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About the Journal

Journal of Educational Technology and Online Learning (JETOL) is an international, refereed, open access e-journal. The Journal targets both researchers and practitioners of educational technology and online learning fields. JETOL has been being published triannual, in January, May, and September. JETOL is currently indexed by Ebsco Host, ProQuest, Index Copernicus, Cite Factor, COSMOS IF, BASE (Bielefeld Academic Search Engine, Google Scholar, LOCKSS, Open- J Gate, International Institute of Organized Research (I2or), Eurasian Scientific Journal Index (ESJI), Directory of Research Journals Indexing (DRJI), ResearchBib, Rootindexing, ASOS Index, ROAD, Rootindexing.

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From the Editors

Dear JETOL readers,

We all witness strange times… After Corona virus outbreak in December 2019, there is a global crisis and the globe is either under lockdown or following social distance protocols. Distance education and online learning appeared to be the new normal. Journal of Educational Technology and Online Learning (JETOL) visions online learning not as an emergency mode, but part of mainstreaming. In such an interesting time, we strive for providing quality articles to contribute to fields of educational technology and online learning.

In our third age, in other words, third volume and first issue, we introduce a wide array of articles. We would like to thank to all authors and reviewers who contributed to the advancement of scientific knowledge and to the field of educational technology and online learning.

In our third year, we worked hard and gained a great momentum and indexed in different databases: EbscoHost, ProQuest, Index Copernicus, Cite Factor, COSMOS IF, BASE (Bielefeld Academic Search Engine, Google Scholar, LOCKSS, Open- J Gate, International Institute of Organized Research (I2or), Eurasian Scientific Journal Index (ESJI), Directory of Research Journals Indexing (DRJI), ResearchBib, Rootindexing, ASOS Index, ROAD, Rootindexing. We hope that JETOL will continue to be a premier source for those who seek and pursuit knowledge.

We hope and believe that, as an open access journal, we will move forward and contribute the universal knowledge ecology.

Yours respectfully,

Dr. Gürhan Durak

Dr. Aras Bozkurt

Editors in Chief

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Disablers and enablers in the uptake of information communication technologies in rural primary schools of Mwinilunga District, Zambia

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Abstract

In this study we interrogated disablers and enablers in the uptake of Information Communication Technologies (ICTs) in five rural primary schools in Mwinilunga district, Zambia. A qualitative research methodology and descriptive research design were applied. An interview schedule and focus group discussions were used as research instruments to interrogate the research problem. Findings of the study were that the teaching of the ICT component particularly in Creative and Technology Studies in rural schools of Mwinilunga district faced many challenges such as lack of ICT equipment, poor internet connectivity, limited skilled human resources and lack of supportive infrastructure. To overcome the disablers, various strategies were applied by schools such as use of personal cell phones as teaching devices, use of zonal schools for capacity building points in ICTs and use of ICT expert teachers as resource persons. The study recommends that Government should make provision for computers and computer facilities in schools through collaboration with other education stakeholders, The government through the Ministry General Education should train more teachers in ICT teaching methodologies and should provide all schools with power supply so that teachers in rural areas can effectively implement the teaching of Information Communication.

1. Introduction

This study is an extract from the lead researcher's master's dissertation pursued at Chalimbana University in Zambia. The thrust of the study focused on implementation of ICT Component of Creative and Technology Studies in Rural Primary Schools of Mwinilunga District, Zambia. The use of information and communication technologies (ICT) has increased in Zambia because of its importance in achieving developmental goals and promoting citizens participation in national development. Acquiring basic knowledge in ICT contributes to national wealth creation. For this to be achieved, education is the best vehicle for carrying out this development.

The research site for this study was Mwinilunga District, one of the remote districts of Zambia, located in North-Western Province. As of the 2000 Zambian Census, the district had a population of 117,505 people (Central Statistics Office, 2010). The source of the Zambezi River is located here, near Kalene Hill, before flowing southwestward into Angola. Mwinilunga is one of the wettest places in Zambia with an annual rainfall of about 1,400mm. Mwinilungu would have benefited from trade with Angola and the DR Congo,

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but wars, bad road conditions and various trade policies between the countries have so far prevented this. Zengamina is a small hydroelectric power generation plant near Kalene Hill in Mwinilunga (Peša, 2013).

Fig. 1. Location of Mwinilunga District in Zambia

From the time Zambia gained its independence, it has invested heavily in education. The Ministry of General Education has been channelling considerable resources and expertise into creation of effective systems and policies that should have a positive impact on students and learning outcomes (Mengo, 2018). In 2012, a policy framework known as Vision 2030 was implemented with the main aim of developing Zambia. Part of this vision was that education was aimed at moulding learners into whole individuals who will contribute profitably to society (UNICEF & World Bank, 2009). In line with this aim, in January 2014, the PF (Patriotic Front) government implemented the ICT policy in primary and secondary education programmes to provide more opportunities to the disadvantaged school-aged children (Phiri & Phiri, 2017).

1.1 Background

Information communication and technologies refers to technologies that provide access to information through telecommunications. Information technology (IT) is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data (Tech Terms, 2010). Knowledge of ICT is a basic requirement in today's world, and technological progress is driving development in all fields.

The education sector is the only one that can bridge the gap in ICT knowledge. This starts at the grassroots level which is primary education and proceeds to the highest learning institutions. In recent times, we have noted that there is an increasing demand for ICTs in schools. To highlight and expand upon previous foundational studies on the disablers and enablers in the uptake of ICT in rural primary schools, Mphahlele (2018) conducted a study on the use of ICT to support learners experiencing reading difficulties in full-service schools in South Africa. Her study revealed the need to use ICTs in the teaching and learning in primary schools. According to Mwaaba (2015), in Zambia, the teaching of ICT is compulsory and all private, community and government schools are mandated to teach ICT.

In our view, this can be attributed to the heightened levels of civic awareness arising from the civic educational processes. These observations are also echoed in the works of the other scholars among them (Bergersen & Muleya, 2019; Habanyati et al., 2020; Machila et al., 2018; Magasu et al., 2020; Muleya, 2017a, 2017b, 2018a, 2018b, 2019; Mupeta et al., 2020; Mwase, et al. 2020; Mwanangombe et al., 2020).

Therefore, the increased demand for the ICTs in schools is seen as making a huge contribution to the social and economic development in the area of employment and productivity, and in the area of increased access to higher quality of life among the many other factors (Tech Terms, 2010).

Mastering ICT skills and using ICT to improve the teaching and learning environment, according to Boafo (2017), is of utmost great importance to teachers in creating a new learning culture. Ghavifekr and Rosdy

(2015) noted that teachers play a critical role in imparting knowledge to their learners in order to allow them to compete favourably in the modern labour market which is mostly ICT-based. ICT presents many opportunities for improving the way we live, the way we teach and the way we learn.

One of the benefits of using technology in the classroom is that it enriches learning through a combination of audio, video, images, texts and collaboration (Suryazni, 2010). Teaching of ICT in primary schools is very important. According to Mengo (2018), Vision 2030 appeals for a robust general education centred on science and technology through a curriculum that involves new teaching methodologies. The Zambian government has developed an ICT policy that aims at ensuring that children learn ICT from primary to tertiary level.

Though the implementation of the ICT policy is progressing well in some schools in Zambia, some challenges, referred to here as disablers, in line with Simui (2009), Simui (2018), and Simui, Kasonde-Ngandu, Cheyeka, Simwinga, and Ndhlovu (2018) have negatively affected the implementation of the ICT policy as noted by UNICEF and World Bank (2009). This, therefore, poses a problem which requires attention if the goals envisioned in the Vision 2030 are to be realised.

1.2 Statement of the problem

Following the publication of Vision 2030, a government policy was developed in 2012 whose aim is for a strong general education base in science and technology, and provision of a curriculum that takes into account new teaching methodologies. The introduction of ICT in primary schools under the revised curriculum has been observed differently by members of society (Mwambazi, 2019). While the introduction of ICTs is a step in the right direction, its implementation in some schools in Zambia remains limited. This situation if not addressed has the potential of derailing the very good intentions that are espoused in the various policy frameworks guiding education provision in Zambia. The solution to address this matter has become a moral imperative.

1.3 Purpose of the study

The purpose of the study was to explore the implementation of ICT in selected rural primary schools of Mwinilunga district, Zambia.

1.4 Research objectives

The specific objectives that guided this study were to:

- Describe the disablers affecting the teaching of ICT in rural primary schools, and
- Explore the strategies used to enhance ICT uptake in rural primary schools.

1.5 Theoretical framework

The study applied the Technology Acceptance Model (TAM). The model developed by Davis (1989) is an adaptation of the model Theory of Reasoned Action (TRA). The development of the TAM resulted from an IBM Canada contract with the Massachusetts Institute of Technology in the 1980s to evaluate the market potential for new products of the brand and to explain the determinants of computers use (Davis, Bagozzi, & Warshaw, 1989). Davis et al. (1989) defined the two main determinants of TAM as follows: (i) perceived utility – the degree to which a person believes that the use of a particular system may improve his performance; and (ii) the facility of perceived use – the degree to which a person believes that the use of an information system will be free of effort.

2. Literature

To gain an understanding of the existing research and debates relevant to disablers and enablers in the uptake of ICT in rural primary schools, the authors reviewed the recent literature that is presented in this section. Pumulo, Mulauzi, and Walubita (2019) focused on the benefits and challenges of computer

education in the curriculum of Zambian primary and secondary schools. The findings revealed that there was insufficient ICT infrastructure in schools. Teachers had a limited knowledge of computers and lacked interest in ICTs. Equally, there were inadequate ICT facilities and equipment; lack of time to adequately teach computer studies; a large teacher/pupil ratio; unreliable or inadequate power supply; a lack of trained teachers in ICTs; a lack of technical support to maintain and upgrade computing equipment; limited financial resources; and a lack of internet connectivity. The study by Pumulo et al. (2019) was conducted in Western Province Mwandi, a newly created district, while the current study was conducted in North-Western Province Mwinilunga, one of the oldest and biggest districts in the province.

Phiri and Phiri (2017) focused on negative factors affecting ICT implementation in selected secondary schools in Chipata District. Findings revealed that there were ICT facilities in the secondary schools such as computers, computer laboratories, internet connections, alongside the traditional methods of telecommunication. However, they revealed that projects involving ICT use and integration in the secondary schools had both internal and external challenging factors leading to weak implementation of ICT projects. The study was done in urban secondary schools of Chipata in the Eastern Province, Zambia while the current study was conducted in rural primary schools of Mwinilunga District, Zambia.

Ghavifekr, Kunjappan, Ramasam and Anthony's (2016) findings indicated the key issues and challenges found to be significant in using ICT tools by teachers included limited accessibility and network connection, limited technical support, lack of effective training, limited time and lack of teachers' competency. The results from an independent t-test showed that use of ICT tools by male teachers (M =2.08, SD =.997) in the classroom was higher than by female teachers (M = 2.04, SD =.992). Their study was conducted in Malaysian secondary schools while the current study was conducted in Zambian primary schools. The former study used a quantitative research design while this study used qualitative research design.

Ndzebele (2013) undertook a study on challenges faced by schools when introducing ICT in developing countries. The findings were that developing countries face several challenges in introducing ICT, mainly a lack of knowledge and skills, time, equipment, maintenance, internet and insufficient funds. The study was conducted in Swaziland using a mixed method design while the current one was conducted in Zambia using a qualitative research design.

Hinostroza (2017) showed that many students and teachers lack the digital skills needed to make effective use of these tools, which limits their potential impact; can have negative consequences for students' learning; and can increase educational inequalities, especially in developing countries.

3. Methodology

This paper is empirical in nature, and a qualitative survey was used to gain in-depth information from the teachers about disablers and enablers in the uptake of ICT in rural primary schools. According to Jansen (2010), a survey can be used to gather information from a sample of entities for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members. It should, however, be noted that for this study, the authors used an open-ended questionnaire to get responses that were qualitative in nature from the teachers in rural primary schools in Mwinlunga.

3.1. Data Collecting Tools

An open-ended questionnaire was used to collect data from 45 teachers and 5 head teachers from five schools in Mwinlunga district, Zambia between September and November 2019.

3.2. Sampling Procedure

Five primary schools participated in the study: Kanyihampa, Kabanda, Mwinilunga, Nswanakudya and Kasangezhi. The schools were purposefully selected for the study since these are the biggest schools in the district with the largest enrolment of pupils and largest cohort of teachers, representing almost half of the

primary schools in Mwinilunga district. Equally, Nswanakudya and Kasangezhi were schools on the outskirts of the district.

3.3. Data Analysis

The authors read through the responses on each questionnaire completed, mapped out a few general categories and classified the responses. Sub-categories were created from the general ones and they were linked with the objectives of this study, namely, (1) to describe the disablers affecting the teaching of ICT in rural primary schools, and (2) to explore the strategies used to enhance ICT uptake in rural primary schools.

3.4. Trustworthiness

In qualitative research, according to Simon and Goes (2016) or trustworthiness and consistency are discussed in terms of the credibility, transferability, dependability, and confirmability of the instrumentation and results of the study. For this study, the authors conducted member checks, and used reflexivity and peer review.

3.5. Research Procedures

The first author visited the five schools, issued the participants with the information sheet related to the study, and requested the participants to read through and sign the consent form when satisfied with the information. Forty-five teachers returned the consent forms and they were given the questionnaire to complete. The questionnaire was completed in about five minutes and the author brought the questionnaires to other authors for analysis.

4. Findings and Discussions

4.1. Findings

Findings for this study are presented according to the sub-categories formulated in relation to the objectives. The sub-categories are *challenges affecting the teaching of ICT in rural Primary schools* and *strategies applied to enhance ICT teaching in Rural Primary Schools*.

Strategies applied to enhance ICT teaching in Rural Primary Schools.

