the curriculum. The order of the planner's steps is predetermined. The plan has a beginning and an end as well as a process and a mechanism, in order that what starts, progresses and ends. However, the curriculum can be broadly defined as the area that addresses the student's experiences. This view calls everything inside the school and even outside it (as long as it is planned) part of the curriculum. It has the roots in Djui's definition of experience and education, as well as in the view of scholars Kasuell and Kemellne

in the 1930s, that the curriculum represents "all the experiences that students gain under the guidance of teachers" (Dervodeli, 2010).

The priorities of the curriculum are: the increase of the importance and quality of learning, the increase of the student outcomes, the improvement of the integration in learning areas, the improvement of the implementation strategies (Nishku et al., 2006).

The core curriculum for the pre-primary grade and primary education, along with other curricular documents, make applicable the Pre-University Education Curriculum Framework, approved by the MEST, in August 2016. This document defines the results for competencies and results for curriculum areas, expressed in knowledge skills, attitudes and values that should be developed and achieved by students by the end of certain time periods as well as the methodological approach of implementation, including teaching, learning and evaluation. This document also defines the distribution of teaching time (lessons) for curriculum areas and their interconnection which enable progress in the development of student competencies (MEST, 2016a; MEST, 2016b; MEST, 2016c).

According to Mehmeti, Buleshkaj & Lynn, (2013) the necessary changes in the curriculum are addressed in three different ways:

1. From focus on subjects to focus on learning outcomes and competency-based
2. From teacher-centered focus to student-centered focus
3. From didactic / teaching methodology to a more interactive and comprehensive methodology.

The full implementation of the new state curriculum, respectively the reform in pre-university education is achieved only when:

-Teachers fully understand and accept the new spirit of the curriculum and its activities return to routine,

-The school is constantly committed to improving the teaching and learning process towards raising the level of students' achievement,

-Schools and municipal directorates of education engage in an ongoing process of collecting and analyzing data, identifying challenges and finding solutions to summarize the requirements of the new state curriculum system.

-MEST monitors the fulfillment of curriculum requirements at the state level, as a basis for providing the necessary institutional support (Kosovo Pedagogical Institute, 2016).

To assess students according to the competency-based curriculum, it is important to establish assessment techniques that enable students to demonstrate not only their knowledge but also their skills and attitudes (MEST, 2013).

Some pedagogues, using the notion "teaching technology", unjustly identify its content with the "educational technique" or in the narrowest sense with what is meant by "teaching tools", namely audio-visual media. Other pedagogues with the notion "technique" mean the teaching techniques, methods, actions and forms of teaching work while the content of the notion "teaching technology" is based on the process of organizing learning according to contemporary requirements by using contemporary tools. From this, which was pointed out above, it can be said that the definition of the meaning of the notion "technique" and "technology" is correct. Although there are dilemmas about their explanation, it is still true that these two notions differ from each other as does the character of their application in teaching work (Vojka-Ismajli, 2012).

Learning works and the basic tasks (functional and educational materials) are effectively accomplished through the theoretical aspect, observation of lessons and finally

through the practical aspect. It results that the teaching practice is realized after the theoretical teaching and the classroom observations. It is therefore rightly said that the classroom observation is considered as a bridge that connects theoretical learning with practical learning (Haliti, 2004).

The first purpose of practical learning is for students to develop certain knowledge, skills and attitudes to be educators at the primary and pre-school level. This includes developing the skills to create and manage a cultivating and supportive environment of learning and play and to plan and implement the curriculum that suits children's development (University of Prishtina, 2004).

Being aware of the need for the best possible training of teachers at both first levels of the education system in Kosova, University "Kadri Zeka" respectively the Faculty of Education aims at training teachers who will be the stimulating force for further development of teaching practice in Kosova. The graduates of the Faculty of Education acquire knowledge and competences from general, academic and didactic-methodological courses. These competences include: knowledge in their respective subject (academic knowledge), needed reflection and professional capacities to solve problems; learning of communication and group work with other professionals in education; holistic conception with children and youngsters; familiarization with and understanding developing characteristics of school children; understanding the differences of pupils' needs, etc (University of Kadri Zeka, 2016).