Given the many challenges faced by primary schools to implement ICTs in teaching creative Technology studies, the following emerged at strategies schools were using as demonstrated in Figure 2 below:

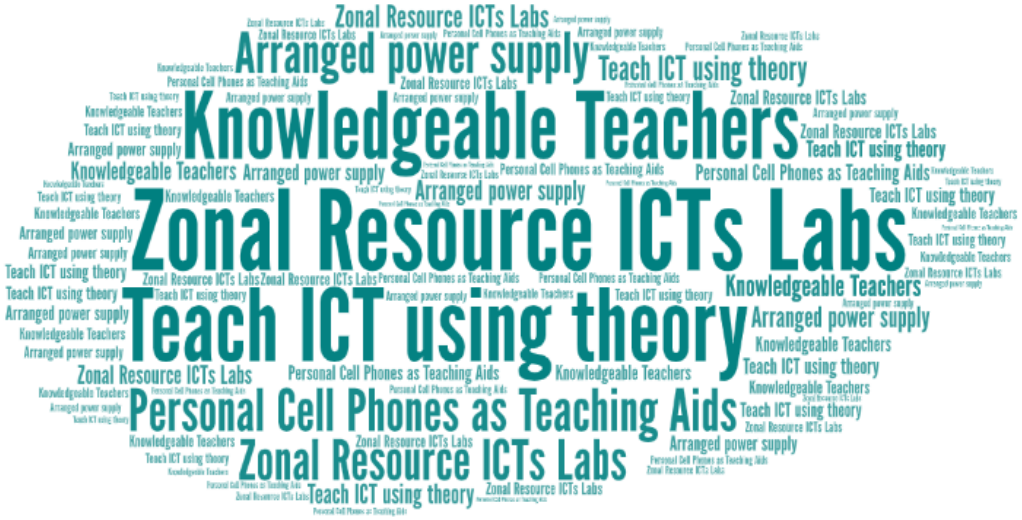

Fig. 2. Antidotes to disablers to uptake of ICTs in Rural Primary Schools

The figure shows that zonal resource centre laboratories were used for all the classes and teachers used their personal phones by to teach ICTs. In addition, schools relied on teachers with expertise in computer studies to orient others during teacher group meetings.

At Kasangezhi Primary School for example, the Head Teacher noted that "*At our school ICT is taught by a few teachers who have acquired some basic skills in computer literacy. Also some teachers who have interest in the subject help others in some topics."*

The Head Teacher's observations were echoed by Teacher K who observed that "*We teach the ICT component using theory. We orient ourselves on the teaching of ICT during teacher group meetings."*

By and large, the lack of specialised ICT equipment and internet connectivity forced teachers to teach theory at the expense of practice. For instance, Teacher M noted that *"Teachers use theory method. Teachers use their phones to teach ICT topics."*

Equally, teachers were observed to have devised personal initiatives by using their own personal cell phones as gadgets for teaching ICTs. Teacher K at Kanyihampa noted that *"Sometimes teachers use phones to teach ICT. Sometimes teachers with basics orient us during teacher group meetings on how teach some topics. Pupils attend lessons in the computer lab in groups instead of learning at once where by their lesson consumes the time for other."*

Further, the Head Teacher at Kanyihampa Primary School recounted that *"Our school relies on some few teachers with basics in ICT. These are the ones who handle creative and technology studies. The few teachers who have some knowledge in ICT orient others in teacher group meetings. Sometimes the school arranges for power. When a teacher wants to present an ICT lesson, the school management arranges for power to enable the lesson to be taught."*

Use of personal cell phones was equally reported at Kasangezhi and Kabanda Primary Schools as Teacher W and head teacher respectively. "*Some teachers use the initiative of teaching the basics with phones. Mostly teachers teach the subject using theory."* (Teacher W). *"The school relies on a teacher who has recently been deployed who was trained in some basics of computer studies. The same teacher at times orients other teachers on the computer basics during teacher group meetings. Teachers use phones to teach ICT basics to the learners."* (Head Teacher, Kabanda Primary School).

Other strategies schools deployed included the use of zonal laboratories supported by Zambia Information and Communication Technology Authority (ZICTA). For example, Head Teacher, Mwinilunga Primary School (2020) noted that: *"Twice in a week we take the children to the zonal computer lab to learn ICT due to other classes who need to use the computer lab. We use teachers who have acquired some basics in computer literacy to teach learners. Our teachers sometimes use their phones to teach but [these] are not sufficient."*

Similarly, Teacher M from Mwinilunga Primary School reported that, "*We use the zonal resource centre lab for all the classes. Sometimes teachers use phones to teach some concepts of ICT.*"

4.2. Discussion

Findings show that 90% of the schools under study are affected by lack of computers. Schools like Kanyihampa and Mwinilunga Primary are zonal centres where there are ZICTA computers. However, they are not adequate since they are the only computers which even the secondary schools situated within the same premise with the primary schools rely on, most often they are used by the secondary schools as indicated by Kanyihampa Primary and Mwinilunga Primary respondents. Kiptalam et al. (2010) observed that access to ICT facilities is a major challenge facing most African countries, with a ratio of 1:150 computer to students against the ratio of 1:15 students in the developed countries.

According to Mungai (2011), computers are still very expensive and, despite spirited efforts by the government agencies, NGOs, corporate organisations and individuals to donate computers to as many schools as possible, there were many schools that were unable to purchase computers for use by their pupils.

The studies indicated that implementation of ICT would require the use of internet as source of information but that this needs to be complemented by traditional libraries. Unfortunately, the internet is only available in the urban schools. There is no internet in most of the rural schools.

Findings indicated that 60% of the schools lacked computer facilities like computer labs. Of the five schools under study, only two schools had computer labs provided by ZICTA. These were Kanyihampa Primary and Mwinilunga Primary. The other three schools, namely, Kabanda, Nwsanakudya and Kasangezhi did not have computer labs.

Findings show that all the primary schools did not have funds to purchase school computers due to the free education policy. Primary schools rely heavily on government grants which are not adequate and very erratic.

According to Mandzebele (2013), lack of equipment is another challenge faced by rural schools. The development of ICT infrastructure in a country is dependent on availability of resources such as computers, printers, multimedia projectors, and scanners which are not available in the institutions. The school may have computers and one printer but the other resources are not available. Using up-to-date hardware and software resources is a key feature in the diffusion of technology, but a rare experience in educational institutions.

Insufficient funds challenge the implementation of ICT teaching in rural areas. Effective and efficient use of technology depends on availability of hardware, software and having access to resources by teachers and students and administrative staff. Most of the computers in the schools are donations or projects from private companies or foreign donors. When the responsibility of maintaining the computers rests on the school, this is a challenge.

Findings indicated that 90% of teachers lack ICT knowledge and skills. At the Kayihampa Primary School, out of 36 teachers, four had acquired ICT basics; at Kabanda Primary School, out of 22 teachers, only three had acquired ICT basics; at Mwinilunga Primary School, only two out of 32 teachers had acquired ICT basics; at Nswanakudya Primary School, three teachers out of 10 had acquired ICT basics; and at Kasangezhi Primary School, only two out of five teachers had acquired ICT basics.

Lack of knowledge and skills among teachers is another hindrance to the implementation of ICT in rural schools. Mukalele (2013) confirmed that the demand for ICT learning is high but there are few qualified teachers. Many teachers have not been taught how to teach ICT. Teachers were hired to teach the subjects in their areas of expertise and are expected teach ICT as well (Mandezebele, 2013). According to Kassimu (2015), other contributing factors include teacher's unwillingness and lack of interest to teach ICT. According to Mungai (2019), there are more students willing to be taught computing skills than there are teachers to transfer the skills. This points to what others refer to as the "digital immigrant syndrome" (Muleya, Simui, Mundende, Kakana, Mwewa & Namangala, 2019, p. 6). This calls for investment in capacity building of teachers in the pedagogy of ICTs tools as well as usage of social media for teaching and learning purposes (Simui et al., 2018; Simui, et al., 2017).

Findings were that 40% of the schools under study did not have electricity or any other form of power supply. Kasangezhi and Nswnakudya did not have a power supply and experienced erratic access to the internet to facilitate the teaching of ICT despite having some teachers with ICT basics. Zambia National Union of Teachers (ZNUT) general secretary agreed that ICT lessons would not be a success unless electricity and computers were made available in all rural schools (Mengo, 2018).

According to Mungai (2011), whose study was undertaken in Kenya, lack of electricity hinders the teaching of ICT in rural schools. Many schools are still not yet connected to electricity; Kenya is a developing country, and the government has not been able to connect all parts of the country to the national electricity grid. Consequently, those schools that fall into such areas are left handicapped and may not be able to offer computer studies.

Many studies have indicated the challenge in implementing ICT in the developing countries especially in rural schools of Zambia. Mungai (2011) agrees that African countries are lagging behind in the implementation of ICT; that the digital divide continues to widen; and the digital literacy challenges are increasing.

5. Conclusion and Suggestions

Basing on the research findings, the conclusion is that the implementation of ICT in rural schools faces a number of challenges. The study indicates that schools in rural areas are faced with the challenge of lack of infrastructure and computer facilities. The study shows that schools in rural areas are faced with the challenge of lack of funds to purchase school computers. The study also found that many teachers lack ICT knowledge and skills, and there are still some schools which are not connected to any kind of power supply this hinders effective teaching ICT.

Drawing from the findings of the study on challenges in implementation of ICT in rural schools, the following suggestions are made:

- Government should ensure that all the schools are provided with computers and other facilities through collaboration with other education stakeholders and donors.
- Government through the Ministry of General Education should ensure that teachers acquire ICT knowledge and skills to effectively implement ICT policy in rural schools.
- Government should supply schools in rural areas with power.

References

Bergersen, A., & Muleya, G. 2019. Zambian civic education teacher students in Norway for a year – How do they describe their transformative learning? *Sustainability*, *11*(24), 7143.

Central Statistics Office. (2010). *Zambia 2010 census of population and housing*. Retrieved from: https://unstats.un.org/unsd/demographic-social/census/documents/Zambia/PreliminaryReport.pdf

Chipili, C. T., Ndhlovu, D., & Simui, F. (2018). Access to career guidance through information and communication technology by learners with visual impairment in selected secondary schools of Zambia. *Zambia ICT Journal,* 2(1), 57–65. Retrieved from: http://ictjournal.icict.org.zm/index.php/zictjournal/article/view/54

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–339.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Ghavifekr, S., & Rosdy, W.A.W. 2015. Teaching and learning with technology: Effectiveness of ICT integration in schools, *International Journal of Research in Education and Science (IJRES),* 1 (2), 175 – 191.

Ghavifekr, S., Kunjappan, T., Ramasam, L., & Anthony, A. (2016), Teaching and learning with ICT tools: Issues and challenges from teachers' perceptions. *Malaysian Online Journal of Educational Technology*, *4*(2), 38–57.

Habanyati, H., Simui, F., Kanyamuna, V., & Muleya, G. (2020). Lived experiences of multi-banked bank account holders with a focus on banks at Manda Hill Mall, Lusaka, Zambia. *Advances in Social Sciences Research Journal, 7*(6) 208–223.

Hinostroza, J. E. (2017). *New challenges for ICT in education policies in developing countries: The need to account for the widespread use of ICT for teaching and learning outside the school.* Retrieved from: https://link.springer.com/chapter/10.1007/978–3–319–67657–9

Kassimu, A. M. (2015). *Challenges facing implementation of ICT in primary schools.* Retrieved from: https://www.researchgate.net>2841

Machila, N., Sompa, M., Muleya, G., & Pitsoe, V. J. (2018). Teachers' understanding and attitudes towards inductive and deductive approaches to teaching social sciences. *Multidisciplinary Journal of Language and Social Sciences Education,* (2), 120–137.

Magasu, O., Muleya, G., & Mweemba, L. (2020). Pedagogical challenges in teaching civic education in secondary schools in Zambia. *International Journal of Science and Research (IJSR), 9*(3), 1483–1488. DOI: 10:21274/SR20327121153

Mengo, V. (2018). *ICT Education in schools: Pros and cons*. Retrieved from: www.dailymal.cozm>ict

Mphahlele, R. (2018). *Information communication technologies as a support mechanism for learners experiencing reading difficulties in full-service schools*. Pretoria: University of South Africa.

Mukalele, R. (2013). *10 Challenges facing implementation of ICT Education in Ugandan schools*. Retrieved from: rmukalele.blogspot.com>2013/07.

Muleya, G., Simui, F., Mundende, K., Kakana, F., Mwewa, G., & Namangala, B. (2019). Exploring learning cultures of digital immigrants in technologically mediated postgraduate distance learning mode at the University of Zambia. *Zambia Informational Communication Technology (ICT) Journal*, 3(3), 1–10.

Muleya, G. (2017a). The conceptual challenges in the conceptualization of civic education. *Journal of Lexicography and Terminology*, *1*(1), 59–81.

Muleya, G. (2017b). Civic education and civics: Where do we draw the line? *Journal of Lexicography and Terminology, 1*(2), 125–148.

Muleya, G. (2018a). Civic education in Zambia before and beyond the Golden Jubilee. In G. Masaiti (Ed.), *Education at fifty years of independence and beyond*. Unza Press.

Muleya, G. (2018b). Civic education versus citizenship education? Where is the point of convergence? *Journal of Lexicography and Terminology*, *2*(1), 109–130.

Muleya, G. (2019). Curriculum policy and practice of civic education in Zambia: A reflective perspective. In A. Petersen et al. (Eds.), *The Palgrave handbook of citizenship and education*. https://doi/10.007/978–3–319–67905–153–1

Mungai, M. (2011). *12 Challenges facing computer education in Kenyan Schools*. Retrieved from: https://www.ictworks.org>12challenges.

Mupeta, S., Muleya, G., Kanyamuna, V., & Simui, F. (2020). Imperial districts civic entrepreneurship: The implementation of civic innovations in the governance of the University of Zambia. *Advances in Social Sciences Research Journal, 7*(7) 674–685.

Mwaaba, C. (2015). *Challenges of ICT in community schools*. Retrieved from: https://www.times.com.zm>challenges.

Mwanangombe, C. Mundende, K. Muzata, K.K. Muleya, G. Kanyamuna, V & Simui, F. 2020. Peeping into the pot of contraceptives utilization among adolescents within a conservative culture Zambia. *American Journal of Educational Research*, *8*(8), 513–523.

Mwase, D., Simuyaba, E., Mwewa, G., Muleya, G., & Simui, F. (2020). Leveraging parental involvement in the education of their children as a conflict resolution strategy in selected secondary schools, Zambia. *International Journal of Research and Innovation in Social Science (IJRISS), |iv*(vii), 356–365.

Peša, I. (2013) Wealth, success, and personhood: Trajectories of labour migration from Mwinilunga District, 1930s-1970s. *Zambia Social Science Journal*, 4(1), Article 6. Retrieved from: http://scholarship.law.cornell.edu/zssj/vol4/iss1/6

Phiri, W., & Phiri, G. G. (2017). *Negative factors affecting ICT implementation in selected secondary schools in Chipata, Zambia.* Retrieved from: http://www.multiresearch.net/cms/publications/CFP2922017.pdf

Pumulo, J., Mulauzi. F., & Walubita. G (2019). *Chapter Five - Introduction of computer education in the curriculum of Zambian primary and secondary schools: Benefits and challenges*. Retrieved from: https://dspace.unza.zm/bitstream/handle/123456789/introduction%20of20compuiter%20education%20in%the%20of%20curriculum%20of%20zamian%20primary%20and%20secondary%20schools.pdf?sequence_1&isallowed-y

Simon M.K. & Goes, J. (2016). Reliability and validity in qualitative studies. In M.K. Simon, & J. Goes (Eds.), *Dissertation & scholarly research: recipes for success.* Retrieved from http://www.dissertationrecipes.com/reliability-validity-qualitative-studies/

Simui, F. (2009). Preparing teachers for inclusive education: A study of the English Approach. *Paper Presented at the SANORD 2ND International Conference: Inclusive and Exclusion in Higher Education*, Rhodes University, Grahmstown, South Africa, December 7 to 9, 2009.

Simui, F. (2018). *Lived experiences of students with visual impairments at Sim University in Zambia: A hermeneutic phenomenological approach.* Unpublished PhD Thesis. http://dspace.unza.zm/handle/123456789/5884

Simui, F., Mwewa, G., Chota, A., Kakana, F., Mundende, K., Thompson, L., Mwanza, P., Ndhlovu, D., & Namangala, B. (2018). "WhatsApp" as a learner support tool for distance education: Implications for policy and practice at University of Zambia. *Zambia ICT Journal, 2*(2), 36–44. https://doi.org/10.33260/zictjournal.v2i2.55.

Simui, F., Nyaruwata, L. T., & Kasonde-Ngandu, S. (2017). ICT as an Enabler to Academic Success of Students with Visually Impaired at Sim University: Hermeneutics Approach. *Zambia ICT Journal*, *1*(1), 5–9. http://ictjournal.icict.org.zm/index.php/zictjournal/article/view/9

Simui, F., Kasonde-Ngandu, S. Cheyeka, A. M., Simwinga, J., & Ndhlovu, D. (2018). Enablers and disablers to academic success of students with visual impairment: A 10–year literature disclosure, 2007–201. *British Journal of Visual Impairment*, 36 (2), 163–174. https://doi.org/10.1177/0264619617739932.

Tech Terms (2010). *ICT information and communication technologies*. Retrieved from: https://www.techterms.com>definition>ict

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Factors influencing EFL students' motivation in online learning: A qualitative case study

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Abstract

Motivation is one of the key factors that affect L2 learners' success and performance in the language learning process; that is why, widely concerns teachers and researchers. Amidst a global health crisis that urged most English preparatory schools across Turkey to carry out their English as a Foreign Language (EFL) lessons online, the question of motivation attracted even more attention. A qualitative case study was conducted in order to explore students' perceptions of online teaching and how it affects their motivation over a period of a seven-week-course. The data was collected through semi-structured interviews and creative writing samples of 12 students from an intact classroom. Both interviews and creative writing tasks demonstrated that students overall believe online education has a negative impact on their motivation due to lack of social interaction, a mismatch between expectations and content, organizational problems and the organization of learning environments. Pedagogical implications are listed.

1. Introduction

Due to the Covid health crisis, educators and students have been left with their feelings of uncertainty and the online courses in this context were implemented on a short notice. In such a climate of unpredictability surrounding online teaching, naturally many questions emerged as to its effectiveness, its impact on the teachers and students. The guiding question for the researchers in this study was students' motivation in a virtual platform which was new for all stakeholders. Understanding the factors that have an impact on students' perceptions could also help administrators to make informed decisions about the course and organizational design as well as guide professional development workshops for instructors.

The situation could be best explored through research that helps reveal the facts through systematic data collection and evidence from the classroom (Dikilitaş & Bostancıoğlu, 2019). Similary, Burston (2003) suggested that there is a need to focus on the different aspects rather than immediate learning while evaluating the impacts of Instructional Technologies (IT) on the curriculum; therefore, qualitative assessment of the impacts of technology comes into prominence. It was designed as a case study in order to get participants' perceptions within a specific context (Baxter & Jack, 2008).

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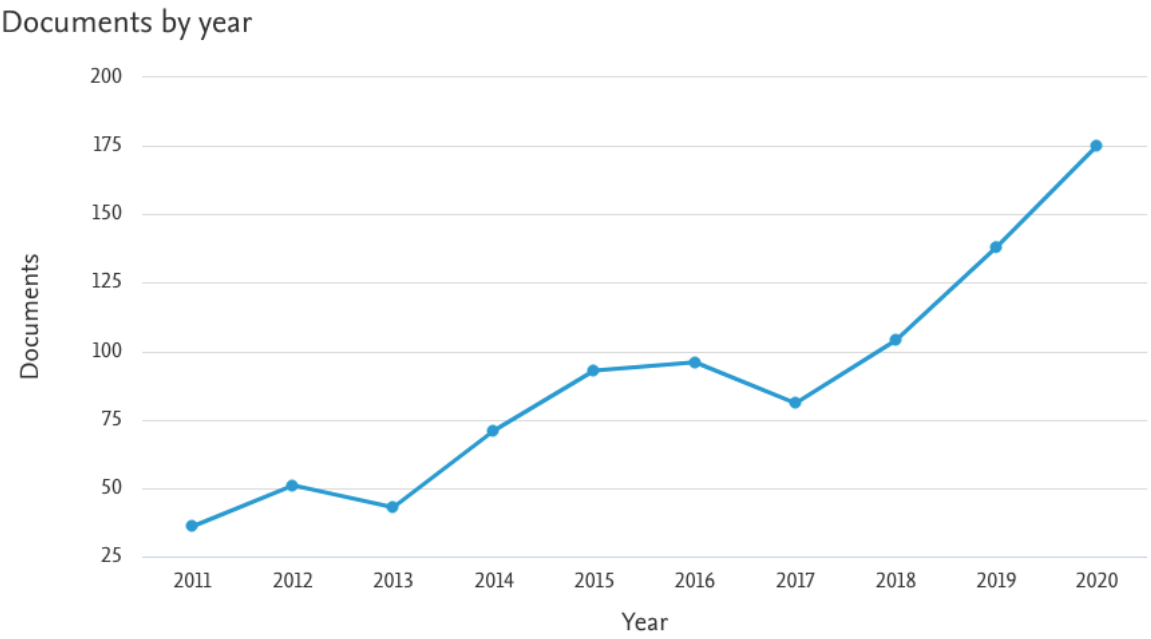

Fig. 1. The number of studies related to online learning motivation in the recent decade

As can be seen in Figure 1 obtained from Scopus database, the number of scientific studies on online learning motivation has increased dramatically over the recent years (Uçar & Kumtepe, 2020). This could be an indication that online learning leads to crucial questions related to learners' motivation and such studies will gain greater popularity in the future.

Based on above overviews, the present case study conducted with 12 learners from an intact classroom aims to expand the understanding of how virtual classrooms influence L2 learning motivation and what kind of practical implications might be suggested to boost learner motivation in these settings. To this end, this study sought to answer below question:

- What are the learners' perceptions of interplay between online learning and L2 learning motivation?

2. Literature Review

2.1. Definition of Motivation in Recent Decades

Researchers and educators have long been interested in learner motivation since it is closely connected to achievement and desired outcomes. Lumsden (1994) defines motivation as learners' willingness to take part in the language learning process. Dörnyei (2015) views it as an indispensable part of the challenging task of L2 learning and its absence will fail individuals even if they're equipped with the most outstanding abilities and a robust motivation will make up for important deficiencies. Motivation is the first condition to take on a learning task and is the engine that powers the process.

Dörnyei (2020) suggests the concept of motivation is closely associated with engagement and motivation must be ensured in order to achieve student engagement. He offers any instructional design should aim to keep students engaged regardless of the learning context, traditional or e-learning, which is a tough job considering the myriad of distractions in the new century. In the classroom environment, learner motivation, acquired through classroom experiences, or comes initially with the learner, plays a vital role (Hedge, 2001).

2.2. Motivation in Online Courses

Distance education has begun to become a widespread phenomenon since the mid-1990s and it comes with many benefits, including broader access to educational activities and learning opportunities, but also concerns regarding students and instructors' skills (Barbour & Reeves, 2009; Campbell & Sarac, 2018). Online learning can be described as a form of distance education made possible by technological devices used by isolated learners in their own settings away from the main education source (Hartnett, 2016).

Motivation is another question that calls for in-depth analysis when it comes to online learning environments (Burston, 2003). Motivation in online courses has been receiving attention in recent years (Chen & Jang, 2010; Baker, 2010; Hartnett et al., 2011; Richardson et al., 2015; Li & Tsai, 2017; Kyewski & Kramer, 2018; Özhan & Kocadere, 2020). While these studies do not specifically focus on L2 courses, their findings are still relevant for the learners of a foreign language in a virtual classroom.

Hartnett et al. (2011) describes motivation in online learning a complex phenomenon that is mostly affected by individual traits and specific contexts. Motivation is worth exploring in an online course because students are inclined to participate less (Kyewski & Krämer, 2018) and high attrition rates lead to motivational questions in distance education for instructional designers.

Various elements have been suggested to interact with online learning motivation in an effort to address the problems of attrition and participation. Learners experience lower levels of motivation when they skip classes or do not participate in the activities. De Barba et al. (2016) found state-level motivation at the moment of learning acts as a mediator between intrinsic motivation and participation. They further discussed that an online learning environment should cater for motivation and participation as situational interest is contextual and depends on how much activities and content are able to keep students' attention. Similarly, Chen and Jang (2010) suggest students need support tailored for their needs in order to decrease their anxiety and uncertainty as a suggestion to deal with attrition.

Course materials and tasks were also questioned in relation with motivation. Hartnett et al. (2011) reports identified regulation (acknowledging the value of an activity) in online settings is as much significant as intrinsic motivation. Thus, it's important to offer meaningful tasks to the learners and ensure grounds for honest communication between instructors and learners. Çebi and Güyer (2020) found a positive correlation between the intensity of students' engagement with course material and their motivation while their choices of materials did not have any impact on motivation.

Researchers asked questions whether gamification can lead to increased motivation. Özhan and Kocadere (2020) found that the experience of flow and affective commitment with the online educational setting with games significantly influenced the participants' motivation. In a similar vein, Kyewski & Krämer (2018) argued awarding badges might boost student motivation and used two different types of badges in their study exploring massive open online courses (MOOCs); one that can be seen by all students and one that can only be seen by the student who won it. They found that the public awards had no impact on intrinsic motivation, however; the students valued their unseen badges as they let them follow their progress.

Among the challenges that come along with online education is instructors' lack of online teaching experience. Instructor presence, which is teaching practices observable by learners usually in a live setting (Richardson et al., 2015), is an important factor that determines students' motivation in virtual classrooms (Baker, 2010). In a similar vein, students' lack of motivation is a critical factor on teachers' motivation as well. In a cross-sectional survey study that examined 39 EFL and English for Academic Purposes (EAP) teachers' experiences of online education at a non-profit private university, Şener et. al (2020) found that a lack of learner motivation, interaction and autonomy was the second most frequently referred issue influencing teacher' experiences. Therefore, it can be concluded that there is a dynamic interplay between learner motivation and positive classroom experiences in online settings.

2.3. Motivation in Online EFL Classes

The studies that delved into the relationship between online learning and learner motivation in a second language education course have examined hybrid courses or online asynchronous components of face-to-face courses (Ushida, 2005; Lin et al., 2017; Murday et al., 2008; Yantraprakorn et al., 2018).

Campbell and Sarac (2018) proposed that the technology is integrated into language learning at an increasing rate in order to boost students' motivation and maximize their understanding of the content. Rubio (2013), on the other hand, suggested that a well-designed blended course with online and offline elements can be more effective than a well-designed face-to-face or a well-designed purely online course in helping students maximize their motivation as well as proficiency in second language education.

Murday et al. (2008) and Ushida (2005) proposed that hybrid courses are generally regarded as more effective than their exclusively online counterparts as they do not rely too much on students' motivation. In Ushida's (2005) study that investigated motivation in online language courses, data was collected from 30 participants who attended different courses through three sets of questionnaires that investigated their general background, technology background and attitudes and motivation as well as through interviews. Their courses were mostly online while they also met as a class once a week and individually met with their teacher or language assistant for 20 minutes. The results of the study showed that students with high integrative motivation were overall more satisfied with the course and the researcher predicted a high correlation between the rates of voluntary participation in online discussions and motivational levels of the students. Ushida's (2005) study also concluded that teacher-specific motivational components, as suggested by Dörnyei (1994), were closely related with the creation of a classroom culture, which affected overall student motivation and attitude in the online classes.

Another study by Lin et al. (2017) investigated the roles of learning strategies and motivation on learning in an asynchronous language course, which is additional to face to face courses. They collected 466 completed surveys that measure their online-learning strategies and motivation. The study found the students had low levels of intrinsic and extrinsic motivation in their online education course. The researchers elaborated on the low motivation and discussed that it might have been caused by a lack of real-time interaction with instructors and classmates.

Another study which was conducted with 8 participants using a self-efficacy scale and interviews reported that insufficient or discouraging teacher feedback affected students' motivation to learn negatively in an online foreign language course in Thailand (Yantraprakorn et al., 2018).

Murday et al. (2008) reported a relationship between motivation and self-discipline based on their qualitative data. Their research proposed that students, who were accustomed to traditional classrooms, appreciated the newfound freedom in online courses, yet they also acknowledged it was hard to keep motivated and disciplined to study on a regular basis.

This study distinguishes itself with its focus on learner motivation in an exclusively online setting in Turkish context.

3. Methodology

3.1. Research design

A case study research design from qualitative research methodology was adopted in this study as the scope of case study is based on a phenomenon that is investigated deeply in its real context (Yin, 2009). The study was also designed as cross-sectional research because it was implemented at one time as the aim was not to investigate the changes in the variables over a period. This qualitative study aimed to explore the impact of online education on students' motivation using semi-structured interviews to understand students' perceptions deeper and a creative writing task in which students discuss their motivation in virtual classrooms.

3.2. Setting

The online course was launched by a prep school of a non-profit private university in Turkey and it aimed to guide students to pass the prep school's skills-based, B2-level proficiency test, in which all four skills have equal weight in terms of their impact on the students' final score. Therefore, the courses were organized to include 45 minutes of reading, listening, speaking and writing every day during the week. Every Friday mock exams were held to keep the students on track.

In the first four weeks, classes were divided into two in order to ensure closer monitoring by teachers. Because of low attendance, classes were later merged for the following three weeks. Attendance was voluntary for intermediate and higher-level students, which led overall attendance rates to fluctuate.

The students who only passed pre-intermediate level needed to successfully complete the online module in order to be eligible for the proficiency test. To achieve this, they needed to attend at least 70 percent of the classes and complete their assignments.