On completion of the studies, students will be able to: dismantle the curriculum into activities planned for children, orienting their work according to the approach with the child in the center; organize educational activities aiming at achieving learning outcomes, provided by the Kosovo Curriculum Framework, according to the respective fields (University of Kadri Zeka, 2021).

Research Methodology

The topic of this research paper has been studied in terms of theory as well as in terms of practice. Regarding the theoretical aspect, various literature related to this issue has been analyzed and explored, whereas regarding the practical aspect, a special attention has been paid to the impact of the Faculty of Education of the "Kadri Zeka" University in preparing its graduates for the implementation of the new school curriculum. To fulfill our objectives, this research has been carried out using the quantitative method through which the necessary data have been collected to reflect the preparedness of graduate students for the implementation of the New Curriculum. The quantitative method serves as a form of collecting numeral data. As Question Pro (2020) states "Quantitative research collects information from existing and potential customers using sampling methods and sending out online surveys, online polls, questionnaires, etc., the results of which can be depicted in the form of numerical." Data has been collected through a questionnaire for graduate students. In order to avoid misunderstandings, the questions have been written in both languages, English and Albanian.

Aim and importance

The implementation of the New Curriculum remains one of the main tasks of teachers that requires adequate professional training, methodological and pedagogical skills, as well as in-depth knowledge of the content of the New Curriculum. Therefore, the major objectives of this research are:

- to assess the preparedness of the graduate students of the "Kadri Zeka" University respectively Faculty of Education in implementing the Kosovo new school curriculum;

- to see whether the Faculty of Education of University "Kadri Zeka" prepares its graduates to implement the new school curriculum;
- to reveal the program courses that best help in training and developing students professionally;
- to show the graduate students' evaluation of the study program compatibility with the teaching process.

Research Questions

This study will seek to answer the following research questions:

1. Are the "Kadri Zeka" University graduate students of preschool and primary program all set to implement the new school curriculum in their teaching?
2. Is there sufficient and adequate literature to equip students with knowledge in the implementation of the new Kosovo curriculum?
3. Does the practice in schools-preschool institutions help students in implementing the new school curriculum?

Data Gathering Procedure

In order to collect data related to the impact of the Faculty of Education of the "Kadri Zeka" University in preparing its graduates for the implementation of the new school curriculum, the graduate students' questionnaire has been used. It is thought that University "Kadri Zeka" graduates can best assess their preparedness or unpreparedness to work according to the new school curriculum and thus provide more complete, convincing and concrete results. The graduate students' questionnaire contains nine questions. For the questionnaire validity, opinions of two academicians of education field were taken. Questionnaire is generally considered to be high in reliability as it is composed of closed questions. The graduate students were required to answer the questionnaire by ticking the appropriate box. The data obtained from the research has been presented in graphs and the results of the research has been presented through them.

Participants

To provide the most accurate and qualitative data and to make this research more beneficial, our research participants comprise 81 graduate students of University "Kadri Zeka" who completed their studies in the Faculty of Education respectively preschool or primary program during different academic years. The graduate students have been selected because it is presumed that they have acquired substantial amount of knowledge and skills for teaching including implementing the new school curriculum. The questionnaire has been submitted online.

Results

Regarding the results of the questionnaire, a total of 9 questions were used to measure the impact of the Faculty of Education in preparing its graduates for the implementation of the new school curriculum. Graduate students of the University "Kadri Zeka" in Gjilan, Kosova were asked to evaluate through the Likert scale, except in some cases where other response options were used. The responses received from the research group consisting of 81 graduates have provided considerable help in highlighting the real data on the topic chosen for research. The results of the questionnaire have been analyzed and are presented in more details below.