3.3. Participants

The study was carried out in an exclusively online course where 18 students were registered and attendance was voluntary. Twelve students participated in the present study, six of them (50%) completed pre-intermediate level and six of them (50%) completed intermediate level before starting the seven-week-long online module. None of them received an online language course prior to the virtual classes investigated in this study.

3.4. Data Collection Tools

In order to explore students' perceptions, semi-structured interviews (SSI) were conducted and creative writing assignments (CWA) were given to students on the topic of advantages and disadvantages of online education.

3.5. Data Collection Procedure

The instructor of the course gave students the writing assignments in week 4 while the semi-structured interviews took place at the end of the seven-week period. The transcriptions of the interviews and the creative writings of the students were examined by the two researchers to see common themes and categories, and the reliability of the findings were ensured by member checking.

3.6. Data Analysis

A thematic analysis was conducted from an inductive perspective, which lets the data lead the researchers who hold no preconceptions prior to the coding and thematization process (Dikilitaş & Bostancıoğlu, 2019). First a line-by-line coding was carried out in order to document the thought flow of each participant in the SSI and CWA separately by each researcher. Initial codes formed the themes. The codes and themes were later refined collaboratively by the two researchers and they were later organized under two major categories.

4. Results

In order for a better understanding of the impacts of online education on motivation, students' semi-structured interviews (SSI) and creative writing assignments (CWA) were transcribed and coded. Two major themes appeared. Students referred to the external factors and internal factors as they elaborated on their motivation in an online L2 learning classroom. The following figure demonstrates the main themes and sub-themes that emerged from qualitative data analysis.

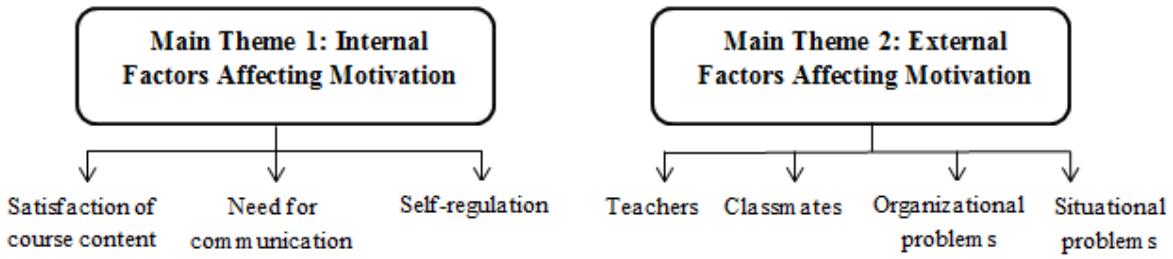

Fig. 2. Factors influencing EFL students' motivation in online learning

4.1. Internal Factors Affecting Motivation

The CWAs and SSIs showed the participants agreed that affective reasons had an impact on their online L2 learning motivation. Their expectations and satisfaction with the course content, communication needs and level of self-determination were frequently implicated and emerged as sub-themes.

4.1.1. Satisfaction of course content

Students frequently referred to their satisfaction with the online course content and materials by making it obvious where they stand on a self-determination continuum of motivation, which has intrinsic motivation and amotivation in its two ends. The students who were internally motivated (S1, S2 and S3) said in the interview that the course content and their expectations did not match.

Those who expressed intrinsic reasons to participate in the course were mostly disappointed as the course aimed to train the students for the proficiency exam. S1 said she hoped to be able to speak English fluently after a year of studying at the prep program: "I'm devoting one year of my life for this; I'd like to use English for myself in the future." (SSI)

S4, who experienced changing degrees of motivation as she was intrinsically motivated at first while later she only aimed to pass the proficiency test, said the materials were not presented in a coherent way and they were not challenging enough to get them prepared for the mock exams.

They had mixed reactions regarding the sufficiency of course materials. S1 said they were sufficient for some skills, such as speaking, not for the others. S2 said only speaking courses and teachers' gamified presentation of content were useful while others were mostly "boring" and "too easy" (SSI). S4 said the materials were not at the same difficulty level as the mock exams yet she enjoyed gamification as well (SSI).

S3, who reported both intrinsic and extrinsic motivation to pursue the virtual courses, said he was happy with the course materials and preferred to follow them for the exam preparation (SSI).

4.1.2. Need for communication

The participants also took an affective stance towards the online course due to their need for communication. They compared face-to-face classes with their virtual learning context and were critical towards the latter for not fulfilling their need for socialization with their friends.

"Seeing more people in the classroom definitely affected my motivation. We're under lockdown and it was so much better to come together in a large group. I'm sure there are others who agree with me." (SSI, S2)

S3 proposed students look for socialization in order to stay motivated to continue the online course: "Improving relationships is important for students because they want to get to know other students. Even recognizing each other could become effective." (CWA) He repeated the same view in the SSI: "I cannot feel motivated when the classroom is empty."

S4 said she needed other students to attend for feeling ambitious and motivated: "We can encourage each other to have ambition and motivation."

S8 also referred to a need for socialization to keep motivated: "When students see their friends with them, they are more motivated. They can exchange ideas." (CWA)

4.1.3. Self-regulation

Self-regulation appeared to be one of the crucial internal factors that impacted the students' motivation. The online learning environment clearly required the participants to develop new studying habits, which was a challenge for them.

"Because of online education most students can act undisciplined. Students feel more free because they are at home." (CWA, S1)

While they acknowledged that online learning was convenient, they felt simply feeling ready to get connected with the class was a challenge for them.

"It's hard to push yourself and sit in front of the computer, it takes discipline." (SSI, S2)

"It's tough to gather yourself and have the discipline to study for the class." (SSI, S4)

"They provide everything you need in an online course, it's up to you to pull yourself together and go for it." (SSI, S3).

Several students also mentioned the enjoyment they get from the course in order to sustain self-determination. They called the online courses "boring" (SSI; S2, S4), which caused them to lose motivation at times.

4.2. External Factors Affecting Motivation

Data from CWA and SSI revealed that participants in general believed that face-to face education was better than online education due to external reasons. A common opinion stated by all the participants against online education was that they found face-to-face education, especially classroom environment, more motivating. Regarding external factors, four minor themes emerged from the SSI and CWA.

4.2.1. Teachers

Class teachers in online education were reported to have affected students' motivation extrinsically in a positive or negative way depending on the context. All participants in the study pointed out that their language learning motivation depended highly on teacher-related factors, which in turn resulted in lower or higher extrinsic motivation. Teaching methods, lesson presentation, feedback and interaction with teachers were the issues mentioned by the participants. It was stated that the instructions and feedback by the teachers were not adequate sometimes, which led to lower motivation for attendance. S2 and S3 noted in SSI that "feedback varied a lot among instructors" indicating that their learning is hindered due to differences in the instruction and methods.

"I check the schedule and the teacher giving the lesson and then I decide whether to attend or not because the methods teachers use vary a lot." (SSI, S3)

Interaction with teachers was also reported to be limited when compared to face-to-face education as students couldn't communicate with their teachers as they usually do in face-to-face education.

"In face-to-face education, students can ask their question easily and without hesitation in class or in breathing time.Thus, students simultaneously learn what they did not understand. Though, in online classes, there is no chance like that because of the limited time and the short breaks." (CWA, S2)

"Face to face education is better than online education. If there are things you don't understand,you can ask questions to your teacher." (CWA, S7)

S2 also mentioned that she felt shy to send messages to teachers. She said that even if she had questions to ask teachers, she did not want to send mails or messages as she thought it would not be right thing to do and it would disturb the teacher. (SSI)

As part of interaction, the use of body language and facial expressions were touched upon by S1 as one of the factors affecting motivation. She compared virtual classes and traditional classes in terms of non-verbal expressions and said "...teachers cannot follow our (non-verbal) signals in virtual classes." (SSI)

4.2.2. Classmates

The impact of the classmates on motivation was reported to be another important factor by the participants.

"In the previous class, there were fewer students and I was less motivated; however, now that I see more students attending classes, I feel more motivated." (SSI, S2)

S8 also noted that having peers around in the classroom environment fosters their motivation because they 'exchange ideas'. (CWA)

Classroom size was mentioned by S1 as a cause for increased affective filter. Having very few classmates in virtual class makes students feel 'nervous' and decrease their motivation to attend classes (SSI).

S3 emphasized the importance of peer learning for L2 motivation and engagement in the classroom practices, and said "classmates definitely affect our motivation, because we have group work activities." (SSI, S3)

4.2.3. Organizational problems

Organizational problems, which were caused by the school in the organization of the online courses, were mentioned many times and emerged as a factor that decreased students' motivation. The lack of group cohesion due to the way the classes were organized to include strong and weak students together was seen problematic. As a result, the simplified tasks and language decreased the identified regulation levels of the students as the lesson content was seen less valuable. Participants didn't feel challenged enough when the instructor graded down the instruction for weaker students.

"When you know something and another friend doesn't, listening to the teacher elaborate becomes a waste of time for you. Even if I listen to the teachers' explanation just to revise a topic, it still gets boring and I lose my motivation." (SSI, S2)

"Students in the same class have different proficiency levels and this affects our motivation a lot." (SSI, S1)

It was also reported that voluntary attendance led them to skip the classes as they are used to being governed with strict attendance criteria in their previous face-to-face classes. Participants criticized the voluntary attendance system since they needed an external regulator and emphasized the negative effects it has on their motivation. It was understood from the interviews that students are inclined to skip classes unless they are compulsory.

"As it is not compulsory for intermediate students to attend classes, I often think if I should skip classes, but I try to push myself and be consistent." (SSI, S1)

"You know us, we lack discipline. If you tell me I'm allowed to skip, I will skip."(SSI, S12)

"Mostly I don't want to attend because it's not compulsory." (SSI, S3)

Another criticism was the lack of opportunities to re-watch the classes even though each class is recorded. It has been stated by S12 that they may not be available during the class hours and he wishes they could watch the recorded sessions in their free time. (SSI)

4.2.4. Situational problems

Another issue related to online learning context was the situational problems which arouse because of studying from home, feeling less motivated due to the home lockdown and their Internet connection.

"If people take online education, they won't be concentrated enough. People more relax when they take online education and it isn't good to feel very comfortable." (CWA, S5)

Additionally, the environment where students take online classes was considered to be inappropriate by two participants. 'Noise' and 'siblings' (CWA, S2) were mentioned and they said that they 'needed a calm environment' to concentrate on their lessons (CWA, S8). However, house is not suitable for them as participants pointed out:

"I am always nervous when I attend classes from home because my parents usually forget that I am having a class and I am afraid that something inappropriate will happen." (SSI, S1)

S1 also focused on how traditional ways of learning are more effective for them:

"..students learn by looking at the paper more than the screen. I also believe that it is not an effective way to learn the subjects because students can easily trick their teachers by not listening to the lesson at online classes because they do not see them. So, to my mind it is the worst way to learn a subject." (CWA)

5. Discussion

The main goal of this study was to investigate the learners' perceptions of online teaching in terms of their motivation and answer the below research question:

What are the learners' perceptions of interplay between online learning and L2 learning motivation?

The qualitative data obtained through SSI and CWA revealed the motivational trajectories that the learners went through. The impact of internal and external factors emerged as the two major themes. Internal factors included the following sub-themes: course satisfaction, self-determination and need for socialization. External factors had sub-themes that were related to teachers, classmates, their distant learning situation and organization of the online courses.

The qualitative results indicate that participants' perceptions of online education tend to be mostly negative as a result of various factors one of which is lack of interaction with their teachers and classmates and teachers' feedback. The findings are in line with the study conducted by Lin et al. (2017). The study found that participants' extrinsic and intrinsic motivation was lower in online education when compared to face-to-face education and the researchers put forward lack of interaction with peers and teachers as the reason why students are less motivated in online courses. Students reported higher motivation levels as a result of satisfying teacher feedback and sufficient communication with teachers. This finding is in line with Ushida's (2005) study on a mostly online language course. Ushida (2005) reported that teachers play an important role in creating a classroom culture that eventually affects students' motivation. Insufficient or negatively-perceived teacher feedback ends up increasing students' affective filters and therefore causing their motivation to drop as one interview participant pointed out. In this study, detailed feedback that satisfied students was found to be a motivation booster and this finding seems to support the study of Chen and Jang (2010), who suggested students need customized support to be less anxious and uncertain and keep following the course. Yantraprakorn et al. (2018) also reported that discouraging teacher feedback had a negative impact in an online L2 course in Thailand. According to Dörnyei (1994), teacher-specific factors have a major impact on students' motivation due to several reasons including feedback. The noticeable instructor presence has the potential to determine students' motivation in online learning settings (Baker, 2010).

In addition, course content, materials and their self-determination to get the most benefit from the course had a major impact on the participants' motivational levels as it was related to their personal goals as L2

learners. The students reported higher levels of engagement when they found the activities and classes relevant to their targets and when they acknowledged that the tasks were meaningful for them. Our findings supported the study of De Barba et al. (2016) as the motivation at the moment of learning acts as a bridge between their intrinsic motivation and participation in distance education. In our study, several students said they chose to attend and participate in speaking classes as they served their needs. This finding seems to confirm the study of Hartnett et al. (2011), who discussed the positive impact of materials that were deemed valuable and meaningful by learners on learner motivation in a virtual setting. Çebi and Güyer (2010) found the more learners were engaged in course materials, the more motivated they grew in an online course. Dincer and Yesilyurt (2017), too, found the students who seek personal development were more motivated and involved in the online speaking courses.

Our participants also viewed course satisfaction in terms of the enjoyment they got out of them. Thus, they referred to gamified lesson content as a motivation booster. Özhan and Kocadere (2020) reported similar conclusions and stated emotional commitment with the games in online courses increased students' motivation.

Even though the participants reported varying degrees of satisfaction with the course content, one thing they agreed on was the need for self-discipline to follow the courses and they stated they had difficulty in convincing themselves to connect to the lesson. This finding supports Murday et al.'s (2008) study that concluded that keeping motivation and discipline at a desired level is tough in online courses. Our study supports the opinions of Kyewski & Krämer (2018) who put forward that participation in online classes tend to be lower.

All in all, the online L2 course was perceived more negatively than positively by the sample of prep school students in a foundation university due to numerous reasons including a lack of communication between teachers and students and within students, and lack of students' self-determination to guide their learning without the presence of an external factor.

6. Conclusion

To conclude, this study aimed to explore students' perceptions of motivation regarding online education. Semi-structured interviews and creative writing assignments of students showed that the views of students are mostly negative in terms of online education. The participants referred to various reasons as to why they feel less motivated in the online learning process such as not being satisfied with the course content and materials, lacking self-discipline to follow the course, a lack of communication as a group of teachers and students and lack of private space to follow the course. Overall, it can be concluded that online learning presents many challenges in terms of keeping students motivated to pursue their goals of second language learning and decision-makers should take the factors that affect learners' motivation into consideration in designing online courses and presenting/selecting professional development training sessions.