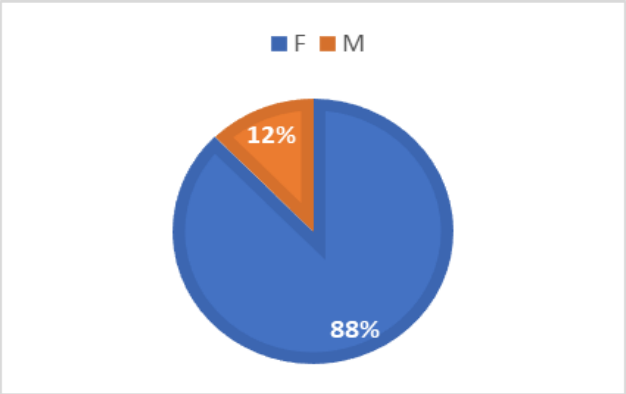

Figure 1. The data for the gender of the graduates

Based on Figure 1, out of 81 (100.0%) participants in the research, 71 (88%) were female and 10 (12%) were male.

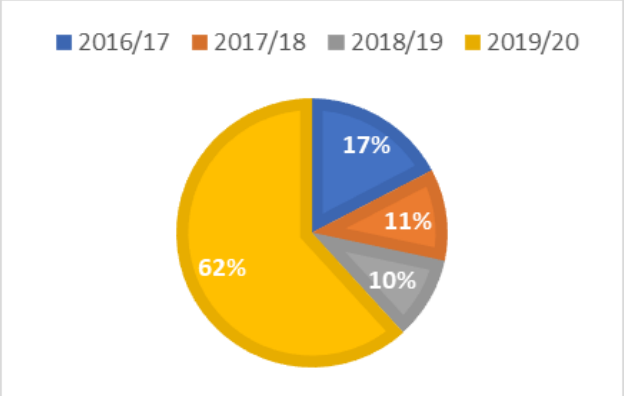

Figure 2. The data for the graduation time

Regarding the graduation time of the participants, 50 (62%) of them graduated in the academic year 2019/20, 14 (17%) in the 2016/17 academic year, 9 (11%) in the 2017/18 academic year and 8 (10%) in the academic year 2018/19.

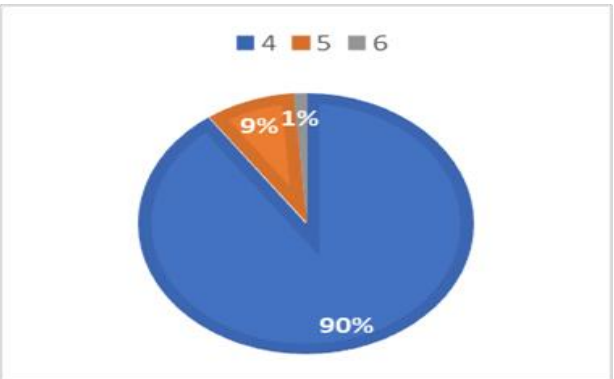

Figure 3. The data for the duration of studies

Figure 3 shows that the studies of 73 (90%) graduate students lasted 4 years, 7 (9%) 5 years and 1 (1%) 6 years. From the table, it can clearly be seen that most of the participants had completed their studies on time.

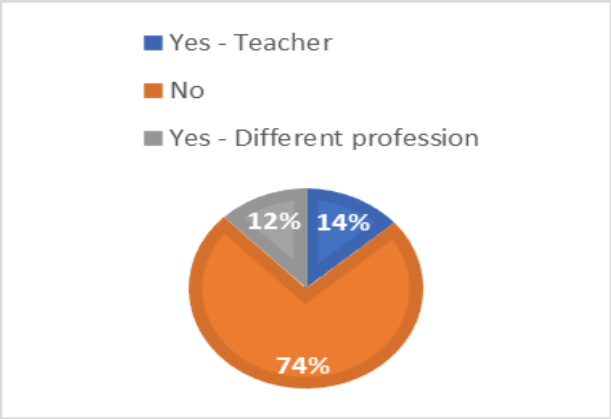

Figure 4. The data for the employment of the graduates

With reference to the results from figure 4, it can be seen that 60 (74%) of participants are unemployed, 10 (12%) are employed in the teaching profession whereas 11 (14%) of participants work in different fields.