7. Pedagogical implications

There are some pedagogical implications that might be drawn as a result of the present study. First of all, measures should be taken to maximize interaction between teachers and students and within the group of students. It might also be a good idea to avoid putting students potentially with different goals in the same classroom in order to ensure group cohesion and working towards a similar goal.

Course content and materials should be engaging and meaningful in order to maximize student motivation and learning.

Instructional designers and teachers should guide students to learn independently as online courses largely depend on students' determination to continue.

Encouraging and satisfying teacher feedback is found to be very important. In order to achieve this and above factors, teachers' awareness is very important. Professional Development activities can be designed to raise teachers' awareness regarding the students' needs in a virtual course. Additionally, dialogic interaction should be sustained among the teachers to help them feel more motivated as well.

Çevrimiçi eğitimde yabancı dil olarak İngilizce öğrenen öğrencilerin motivasyonunu etkileyen faktörler: Nitel bir durum çalışması

Özet

Motivasyon, yabancı dil öğrencilerinin dil öğrenme sürecinde başarı ve performansını etkileyen en önemli faktörlerden biridir ve bu nedenle hem öğrenciler hem öğretmenler için hayati önem taşır. Küresel pandemi sürecinde yabancı dil olarak İngilizce öğretilen hazırlık okulu dersleri sanal ortamlara taşınmış ve motivasyon konusu çok daha fazla ilgi çekmeye başlamıştır. Bu nitel durum çalışması, yedi haftalık bir çevrimiçi İngilizce öğrenimi süresince öğrencilerin çevrimiçi eğitime yönelik algılarını ve motivasyonlarına etki eden unsurları araştırmak amacıyla yapılmıştır. Bu çalışmada aynı sınıfta eğitim alan 12 öğrenciyle yapılan yarı yapılandırılmış görüşmeler ve öğrencilerin yazma performansına yönelik yapılan çalışmalarından elde edilen veriler kullanılmıştır. Öğrencilerin görüşleri incelendiğinde, genel olarak çevrimiçi eğitime karşı negatif tutum geliştirdikleri; buna sebep olarak ise sosyal etkileşim eksikliği, çevrimiçi eğitim içeriğinin beklentileri karşılayamaması, eğitim planlamasındaki ve öğrenme ortamının planlanmasındaki sorunların etkili olduğu gözlemlenmiştir. Pedagojik çıkarımlar sunulmuştur.

Anahtar kelimeler: Çevrimiçi öğrenme, motivasyon, uzaktan eğitim, EFL, durum çalışması

References

Baker, C. (2010). The impact of instructor immediacy and presence for online student affective learing, cognition, and motivation. *Journal of Educators Online*, 7(1).

Barbour, M. K. & Reeves, T. C. (2009). The reality of virtual schools: A review of the literature. *Computers & Education, 52(2)*, 402-416.

Baxter, P. & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13(4), 544-559*.

Burston, J. (2003). Proving IT works. *CALICO journal*, 219-226.

Campbell, C. & Sarac, B. (2018). The role of technology in language learning in the twenty-first century: Perspectives from academe, government, and the private sector. *Hispania, 100(5)*, 77-84.

Chen, K. C. & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior, 26(4),* 741-752.

Çebi, A., & Güyer, T. (2020). Students' interaction patterns in different online learning activities and their relationship with motivation, self-regulated learning strategy and learning performance. *Education and Information Technologies,* 1-19.

De Barba, P. G., Kennedy, G. E., & Ainley, M. D. (2016). The role of students' motivation and participation in predicting performance in a MOOC. *Journal of Computer Assisted Learning, 32(3)*, 218-231.

Dikilitaş, K. & Bostancıoğlu, A. (2019). *Inquiry and Research Skills for Language Teachers.* Springer Nature.

Dinçer, A. & Yeşilyurt, S. (2017). Motivation to Speak English: A Sef-Determination Theory Perspective. *PASAA: Journal of Language Teaching and Learning in Thailand, 53*, 1-25.

Dörnyei, Z. (1994). Motivation and motivating in the foreign language classroom. *The Modern Language Journal, 78 (3)*, 273-284.

Dörnyei, Z. & Ryan, S. (2015). *The psychology of the language learner revisited.* Routledge.

Dörnyei, Z. (2020). *Innovations and Challenges in Language Learning Motivation.* Routledge.

Hartnett, M. (2011). Examining motivation in online distance learning environments: Complex, multifaceted, and situation-dependent. *International Review of Resarch in Open and Distributed Learning, 12(6)*, 20-38.

Hartnett, M. (2016). The importance of motivation in online learning. In *Motivation in online education* (pp. 5-32). Springer, Singapore.

Hedge, T. (2001). *Teaching and learning in the language classroom* (Vol. 106). Oxford, England: Oxford University Press.

Kyewski, E. & Krämer, N. C. (2018). To gamify or not to gamify? An experimental field study of the influence of badges on motivation, activity, and performance in an online learning course. *Computers & Education*, *118*, 25-37.

Li, L. Y. & Tsai, C. C. (2017). Accessing online learning material: Quantitative behavior patterns and their effects on motivation and learning performance. *Computers & Education, 114*, 286-297.

Lin, C. Z., Zhang, Y., & Zheng, B. (2017). The roles of learning strategies and motivation in online learning: A structural equation modeling analysis. *Computers & Education, 113*, 75-85.

Lumsden, L. S. (1994). Student Motivation. *Research Roundup, 10(3)*, n3.

Murday, K., Ushida, E., & Ann Chenoweth, N. (2008). Learners' and teachers' perspectives on language online. *Computer Assisted Language Learning, 21(2)*, 125-142.

Özhan, Ş. Ç., & Kocadere, S. A. (2020). The effects of flow, emotional engagement, and motivation on success in a gamified online learning environment. *Journal of Educational Computing Research, 57(8)*, 2006-2031.

Richardson, J. C., Koehler, A. A., Besser, E. D., Caskurlu, S., Lim, J., & Mueller, C. (2015). Conceptualizing and investigating instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning, 16(3)*.

Rubio, F. (2013). The Effects of Blended Learning on Second Langauge Fluency and Proficiency. *AAUSC 2012 Volume -- Issues in Language Program Direction: Hybrid Langauge Teaching and Learning: Exploring Theoretical, Pedagogical and Curricular Issues,* 137.

Şener, B., Ertem, İ. S., & Ahmet, M.E.Ç. (2020). Online teaching experiences of ELT instructors. *Journal of Educational Technology and Online Learning, 3(3)*, 340-362.

Ucar, H., & Kumtepe, A. T. (2020). Effects of the ARCS-V-based motivational strategies on online learners' academic performance, motivation, volition, and course interest. *Journal of Computer Assisted Learning, 36(3)*, 335-349.

Ushida, E. (2005). The role of students' attitudes and motivation in secondn language learning in online language courses. *CALICO journal*, 49-78.

Yantraprakorn, P., Darasawang, P., & Wiriyakarun, P. (2018). Self-efficacy and online language learning: causes of failure. *Journal of Languaeg Teaching and Research, 9(6)*, 1319-1329.

Yin, R. K. (2009). Case study research: Design and methods fourth edition, *Los Angeles and Londo: SAGE*

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The future of education according to the fourth industrial revolution

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Abstract

The current study falls in line with the contemporary effort aiming towards raising societal awareness about the impacts of the 4th Industrial Revolution IR 4.0 in education. The study aimed to reveal the effects of IR 4.0 products such as the internet of things, cloud computing, big data, cybersecurity, artificial intelligence, Blockchain and robots on the educational variables: control learning, learning opportunities, Instructional activities, and social implications. To achieve the aim, a questionnaire of 30 items was applied to 77 pre-service science teachers as a pilot sample at Sohar University in Sultanate of Oman in the academic year 2019/2020. Findings showed variations in the pre-service science teachers' perceptions about the implications of IR 4.0 on education. They believed that block-chain, Cloud Computing, and cybersecurity will be used in a wide range in the future to improve learning opportunities and keep students' activities for a long time. On the other hand, they referred that the teaching-learning processes will occur without values and with the low level of student-teachers interactions. Also, they predicted that robots and machines will work instead of humans even in educational jobs in the future. According to the findings, the study suggested implementing significant transformations in instructional programs, curricula, learning environment, liquid instructional skills, and teachers-students' roles to deal with IR 4.0 technologies and products.

1. Introduction

The Industrial Revolutions appeared as a result of developing science, technology, and community culture; they aim to improve human life. Each revolution has its characteristics and implications. The first industrial revolution IR 1.0 started at the end of the 19th century passed through the introduction of mechanical production facilities powered by water and steam. The second one IR 2.0 which started at the beginning of the 20th century dealt with mass production assembly lines requiring labour and electrical energy. While the third industrial revolution IR 3.0 which appeared in the 70ies of the 20th century characterized by applying automated production using electronics and information technology (Dino & Ong, 2019; Gleason, 2018). Currently, humans try to accommodate the fourth industrial revolution IR 4.0 which is defined briefly as the vital interaction between human and machines (Lee, Yun, Pyka, Won, Kodama, Schiuma, Park, Jeon, Park, Jung, Yan, Lee & Zhao, 2018).

A lot of products and technologies formed the main features of IR 4.0. Internet of Things IoT is an example is internet-connected sensor embedded in products such as vehicles and home appliances that allow these things to connect, interact and exchange data. The global IoT market is expected to reach $ 19 trillion by 2020, with 26 billion embedded devices (Waghid, Waghid & Waghid, 2019). Another example of IR 4.0 products is Cloud Computing which refers to the use of a network to host massive volumes of data collected

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by IoT systems on the internet rather than on your personal computer. Analysis of this Big Data leads to smarter business decisions and drive innovations (Menon & Castrillon, 2019; Neves & Ambassador, 2017). Artificial Intelligence AI is also an example of IR 4.0 products which are formed by computer science learning algorithms capable machines like robots to perform complex tasks such as visual perception, speech recognition, and decision making (Liaoa, Louresa, Deschampsa, Brezinskia & Venancioa, 2018; Mezied, 2016).

According to IR 4.0, technologies are fused and there are no solid lines between the physical, digital, and biological aspects of life. Nowadays, IR 4.0 is immersed in most active sectors such as industry, agriculture, medicine, and economics. Also, IR 4.0 technologies are predicted to have an impact on the 2030 Sustainable Development Goals such as good health, clean water and sanitation, clean energy, sustainable cities, and climate action (Min, Kim, Lee, Jang, Kim & Song, 2019).

The educational system is not isolated from IR 4.0 technologies which are predicted to have a significant effect on learning opportunities, educational policies, and instructional procedures(Al Lily, Elayyan, Alhazmi & Alzahrani, 2018). Changing starts from schools and universities when they design a suitable program and curricula that matching with employment. World Economic Forum (2018) referred that 65% of the students in school today will work in jobs that do not currently exist and 47% of today's jobs will be automated in the next decade. Also, until 2020 more than 50% of the content in a graduate degree will be useless in 5 years. These data excite experts and educators to research more and more to suggest methods and strategies that ensure quantitative and qualitative learning that helps the students to face the future (Schwap, 2016).

The fourth Industrial Revolution IR 4.0 will accelerate the rate of disruption in jobs which we are already experiencing and it is necessary to empower individuals to take charge of their education and career strategies (Reaves, 2019). World Economic Forum reports that IR 4.0 requires reshaping the future of education and work to diversify talents (Yang, 2019). So, Organizations need to have a successful strategy and adopt new products of IR 4.0 such as big data, blockchain technology and artificial intelligence in education instead of traditional procedures (Shahroom & Hussein, 2018; Ceylan, 2020). Janikova & Kowalikova (2017) considered that the key role in the future is summarized by ensuring long-life learning and providing individuals with experiences about the dynamic market and socio-economic changes. While Sharma (2019) emphasized that when we teach our students according to IR 4.0, we must preserve our core attributes, our ethical standards, and our way of life. Also, she considered that the transformation of higher education is a key factor in the digital transformation of IR 4.0.

1.1. The Problem Statement

Most education systems in the world start changing their educational policies and plans to prepare the students for the mysterious future where a new type of jobs that we can´t even imagine today and new technologies that most of us have never even dream about(Kim, 2017; Lodder, 2016).

Sultanate of Oman is a country that tries to work hard to develop its education system. It is always revising and reviewing science curricula to provide the students with all competencies and skills that qualify them for future life challenges and industrial revolutions. From the belief that IR 4.0 stresses technology in every aspect, Omani policy adopting IR 4.0 ideas according to four main steps: awareness, training, deployment, and innovation. In Education, the Omani Ministry of Education's General Directorate of Education in the Governorate of North Al Batinah hosted the first conference entitled "The International Conference of the Fourth Industrial Revolution and its impact on education" in Sohar in the time interval 21st to 23rd January 2019. Many papers were discussed to suggest the best methods to reconstruct our educational systems and programs for IR 4.0 (Elayyan & Al-Shizawi, 20.19).

The current study falls in line with the world's efforts which aim to redirect teaching and learning processes toward IR 4.0 products and technologies. Specifically, this study tries to predict the future of education according to IR 4.0 from pre-service science teachers' point of view at Sohar University.

2. Methodology

The current study applied the quantitative survey design which "involves data to test hypotheses or to answer questions about people's opinions on some topic or issue" (Gay, Mills, & Airasian, 2013, 184). The sample consists of 77 pre-service science teachers in the Teacher Preparation Program TPP at Sohar University in the academic year 2019/2020. All individuals in the sample were female with 22-24-year-olds. They were chosen in a pilot technique because they graduated with a bachelor in physics, chemistry, and biology before attending TPP. So, they have a good background in science and technology which qualified them to react toIR 4.0 ideas and products.

2.1. Data Collection Tool

The current study applied the quantitative survey method with a questionnaire as the main tool to collect data. The questionnaire was constructed by revising the related literature (Butler, 2018; Dino & Ong, 2019; Elayyan, 2016 & Sharma, 2019). Then, constructing a draft copy of 32 items that were distributed into four dimensions: control learning, learning opportunities, content, and instructional activities, and social implications. To check validity, the questionnaire was submitted to 18 specialists in science curricula, Instructional technology, and also submitted to science supervisors to put their notes about the suitability and accuracy of items to be applied. After collecting the experts' point of views and implemented their modifications, 2 of these items were deleted and the final version of the questionnaire consisted of 30 items (7 items for d control learning, 9 for learning opportunities, 9 for content and instructional activities, 5 for social implications) with 5 points Likert scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2, strongly disagree = 1). Finally, to check reliability, the final version of the questionnaire was applied to a pilot sample of 25 pre-service teachers out of the study sample, then calculate the self-constancy by Cronbach's Alfa formula, the value was 0.89 which means that the study tool, as in appendix, as applicable.

3. Findings and Discussions

Study findings were obtained after applying the questionnaire to the sample of pre-service science teachers. The averages and standard deviations were calculated for each item in the questionnaire. Also, intervals of a typical 5 point Likert scale were calculated to determine the pre-service science teachers' perceptions ratio about implications of applying IR 4.0 in education as in the following: calculating the Range (max. score – min. score = 5-1= 4), then calculating the category interval (=Range/max. score = 4/5 = 0.8), so we have 5 intervals as shown in table 1.

Table 1.

Teachers' perceptions of degrees vs. average intervals of the questionnaire items

Average Interval	Perception's ratio
1.0-1.8	Very low
>1.8-2.6	low
>2.6-3.4	intermediate
>3.4-4.2	high
>4.2-5.0	Very high

Also, averages were transformed to Percentages of perception from the equation: Percentage = [(Average – 1)/Range] × 100%. Data were collected and then arranged in table 2 to discuss the study question.

Table 2.

Averages and standard deviations of pre-service science teachers' perceptions about education according to IR 4.0

	Items	Average	Standard Deviation	Percentage of availability	Rank	perception Ratio
	Dimension1: Control Learning					
	Applying IR 4.0 in education will:					
1	decrease Teacher's attendance to the school	3.74	1.58	68.59%	5	high
2	keep the humanity interactions between teachers and students	1.77	1.49	19.23%	7	Very low
3	increase classroom management	4.59	1.04	89.74%	3	Very high
4	verify of the students' files anywhere by Block-Chain	4.77	0.79	94.23%	2	Very high
5	improve decisions toward students by using artificial intelligence	2.05	1.60	71.15%	6	low
6	keep students' activities and duties for a long time by using Cloud Computing	4.87	0.59	96.79%	1	Very high
7	keep student's data safety by using cybersecurity	4.33	1.23	83.33%	4	Very high
		3.73	0.76			
	Dimension 2: Learning Opportunities					
	Applying IR 4.0 in education will:					
8	increase the experiences exchange	4.41	1.17	85.26%	7	Very high
9	provide more learning resources and database	4.87	0.59	96.79%	2	Very high
10	allow learning anytime and anywhere	4.87	0.59	96.79%	2	Very high
11	support more opportunities in individual learning	4.77	0.85	94.23%	5	Very high
12	support more opportunities in social learning	2.85	1.67	46.15%	9	intermediate
13	enhance Global learning (No boundaries and no restrictions)	4.82	0.66	95.51%	4	Very high
14	achieve long-life learning	4.56	1.05	89.10%	6	Very high
15	extend the learning platforms instead of the typical school	4.90	0.55	97.44%	1	Very high
16	help to produce nano-robots to inter them inside the student's brain to improve his motivation toward learning	3.67	1.50	66.67%	8	high
		4.41				
	Dimension3: Content and instructional activities					
	Applying IR 4.0 in education will:					
17	ensure commitment to educational ethics	2.72	1.57	42.95%	9	Very low
18	modify in instructional strategies	4.64	0.95	91.03%	3	Very high
19	Change the courses' learning outcomes	4.44	1.20	85.90%	5	Very high
20	adopt the integrated curricula (i.e. No boundaries between curricula)	4.36	1.23	83.97%	6	Very high
21	allow Robots to teach inside the classroom instead of lecturers	4.49	1.18	87.18%	4	Very high
22	apply non-biasing e-evaluation	4.31	1.24	82.69%	7	Very high
23	understand more and more instructional content	4.18	1.27	79.49%	8	high

24	allow e-applications and mobiles dominates on education	4.82	0.66	95.51%	1	Very high
25	introduce new concepts in the courses (smart cities, medical technology, etc.)	4.74	0.81	93.59%	2	Very high
		4.30				Very high
	Dimension4: Social implications					
	Applying IR 4.0 in education will:					
26	cut (or decrease) spending on education	3.56	1.58	64.10%	2	high
27	raise awareness in social issues and problems	2.54	1.67	38.46%	3	low
28	raise the student' healthcare by following their files anytime and anywhere by using Block-Chain	4.28	1.37	82.05%	1	Very high
29	enhance the social values	2.31	1.51	32.69%	4	low
30	increase job opportunities in the educational field	1.67	1.23	16.67%	5	Very low
		2.87				

Table 2 shows the pre-service science teachers' perceptions about applying IR 4.0 in education. The total average for dimension 1 "control learning" was m= 3.73 and the averages' range 1.77 - 4.87. This result reflects the awareness-raising of IR 4.0 technologies and products in education. The pre-service science teachers believe that block-chain, cloud computing, and cybersecurity will be used in a wide range in the future to keep student's data and activities for a long time. On the other hand, they have very low perceptions about the humanity reactions between teachers and students as in item 2 which has an average m= 1.77. This means that the student will interact with the machine more than humans (teachers, supervisors, and classmates). Also, the pre-service science teachers have low perceptions about item 2 which states that "Improve decisions toward students by using artificial intelligence" with an average m= 2.05. This result refers that the teacher will have strong decisions about the students' marks and behaviors.

Table 2 also shows the total average m= 4.41 and averages' range (2.85-4.90) for dimension 2 "learning opportunities". According to these results, the pre-service science teachers believe that applying IR 4.0 will improve learning opportunities by providing more learning resources and database, allowing learning anytime and anywhere, enhancing global learning, and achieve long-life learning where these statements have high averages with values(m= 4.87, 4.87, 4.82, 4.56) respectively. The results show that there are differences in perceptions about the role of IR 4.0 in social learning and individual learning. In item 12 the average was m=2.85 while in item 11 the average m=4.77 which means that IR 4.0 technologies and products support individuals more than social learning which is compatible with the previous result that relevant with low human interactions.

For dimension 3 "content and instructional activities", the findings show that IR 4.0 will cause a true revolution in instructional strategies, learning outcomes, and non-biasing e-evaluation where these indicators in items 18, 19, 22 have high averages m= 4.64, 4.44, 4.31 respectively. The findings also refer that the teachers will have more instructional aids such as robots, mobiles, and other e- applications that help to understand the educational situations not only verbally but also visually which reflects positively on motivation and interest to learn. The lowest average in this dimension was for item 17 which is stated that "ensure commitment to educational ethics", which means that there is no control on educational system and processes according to IR 4.0 applications.

Finally, findings that related to dimension 4 "social implications" show the averages' range (1.67-4.28) which means variation in pre-service science teachers' perceptions. They believe that applying IR 4.0 technologies will raise the students' healthcare by following their files anytime and anywhere by using block-chain as in item 28 with the highest average m=4.28. But, they showed low perceptions about the

capability of IR 4.0 technologies to raise awareness in social issues and problems and enhance social values. This result reflects the belief that robots and artificial intelligence help to decide according to the input data but it is impossible to have emotional skills to understand attitudes and values. Item 30 which stated that "applying IR 4.0 in education will Increase job opportunities in educational field" has the lowest average m=1.67 which means that the pre-service science teachers believe that in the future robots and machines will work instead of humans even in educational jobs.

4. Conclusions and Suggestions

Based on the findings of the current study, the pre-service science teachers showed variations in their point of view about the implications of IR 4.0 on education. This means that educators should understand the positive side and also negative sides when they deal with IR 4.0 to design teaching and learning processes. Even if there are disadvantages (or negative sides) of IR 4.0, it is important to apply its technologies and products in education to qualify students who have competencies and skills to understand the future challenges and try to solve them.

To achieve that it is important to ensure integration between disciplines as in Science, Technology, Engineering and Mathematics STEM approach and also integration between the educational system elements (educational policy, teachers, curricula, learning environment, and students) and industrial sectors in society. This integration helps to design curricula and instructional activities that qualify the students to have future jobs, because in the future the problem could not be the lack of jobs but the shortage of skills that will depend completely on IR 4.0 ideas. In the future we will lose a lot of jobs such as typical engineers, programmers, typical doctors, waiters, etc. and new jobs will appear such as robot technicians, big data investigators, artificial intelligence experts, blockchain designers, and 3D printing engineers.

On the other hand, it is important to activate student-centered learning. To achieve that it is important to measure the students' learning style and multiple- intelligence to transform classrooms from old-fashioned to flexible. A flexible classroom allows during a specific time to implement more than one event compatible with visual, verbal, and kinesthetic students. This paradigm helps to improve the student's learning according to their interests and abilities which lead to too long life learning and dealing with the future's technology easily.

Another procedure that helps to prepare the students for the IR 4.0 is the transformation from knowledge skills to liquid or soft skills. Reading comprehension, writing expressions, and mathematical reasoning are not valid skills to have a job in the future. It is important to develop the students' right-brain skills to have other types of skills such as technical skills, critical thinking, coordinating with others, verbal communications, and time management. These soft skills will be fundamentals and the basic requirements to deal with IR 4.0 technologies and ideas. Also, It is necessary, nowadays, to improve digital skills such as blogging, filming, podcasting, wiki building and uploading by preparing a virtual learning environment (VLE) as a platform to facilitate e-learning and enable the students to design and online delivery of modules (Molotsi, 2020).

In the same context, it is important to revise our learning outcomes and curricula content. Also, how the scientific content design and deliver to the students. In the future it is not probable to still presenting content by text (written) books; Massive Open Online Courses (MOOCs) will be an active substitution in the future. MOOCs are a potentially disruptive innovation and match with IR 4.0 technologies and the global job markets' needs. The number of MOOCs are increasing exponentially across the globe, making learning more accessible to people. Also, the number of participants has doubled in 2015 from 18 million students to 35 million students across all MOOC providers; even universities are digitizing some of their courses (Reaves, 2019).

On the other hand, using MOOCs and other educational platforms allow to adopt Student's Global Identity, which is a portable and secure card that stores individual information and can be used across countries

especially in cases of conflict eruption, natural disaster, and coronavirus (covid-19) pandemic. During covid-19 which is declared as a pandemic on 11 march 2020, all countries start learning online and applying technology in education. Time by time this type of learning will be an educational culture and maybe an alternative to traditional learning. IR 4.0 technologies and products will facilitate this transition. So, in the near future, it is not unusual for robots to deliver a model lesson in science or the students solve their mathematics problems by using artificial intelligence, and probably that there's no use of working and teaching in traditional schools and universities.

References

Al Lily, A.E., Elayyan, S.R., Alhazmi, A.A. et al. Understanding the public temper through an evaluation of rumours: an ethnographical method using educational technology. *Palgrave Commun 4*, 141 (2018). https://doi.org/10.1057/s41599-018-0197-2

Butler, J. (2018). The Fourth Industrial Revolution and Education. *South African Journal of Science*, 114(5/6), 1-1. http://dx.doi.org/10.17159/sajs.2018/a0271

Ceylan, A. (2020). Book Review: Blockchain Technology Applications in Education. Journal of Educational Technology & Online Learning, 3(2), 168-1. Retrived from https://dergipark.org.tr/en/download/article-file/1068227

Dino, M. & Ong, I. (2019). Research, Technology, Education & Scholarship in the Fourth Industrial Revolution [4IR]: Influences in Nursing and the Health Sciences. *The Journal of Medical Investigation*, 66, 3-7.

Elayyan, S. & Al-Shizawi, F. 2019. Teachers' Perceptions of Integrating STEM in Omani Schools. *Shanlax International Journal of Education*. 8(1): pp. 16-21. Retrived from http://www.shanlaxjournals.in/journals/index.php/education/article/view/1136

Elayyan, S. 2016. Analytical Study of Physics Education Websites' Content. *Universal Journal of Educational Research*. 4(12): pp. 2832 – 2839. DOI: 10.13189/ujer.2016.041217

Retrived from http://www.hrpub.org/journals/jour_archive.php?id=95&iid=1038

Gay, L., Mills, G. & Airasian, P. (2012). Educational Research: Competencies for Analysis and Applications. 10th edition. New Jersey: Pearson.

Gleason, N. (2018). Singapore's Higher Education Systems in the Era of the Fourth Industrial Revolution: Preparing Lifelong Learners. *Higher Education in the Era of the Fourth Industrial*. Chapter 7, 145-169. Singapore: Palgrave Macmillan.

Janikova, P. & Kowalikova, P. (2017). Technical Education in the Context of the Fourth Industrial Revolution. *Open Online Journal for Research and Education*. Special Issue, 65-73.

Jr, R. C. (2017, Nov 10). *Educating for the fourth industrial revolution*. Retrieved from http://www.universityworldnews.com/article.php?story=20171107123728676

Kim, J. R. (2017, Dec 1). *Look inside the Republic of Korea's classrooms of the future.* Retrieved from http://news.itu.int/education-4th-industrial-revolution-look-inside-republic-koreas-classrooms-future/

Lee, M., Yun, J., Pyka, A., Won, D., Kodama, F., Schiuma, G., Park, H., Jeon, J., Park, K., Jung, K., Yan, M., Lee, S. & Zhao, X. (2018). How to Respond to the Fourth Industrial Revolution, or the Second Information Technology Revolution? Dynamic New Combinations between Technology, Market, and Society through Open Innovation. *Journal of Open Innovation: Technology, Market & Complexity*, 4(21), 1-24. doi:10.3390/joitmc4030021

Liaoa, Y., Louresa, E., Deschampsa, F., Brezinskia, G. & Venancioa, A. (2018). The Impact of the Fourth Industrial Revolution: A cross-country/region comparison. *Production*, 28, 1-18. DOI: 10.1590/0103-6513.20180061

Lodder, J. (2016, Feb 21). *The Fourth Industrial Revolution and the Education System, how to respond?* Retrieved from https://www.linkedin.com/pulse/fourth-industrial-revolution-education-system-how-respond-john-lodder

Menon, K. & Castrillon, G. (2019). Reimagining curricula for the Fourth Industrial Revolution. *The Independent Journal of Teaching and Learning*, 14(2), 6-19.

Mezied, A. A. (2016, Jan 22). *What role will education play in the Fourth Industrial Revolution?* Retrieved from https://www.weforum.org/agenda/2016/01/what-role-will-education-play-in-the-fourth-industrial-revolution/

Min, J., Kim, Y., Lee, S., Jang, T., Kim, I. & Song, J. (2019). The Fourth Industrial Revolution and its Impact on Occupational Healthand Safety, Worker's Compensation and Labor Conditions. *Safety and Health Work*, 10, 400-408.