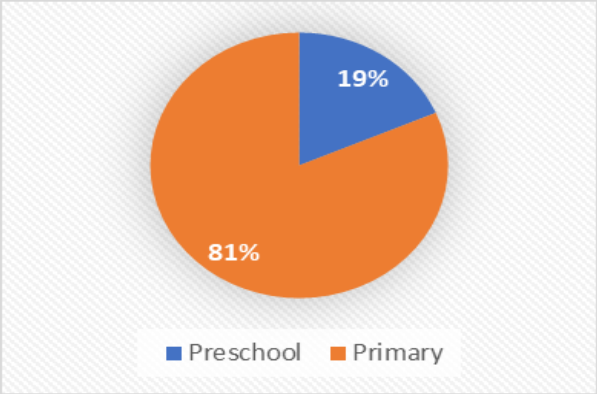

Figure 5. The data for the program of studies

The above figure shows that the questionnaire was filled out by 66 (81%) graduates of the primary program and 15 (19%) graduates of the preschool program.

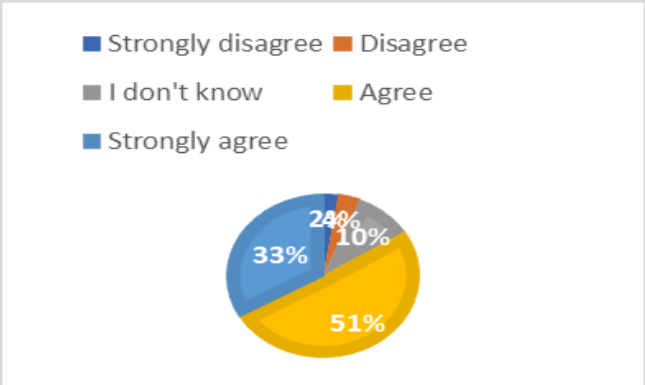

Figure 6. The research results for the statement: Studies at the UKZ Education Faculty helped me to develop key competencies for the teaching process.

Figure 6 presents the data for the statement: Studies at the UKZ Education Faculty helped me to develop key competencies for the teaching process. 41 (51%) of graduate students

answered: I agree; 27 (33%) answered: I strongly agree; 8 (10%) answered: I don’t know; 3 (4%) answered: I disagree; and 2 (2%) answered: I strongly disagree.

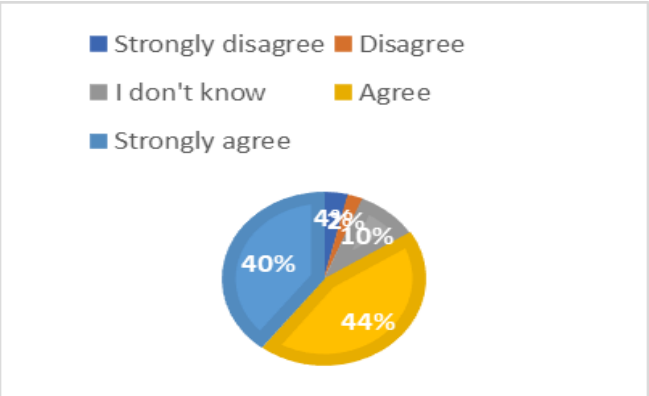

Figure 7. The research results for the statement: The duration of studies for the preparation of preschool / primary teachers enabled my preparation as a teacher

Regarding the statement: The duration of studies for the preparation of preschool / primary teachers enabled my preparation as a teacher. We received the following responses from the graduates: 36 (44%) responded: I agree; 32 (40%) responded: I strongly agree; 8 (10%) responded: I don’t know; 2 (2%) responded: I disagree; and 3 (4%) responded: I strongly disagree.

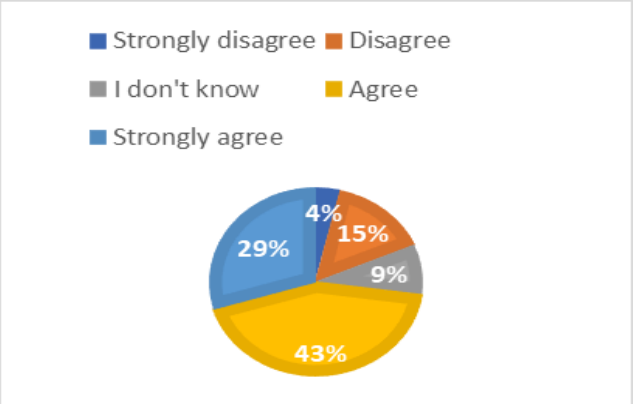

Figure 8. The research results for the question: Do you think that the study program offered by the faculty has prepared you for the labor market?