Molotsi, A. (2020). The university staff experience of using a virtual learning environment as a platform for e-learning. *Journal of Educational Technology & Online Learning*, 3(2), 133-151. Retrived from https://dergipark.org.tr/en/download/article-file/1068222.

Neves, M., & Ambassador, S. (2017, Jul 17). *The (unknown) Impact of the Fourth Industrial Revolution in Education*. Retrieved from http://blog.scientix.eu/2017/07/the-unknown-impact-of-the-fourth-industrial-revolution-in-education/

Reaves, J. (2019). 21st Century Skills and the Fourth Industrial Revolution: A critical Future Role for Online Education. *International Journal on Innovations in Online Education*, 3(1), 1-21.

Schwap. K. (2016). The Fourth Industrial Revolution. Geneva: World Economic Forum.

Shahroom, A. & Hussin, N. (2018). Industrial Revolution 4.0 and Education. *International Journal of Academic Research in Business and Social Sciences*, 8(9), 314–319. http://dx.doi.org/10.6007/IJARBSS/v8-i9/4593

Sharma, P. (2019). Digital Revolution of Education 4.0. *International Journal of Engineering and Advanced Technology (IJEAT)*, 9(2), 3558- 3564. DOI: 10.35940/ijeat.A1293.129219

Waghid, Y., Waghid, Z. & Waghid, F. (2019). The Fourth Industrial Revolution Reconsidered: On Advancing Cosmopolitan Education. *South African Journal of Higher Education*, 33(6), 1-9. http://dx.doi.org/10.20853/33-6-3777

World Economic Forum (2018). The Future of Jobs Reports. Geneva: World Economic Forum.

Yang, C. (2019). The Fourth Industrial Revolution, Aging Workers, Older Learners, and Lifelong Learning. Adult Education Research Conference. *Conference Proceeding*. Buffalo, New York. Retrieved from https://newprairiepress.org/aerc/2019/papers/35/

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Digital citizenship and its teaching: A literature review

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Abstract

Use of digital tools that have entered people's lives in recent years has become a necessity during the COVID-19 pandemic, and students have started to use digital tools extensively both in their lessons and at their home. Students use technology intensively on daily basis, and the need for training these students in a way to establish safe online communication and collaboration has put the concept of digital citizenship on the agenda. In this study, the theoretical framework of the concept of digital citizenship was introduced, and the studies reported in the literature regarding digital citizenship and teaching of it were examined. The studies reviewed included (1) those on the introduction of the concept of digital citizenship or the elements of digital citizenship, (2) those conducted to determine the participants' digital citizenship levels or perceptions, (3) those examining the curricula within the framework of digital citizenship, and (4) those carried out in relation to teaching of digital citizenship and its elements. The studies in each group were briefly introduced. As a result of the study, several suggestions were put forward regarding digital citizenship education.

1. Introduction

The digital tools that have entered the lives of people with the development of technology in recent years allow them to share their photos, videos, drawings or views in virtual environments such as social media and to make joint projects with people from different parts of the world (Fingal, 2020). During the COVID-19 pandemic, the use of digital tools has become a necessity, and students have started to use digital tools extensively both in their lessons and at their home (Ranchordas, 2020). Since they use technology extensively on daily basis, it is necessary to prepare students in a way to have them communicate and collaborate safely and responsibly in online environments (Parent and Community Impact, Technology, 2018; Tan, 2011). Safe and responsible online communication and collaboration have brought the concept of digital citizenship to the fore (Ribble, Bailey, & Ross, 2004; Ribble, 2008; Shelley, 2004). The rules for correct and responsible technology usage that provide guidance to students on how to direct the online world in their personal and academic lives rather than just being a citizen of a country are called digital citizenship (Parent and Community Impact, Technology, 2018; Ranchordas, 2020; Tan, 2011). Ribble and Bailey (2007) define digital citizenship as the online display of behaviors that ensure the legal, safe, ethical and responsible use of information and communication technologies.

In order to better understand the concept of digital citizenship, the definition of citizenship can be considered: According to the current Turkish dictionary, citizenship refers to "the state of being born, growing up or having lived in a country" (TDK, 2020). Alberta Education (2012) defines citizenship as being a member of a social, political or national community. Accordingly, the community is at the center

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of the definition; in other words, citizenship takes place within a community and includes both rights and responsibilities. For example, there are rights for community members like the right to speak freely, and there are responsibilities along with these rights as well. Responsibilities are the boundaries within which community members have to live. Except for some minor differences, this general framework applies to digital citizenship (Alberta Education, 2012).

Traditionally, the basic principles of citizenship are reported to include being respectful and polite, responsible and making positive contributions to the society (Impero Software & Digital Citizenship Institute, 2016). The principles of digital citizenship are not much different from those of traditional citizenship (Somyürek, 2019). Just as all children throughout human history need help from their parents and teachers to become good citizens, today's young people, called digital natives, also need guidance to learn how to apply citizenship principles in the digital world (Impero Software & Digital Citizenship Institute, 2016; Fingal, 2020). The International Society for Technology in Education [ISTE] (2016, 2018) reports the characteristics of a good citizen and those of a good digital citizen as in Table 1.

Table 1.

Citizenship in the digital era (ISTE, 2016, 2018).

	A good citizen	**A good digital citizen**
1	advocates equal human rights for all.	advocates equal digital rights and digital access for all.
2	treats other people with respect.	tries to understand all points of view.
3	does not damage or steal other people's belongings (assets).	respects the digital privacy, intellectual property and other rights of online people.
4	communicates openly, respectfully and empathetically.	communicates and empathizes with other people through digital channels and treats them with empathy.
5	speaks honestly and does not repeat unconfirmed news.	uses critical thinking for all online resources and does not share unreliable sources such as fake news or advertisements.
6	works to make the world a better place.	uses technology to support and develop social goals.
7	protects himself and other people from harm.	gives importance to physical, emotional and mental health while using digital tools.
8	works with other people in social projects.	uses digital tools to collaborate with other people.
9	always maintains a positive self-image.	understands the permanence of the digital world and manages his/her digital identity by taking the necessary measures.

According to ISTE (2018), students should learn to improve the skills listed in Table 1 in order to be successful in their schools, work life and society.

Digital citizenship and teaching of it have gained importance in recent years and are now the subject of intensive scientific research. This situation can also be seen in the graph below obtained by analyzing the number of studies conducted in the last 10 years as a result of the search done with the keyword of "digital citizenship" in the Scopus database (Figure 1).

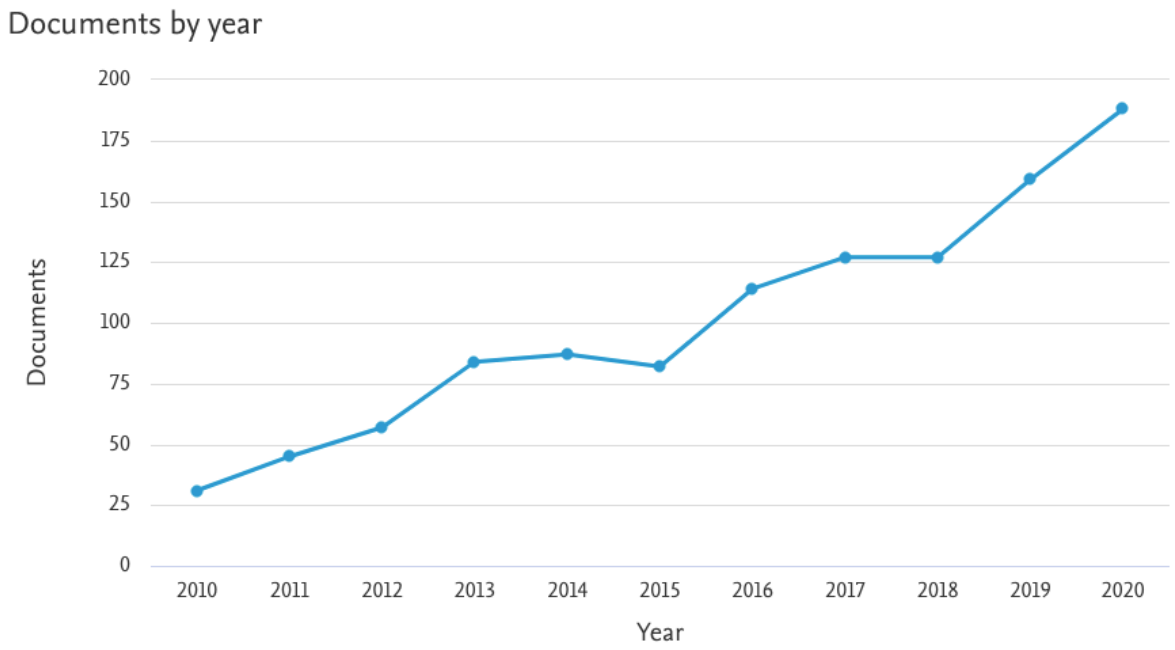

Fig. 1. The number of studies on digital citizenship

As can be seen in Figure 1, the number of scientific studies on digital citizenship has increased over the years. This situation could be considered to be an indication that the importance of digital citizenship is gradually increasing and will become an indispensable part for the world of tomorrow. Although many studies have been carried out on digital citizenship in recent years, there is no literature review study except for the study by Walters, Gee and Mohammed (2019). Walters et al. (2019) conducted a literature review covering the studies on elementary school teachers' knowledge, beliefs and activities they planned and implemented in relation to digital citizenship. The present study was conducted considering the low number of studies in the literature which examined and classified the studies on digital citizenship and teaching of it. In this study, the purpose was to introduce the theoretical framework of the concept of digital citizenship and to examine and classify the studies on digital citizenship and teaching of it in the literature. It is thought that the study will guide researchers who will work on digital citizenship and teaching of it. The study is thought not only to guide researchers who will work on digital citizenship and its teaching but also to contribute to the field of digital citizenship education. The following section introduces the theoretical framework of the concept of digital citizenship.

2. Theoretical Framework

The need for the rules for correct and responsible technology usage so that students can communicate and collaborate safely and responsibly has put the concept of digital citizenship on the agenda (Parent and Community Impact, Technology, 2018; Ranchordas, 2020; Ribble, Bailey, & Ross, 2004; Ribble, 2008; Shelley, 2004; Tan, 2011). Digital citizenship, defined as the online display of behaviors that ensure the legal, safe, ethical and responsible use of information and communication technologies, is considered to include nine basic elements (Ribble, 2011; Ribble & Bailey, 2007). These elements are identified to provide a framework for digital citizenship education and to ensure the best use of technology in society. The nine elements of digital citizenship are examined under three main categories (Government of Newfoundland and Labrador Education, 2013; Impero Software & Digital Citizenship Institute, 2016; ISTE, 2016; Ribble, 2008, 2011; Ribble & Bailey, 2007). These are (a) respect for self and other people, (b) self-education and connecting with other people and (c) protecting self and other people. The elements of digital citizenship belonging to the categories are as follows:

a. Respect for self and other people

1. **Digital access**: Fully electronic participation in the society. Can all users participate in the digital society at an acceptable level at any time?
2. **Digital etiquette**: The online behavior standards that digital technology users are expected to apply. Do users think of other people when using digital technologies?
3. **Digital law**: Legal rights and restrictions regulating the use of technology. Are users aware of the laws (rules, policies) regulating the use of digital technologies?

b. Self-education and connecting with other people

1. **Digital communication**: Electronic information exchange. Do users have an understanding of digital communication methods and of when they are correct?
2. **Digital literacy**: The ability to know and use when and how to use digital technology. Do users take the time to learn about digital technologies? Do they share this information with other people?
3. **Digital commerce**: Online shopping. Do users have knowledge and protection to shop in the digital world?

c. Protecting self and other people

1. **Digital rights and responsibilities**: The privileges and freedoms given to all digital technology users and the expectations from them. Are users ready to protect other people's rights in order to protect their own digital rights?
2. **Digital security**: Precautions to be taken to protect the personal security of all technology users and the security of their networks. Do users take the time to protect their information and also take precautions to protect other people's data?
3. **Digital health and wellness**: Physical and psychological health aspects related to the use of digital technology. Do users consider both physical and psychological risks when using digital technology?

Alberta Education Cataloging in Publication Data, a document created by the Alberta State Ministry of Education located in the west of Canada to adapt digital citizenship to the education system, added two more elements to these nine elements in the source named Digital Citizenship Policy Development Guide (Alberta Education, 2012):

1. **Cloud computing**: Easily access to networked servers across the Internet. Cloud computing increases the possibilities of hardware and decreases the cost. Therefore, cloud computing has the potential to increase the accessibility to technology resources, yet it also increases the risk of security and information privacy.
2. **Personal Devices:** Technologies belonging to students or teachers such as smartphones, tablets and laptops. These devices might or might not be connected to the school network. An important problem with personal devices is that these devices have the same features, which means they are not standard. Standard hardware and devices are advantageous in terms of universal service and support. Personally-selected devices have advantages with respect to personalization, ownership and responsibility. There must be a balance in accordance with the purpose and application of the technological source. In addition, by bringing personal devices to the school and to encourage their use for educational purposes, and the activities and programs used by students with personal devices should be designed in a way to be suitable for students who do not have personal devices.

According to Alberta Education (2012), these 11 elements include a series of thoughts and questions for policy makers in terms of teaching the complex subject of digital citizenship.

The following section presents studies in the literature regarding digital citizenship and its teaching.