The opinions of the graduates on the question: Do you think that the study program offered by the faculty has prepared you for the labor market? can be seen in Figure 8: 35 (43%) agreed; 24 (29%) strongly agreed; 7 (9%) did not have an opinion on the question; 12 (15%) disagreed; 3 (4%) strongly disagreed.

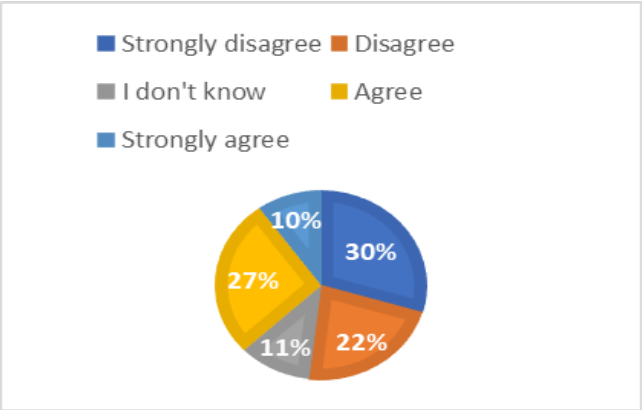

Figure 9. The research results for the statement: The study program has provided me with key competencies from the Kosovo Curriculum Framework – KCF

In Figure 9 are shown the answers of the statement: The study program has provided me with key competencies from the Kosovo Curriculum Framework – KCF. 22 (27%) of the responding graduates said: I agree; 24 (30%) said: I strongly disagree; 18 (22%) said: I disagree; 9 (11%) said: I don't know; and 8 (10%) said: I strongly agree.

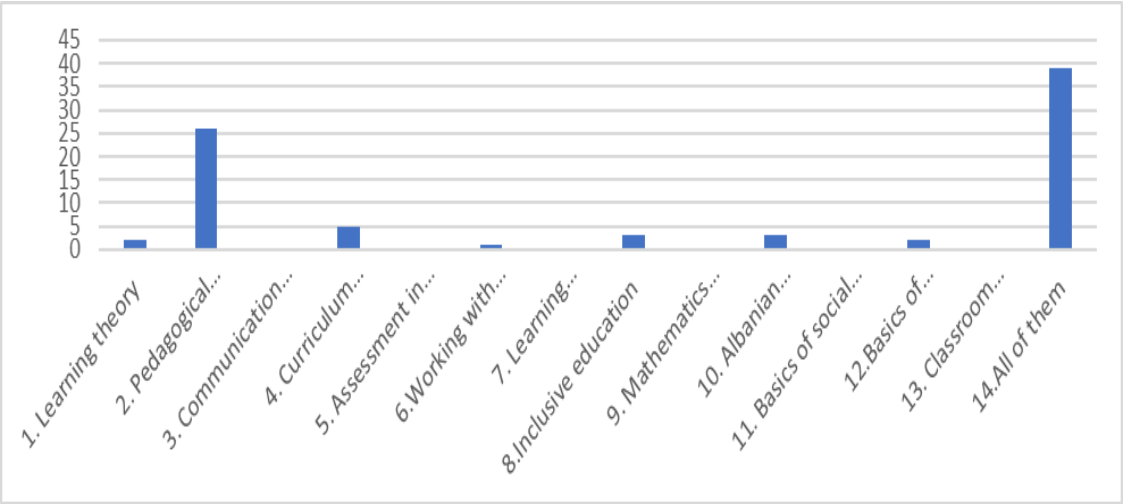

Figure 10. The research results for the question: Which of the study program courses are the main courses of your training and professional development?

Regarding the graduates' responses on the question: Which of the study program courses are the main courses of your training and professional development? Figure 10 shows the following results: 39 (48.1%) chose the option: all of them (all the courses listed under the question); 26 (32.1%) chose the course: Pedagogical practice; 3 chose: Inclusive education; 3: Albanian language methodology; 2: Learning theory; 2: Basics of natural sciences with methodology; and 1: Working with Gifted and Talented Children.

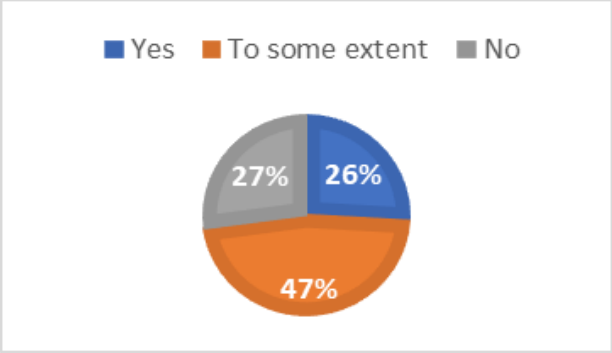

Figure 11. The research results for the question: Do you think that the above-mentioned courses are sufficient for your preparation in the implementation of the Kosovo Curriculum Framework - KCF?

Do you think that the above-mentioned courses are sufficient for your preparation in the implementation of the Kosovo Curriculum Framework - KCF? Graduates' answers to this question are shown in figure 11; 38 (47%) said: to some extent; 21 (26%) said: yes; and 22 (27%) said: no.

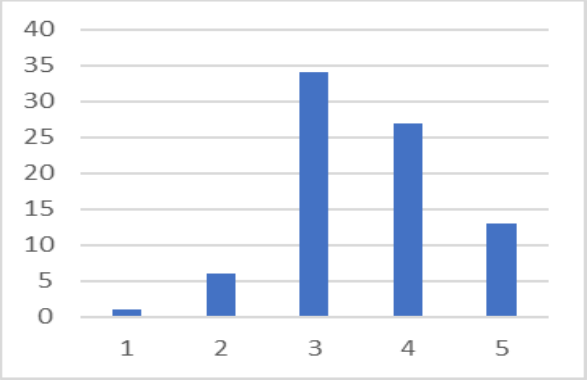

Figure 12. The research results for the question: What is your overall evaluation of the quality of the study programs you have attended / completed? – 1 = worst; 5 = best.

Regarding the quality of the study program, 34 (42%) of graduates evaluated it with the grade 3; 27 (33.3%) with the grade 4; 13 (16%) with the grade 5; 6 (7.4%) with 2; and 1 (1.2%) with 1.

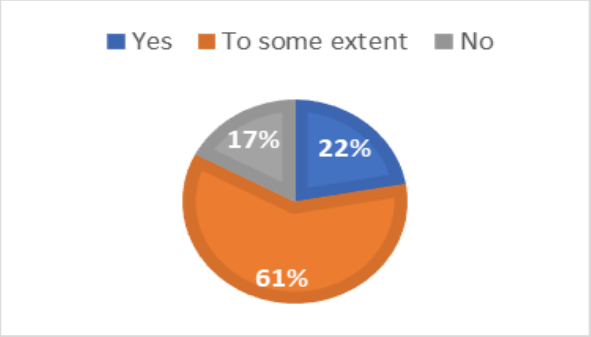

Figure 13. The research results for the question: Is the literature used by the professors appropriate for your training and professional development?

As it can be seen in figure 13, the results of the question: Is the literature used by the professors appropriate for your training and professional development? are: 49 (61%) of the graduates answered: to some extent; 18 (22%) answered: yes; and 14 (17%) answered: no

Discussion

In this section of this study, it is important to compare and contrast the findings with the literature review. The results of this research paper indicate that studies at the UKZ Education Faculty help students to develop key competencies for the teaching process. The majority of the graduate students chose agree and strongly agree as shown in figure 6. This result is consistent with UKZ self-evaluation report (2016) stating that the graduates of the Faculty of Education acquire knowledge and competences from general, academic and didactic-methodological courses.

According to University "Kadri Zeka" (2021) its graduate students are able to dismantle the curriculum into activities planned for children, orienting their work according to the approach with the child in the center as well as organize educational activities aiming at achieving learning outcomes, provided by the Kosovo Curriculum Framework, according to the respective fields. Yet, the opposite of this resulted in this research paper, figure 9 shows that when students were asked whether the study program has provided them with key competencies from the Kosovo Curriculum Framework 22 (27%) of the responding graduates said: I agree; 24 (30%) said: I strongly disagree; 18 (22%) said: I disagree; 9 (11%) said: I don't know; and 8 (10%) said: I strongly agree. The reason is that graduate students of the University "Kadri Zeka" who participated in this research completed their studies before the last re-accreditation process in which significant changes have been made with regard to the new school curriculum. The course pedagogical practice help students develop certain knowledge, skills and attitudes to be educators at the primary and preschool level (University of Prishtina, 2004). Similarly, this research paper concludes that primary and preschool programs' courses respectively pedagogical practice are the main courses of students' training and professional development.

Conclusions and Suggestions

Based on the abovementioned findings of the study, the following conclusions are drawn:

University "Kadri Zeka" respectively Faculty of Education prepares its students to develop key competencies for the teaching process.
The majority of students agreed that the studies at UKZ enabled their preparation as a teacher.
The study programs offered by the Faculty of Education such as primary and preschool program prepare the graduate students for the labor market.
The UKZ Faculty of Education offers many courses that train and develop students professionally.

Suggestions based on the results of the present study are as follows:
University "Kadri Zeka" respectively Faculty of Education should offer more courses in all areas of the current curriculum so that graduate students can effectively implement the new school curriculum.

The Professors of the UKZ Faculty of Education should provide materials or create better materials on the current curriculum to ensure that all students receive the information that is necessary for them to be successful in implementing the new school curriculum.
The Faculty of Education students must be in constant search of professional development as well as demand opportunities to expand knowledge about teaching strategies.

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Appendices

Questionnaire

Dear graduate students, through this questionnaire we would like to receive your opinions regarding your preparation for the implementation of the new school curriculum in your teaching. It is thought that you can best assess the preparation or non-preparation of students to work according to the new curriculum, so we believe that your answers will help us ascertain the impact of the Faculty of Education in preparing its graduates for the implementation of the new school curriculum.
I appreciate your cooperation!

1. Respondent details:
Gender: Female Male

Graduation time: Academic year 2016/17; 2017/18; 2018/19; 2019/20

Duration of studies: 4 years 5 years 6 years

Are you employed?: Yes-teacher; No; Yes-different profession

Program: Preschool Primary

2. Studies at the UKZ Education Faculty helped me to develop key competencies for the teaching process
Strongly disagree
Disagree
I don't know
Agree
Strongly agree

3. The duration of studies for the preparation of preschool / primary teachers enabled my preparation as a teacher
Strongly disagree
Disagree
I don't know
Agree
Strongly agree

4. Do you think that the study program offered by the faculty has prepared you for the labor market?
Strongly disagree
Disagree
I don't know
Agree
Strongly agree

5. The study program has provided me with key competencies from the Kosovo Curriculum Framework – KCF
Strongly disagree
Disagree

I don't know
Agree
Strongly agree

6. Which of the study program courses are the main courses of your training and professional development?
1.Learning theory;
2. Pedagogical Practice;
3. Communication in education;
4. Curriculum development;
5. Assessment in education;
6. Working with Gifted and Talented Children;
7. Learning difficulties;
8. Inclusive education;
9. Mathematics teaching methodology;
10. Albanian language methodology;
11. Basics of social sciences with methodology;
12. Basics of natural sciences with methodology;
13. Classroom management and discipline;
14. All of them

7. Do you think that the above-mentioned courses are sufficient for your preparation in the implementation of the KCF?
a. Yes
b. To some extent
c. No

8. What is your overall evaluation of the quality of the study programs you have attended / completed? – 1 = worst; 5 = best
1 2 3 4 5

9. The literature used by the professors is appropriate for your training and professional development
a. Yes
b. To some extent
c. No