3. Literature on digital citizenship and its teaching

When studies on digital citizenship and teaching of it are examined, it is seen that most of them are related to the introduction of the concept of digital citizenship or the elements of digital citizenship (Alberta Education, 2012; Choi, 2016; Çubukçu & Bayzan, 2013; Government of Newfoundland and Labrador Education, 2013; Impero Software & Digital Citizenship Institute, 2016; ISTE, 2016; Karakuş Yılmaz, 2020; Ribble, 2008, 2011; Ribble & Bailey, 2007; Sağıroğlu, Bülbül, Kılıç, & Küçükali, 2020; Walters et al., 2019; Yaman, Kabakçı Yurdakul, & Dönmez, 2020). A great majority of the studies in the literature are about determining digital citizenship levels or perceptions of students, educational administrators, preservice teachers and teachers (Al-Abdullatif & Gameil, 2020; Akcil, Altinay, & Altinay, 2016; Al Raqqad, 2020; Arcagök, 2020; Aslan, 2016; Ata & Yıldırım, 2019; Aygün, 2019; Aygun & Ilhan, 2020; Çebi & Bahçekapılı Özdemir, 2019; Çepni, Oğuz, & Kıcan, 2014; Dedebali & Dasdemir, 2019; Dere & Yavuzay, 2019; Elmalı, Tekin, & Polat, 2020; Görmez, 2017a; Hollandsworth, Dowdy, & Donovan, 2011; Hollandsworth, Donovan, & Welch, 2017; Jwaifell, 2018; İridağ, 2020; Kabataş, 2019; Kaya & Kaya, 2014; Korucu & Totan, 2019; Martin, Hunt, Wang, & Brooks, 2020b; Nazik et al., 2020; Öztürk, 2019; Peker Ünal, 2017; Som Vural, 2016; Xu, Yang, MacLeod, & Zhu, 2019; Yalçınkaya & Cibaroğlu, 2019; Yılmaz & Dogusoy, 2020). There are also studies in the literature examining the subjects and outcomes in the curricula within the framework of digital citizenship (Aydemir, 2019; Başarmak, Yakar, Güneş, & Kuş, 2019; Görmez, 2017b; Kara & Atasoy, 2019; Peker Ünal, 2017; Turan & Karasu Avcı, 2018). There are also studies on teaching of digital citizenship and its elements (Altınay Gazi, 2016; Buchholz, DeHart, & Moorman, 2020; Cunningham, 2018; Edtech, 2020; Farmer, 2011; Gleason & Von Gillern 2018; Hays, 2019; Hertz, 2011; Hui & Campbell, 2018; Krutka & Carpenter, 2017; Lauricella, Herdzina, & Robb, 2020; Lynch, 2017; Martin, Gezer, Wang, Petty, & Wang, 2020a; Özer & Albayrak Özer, 2020; Ribble, 2012; Tapingkae, Panjaburee, Hwang, & Srisawasdi, 2020; Vlaanderen, Bevelander, & Kleemans, 2020). These studies are introduced in the following sections.

3.1. Studies on the introduction of the concept of digital citizenship or the elements of digital citizenship

Apart from the studies cited in the theoretical framework section, there are also studies explaining what the concept of digital citizenship means in the literature. Çubukçu and Bayzan (2013) explained digital citizenship and its elements and mentioned the steps to be taken in Turkey in line with the developments in digital citizenship. The heading of digital citizenship was included in two different sections in the Digital Literacy book prepared within the scope of the Safe Internet Center's book series of open-source content production project, and the concept of digital citizenship was explained together with the introduction of its elements (Karakuş Yılmaz, 2020; Sağıroğlu et al., 2020). Yaman et al. (2020) introduced the concept of digital parenting after introducing digital citizenship and its elements. Walters et al. (2019), by introducing digital citizenship and its elements, conducted a literature review study that covered the studies conducted in the context of elementary school teachers' knowledge, beliefs and activities they planned and implemented in relation to digital citizenship. Choi (2016), after mentioning the definition and types of traditional citizenship, examined 254 studies conducted on digital citizenship between 2003 and 2014. In the study carried out with the concept analysis method, it was concluded that there were four categories constituting the concept of digital citizenship: Ethics, Media and Information Literacy, Participation/Engagement and Critical Resistance. In the study, it was suggested that digital citizenship should be understood as a multidimensional and complex concept that is mutually but non-linearly related to offline (location-based) civil lives.

3.2. Studies on determining the participants' digital citizenship levels or perceptions

In some of the studies carried out to determine the participants' digital citizenship levels or perceptions , the purpose was to determine the extent to which elementary, secondary, high school and university level

students owned the characteristics related to the elements of digital citizenship (Al-Abdullatif & Gameil, 2020; Al Raqqad, 2020; Çebi & Bahçekapılı Özdemir, 2019; Çepni et al., 2014; Jwaifell, 2018; İridağ, 2020; Korucu & Totan, 2019; Martin et al., 2020b; Nazik et al., 2020; Öztürk, 2019; Peker Ünal, 2017; Som Vural, 2016; Yalçınkaya & Cibaroğlu, 2019), while some others studies aimed to identify these characteristics within the contexts of educational administrators, teachers or preservice teachers (Akcil et al., 2016; Arcagök, 2020; Aslan, 2016; Ata & Yıldırım, 2019; Aygün, 2019; Aygun & Ilhan, 2020; Dedebali & Dasdemir, 2019; Dere & Yavuzay, 2019; Elmalı et al., 2020; Görmez, 2017a; Hollandsworth et al., 2011, 2017; Kabataş, 2019; Kaya & Kaya, 2014; Xu et al., 2019; Yılmaz & Dogusoy, 2020). In some of these studies, the participants' digital citizenship levels or perceptions were high (Al Raqqad, 2020; Aslan, 2016; Ata & Yıldırım, 2019; Elmalı et al., 2020; Kabataş, 2019; Yılmaz & Dogusoy, 2020); in some studies, these levels and perceptions were moderate (Akcil et al., 2016; Arcagök, 2020; Aygün, 2019; Aygun & Ilhan, 2020; Çebi & Bahçekapılı Özdemir, 2019; Çepni et al., 2014; Dedebali & Dasdemir, 2019; Hollandsworth et al., 2011, 2017; İridağ, 2020; Kaya & Kaya, 2014; Korucu & Totan, 2019; Nazik et al., 2020; Öztürk, 2019; Som Vural, 2016; Xu et al., 2019; Yalçınkaya & Cibaroğlu, 2019); and in some other studies, these levels and perceptions were found low (Al-Abdullatif & Gameil, 2020; Dere & Yavuzay, 2019; Görmez, 2017a; Jwaifell, 2018; Martin et al., 2020b; Peker Ünal, 2017). Some of the studies in this category included scale development studies conducted to determine the participants' digital citizenship levels or perceptions (Al-Zahrini, 2015; Choi, Glassman, & Cristol, 2017; Elçi & Sarı, 2016; Jones & Mitchell, 2016; Isman & Gungoren, 2014; Kim & Choi, 2018; Kocadağ, 2012; Kuş, Güneş, Başarmak, & Yakar, 2017; Nordin et al., 2016).

3.3. Studies examining the curricula within the framework of digital citizenship

In Turkey, several studies have been conducted in recent years to examine the subjects and outcomes in the curricula within the framework of digital citizenship. In Turkey, various course books and curricula were examined within the framework of digital citizenship and its elements at elementary school, secondary school and high school levels. In these studies, it was concluded that digital citizenship and its elements were not included in the curricula at all or there was little research (Aydemir, 2019; Başarmak, Yakar, Güneş, & Kuş, 2019; Görmez, 2017b; Kara & Atasoy, 2019; Peker Ünal, 2017; Turan & Karasu Avcı, 2018). Başarmak et al. (2019) stated that the content on digital citizenship was mostly included in the computer science curriculum, and the democracy and human rights curriculum.

3.4. Studies on teaching of digital citizenship and its elements

Studies on teaching of digital citizenship and its elements can be examined in two groups: (1) Studies in which suggestions were put forward related to teaching of digital citizenship and its elements or in which examples of related activities were presented (Buchholz et al., 2020; Cunningham, 2018; Edtech, 2020; Farmer, 2011; Gleason & Von Gillern, 2018; Hays, 2019; Hertz, 2011; Krutka & Carpenter, 2017; Lynch, 2017; Ribble, 2012; Özer & Albayrak Özer, 2020), (2) studies which determined the status of digital citizenship education or which presented experimental results regarding teaching of digital citizenship and its elements (Altınay Gazi, 2016; Hui & Campbell, 2018; Lauricella et al., 2020; Martin et al., 2020a; Tapingkae et al., 2020; Vlaanderen et al., 2020).

Farmer (2011), who conducted one of the studies examined in the first group, defined digital citizenship, discussed its results on individuals and the learning community in general, and suggested strategies for digital citizenship education. Hertz (2011) mentioned course resources and online learning tools on his blog page, where he shared his experiences regarding teaching digital citizenship to elementary school students. In another study, Ribble (2012) introduced digital citizenship and its elements and explained why teaching is necessary. Lynch (2017) introduced the applications, tools and resources related to teaching digital citizenship to students. Regarding the sources introduced, the researcher gave information about the target age group, characteristics and the extra content offered. Krutka and Carpenter (2017) argued that teaching via social media will enable students to develop as digital citizens within democracy. In the study, three

types of educational activities for digital citizenship were suggested to be applied in the democratic curricula. Cunningham (2018) put forward suggestions in relation to teaching digital citizenship to children with learning difficulties and attention deficit problems. Gleason and Von Gillern (2018) conducted a case study on the use of social media for teaching digital citizenship. In the study, a curriculum supported with social media was proposed for secondary and high school students to develop their digital citizenship practices. Hays (2019) explained both the methods that can be used to develop students' digital citizenship and the things to be done with these methods. Ways for teachers to support digital citizenship and for students to engage with digital citizenship were suggested. In a study conducted by Buchholz et al. (2020), the researchers discussed the concept of digital citizenship within the context of the changing educational practices after the COVID-19 epidemic, and scenarios were presented for the solution of four ethical problems posed by ISTE. With the scenarios presented in the study, the purpose was to make teachers think about developing digital literacy and digital citizenship in their classes. Edtech (2020) introduced resources for teaching digital citizenship for K12 teachers, including articles, online games, applications, web pages, tools, lesson plans, activities, curricular ideas and videos. Özer and Albayrak Özer (2020) prepared a book containing examples of activities for teaching the dimensions of digital citizenship.

Altınay Gazi (2016), who conducted one of the studies examined in the second group, taught digital citizenship for one hour and concluded that there was an increase in digital citizenship awareness of high school students and teachers who participated in the study. Hui and Campbell (2018) stated that after a course in which digital citizenship and its elements were taught, preservice teachers showed development in all the elements of digital citizenship except digital ethics and digital health. Lauricella et al. (2020) examined elementary school teachers' efficacies in teaching digital citizenship. In the study conducted with the participation of 585 elementary school teachers in the USA, most of the teachers stated that they taught at least one digital citizenship competence, and one-third of the teachers stated that they did not teach any digital citizenship competence. In the study, it was concluded that the teachers' competencies in teaching digital citizenship differed depending on the class grade they were teaching, the type of the school they worked in and their years of seniority in teaching. Martin et al. (2020a) found that digital citizenship knowledge of teachers who attended a professional development course increased significantly compared to their knowledge levels before the course. Tapingkae et al. (2020) designed a game-based learning environment for seventh and eighth grade students so that they could learn digital citizenship behaviors. It was revealed that digital citizenship behaviors of the students studying in the game-based learning environment developed and that their motivations and perceptions regarding learning increased. Vlaanderen et al. (2020) reached the conclusion that children between the ages of 10-12 strengthened their digital citizenship after they were taught about cyber-bullying.

4. Discussion, conclusion and suggestions

During the COVID-19 epidemic, students started to use digital tools extensively both in their lessons and at their home and use of digital tools has become a necessity (Ranchordas, 2020). Students using digital tools extensively should be prepared to communicate and collaborate online in a safe and responsible manner (Parent and Community Impact, Technology, 2018; Tan, 2011). The need for establishing communicate and collaborating securely and responsibly online has brought up the concept of digital citizenship (Ribble et al., 2004; Ribble, 2008; Shelley, 2004). In this study, the theoretical framework of the concept of digital citizenship was introduced, and the studies in the literature on digital citizenship and teaching of it were examined. The studies examined were classified as follows: (1) those on the introduction of the concept of digital citizenship or its elements, (2) those conducted to determine the participants' digital citizenship levels or perceptions, (3) those examining the curricula within the framework of digital citizenship, and (4) those related to the teaching of digital citizenship and its elements.

It was seen that most of the studies in the literature were about determining the participants' digital citizenship levels or perceptions. In most of these studies, the participants had moderate digital citizenship

levels and perceptions (Akcil et al., 2016; Arcagök, 2020; Aygün, 2019; Aygun & Ilhan, 2020; Çebi & Bahçekapılı Özdemir, 2019; Çepni et al., 2014; Dedebali & Dasdemir, 2019; Hollandsworth et al., 2011, 2017; İridağ, 2020; Kaya & Kaya, 2014; Korucu & Totan, 2019; Nazik et al., 2020; Öztürk, 2019; Som Vural, 2016; Xu et al., 2019; Yalçınkaya & Cibaroğlu, 2019). Based on the fact that there was high number of studies in which the participants' digital citizenship levels or perceptions were moderate or low (Al-Abdullatif & Gameil, 2020; Dere & Yavuzay, 2019; Görmez, 2017a; Jwaifell, 2018; Martin et al., 2020b; Peker Ünal, 2017), it could be stated that there is a need for teaching digital citizenship and its elements.

In recent years, there has been a decrease in the number of studies in which suggestions for teaching digital citizenship and its elements or examples of related activities were presented (Buchholz et al., 2020; Cunningham, 2018; Edtech, 2020; Farmer, 2011; Gleason & Von Gillern, 2018; Hays, 2019; Hertz, 2011; Krutka & Carpenter, 2017; Lynch, 2017; Ribble, 2012; Özer & Albayrak Özer, 2020) and an increase in the number of studies in which the results of educational practices were presented (Altınay Gazi, 2016; Hui & Campbell, 2018; Martin et al., 2020a; Tapingkae et al., 2020; Vlaanderen et al., 2020). Accordingly, it could be stated that the importance given to teaching digital citizenship has increased. During the COVID-19 pandemic, the fact that students and teachers have to use digital tools requires more attention to the issue of teaching of digital citizenship and its elements. For this reason, in order to teach digital citizenship and its elements, related curricula should be prepared, and activities should be planned in line with the studies in the literature.

It was seen that the studies in which the curricula were examined within the framework of digital citizenship were mostly related to the curricula applied in Turkey. In Turkey, there is no course dedicated completely to teaching digital citizenship at elementary, secondary and high school levels (Ministry of National Education, 2018). There are outcomes, but not enough in number, regarding digital citizenship in the information technologies and software curriculum and in the social studies curriculum at elementary and secondary school levels and in the computer science curriculum and in the democracy and human rights curriculum at high school level (Aydemir, 2019; Başarmak et al., 2019; Görmez, 2017b; Kara & Atasoy, 2019; Peker Ünal, 2017; Turan & Karasu Avcı, 2018). With the changes done in the curricula at elementary, secondary and high school levels in Turkey in 2018, the competencies that students were expected to gain within the scope of all curricula were determined. Among these competencies, in relation to digital competence, characteristics related to digital citizenship were emphasized (Ministry of National Education, 2018). In addition, the curricula implemented in education faculties where teacher candidates training programs are applied were changed as well in 2018 (Council of Higher Education, 2018). Within the scope of the renewed curricula, there is no course dedicated completely to teaching digital citizenship. There are courses in the department of Computer Education and Instructional Technology and in the department of Social Studies, which cover the subject of digital citizenship or its elements. These courses are the compulsory field education course of "information ethics and security" in the department of Computer Education and Instructional Technology and the elective field education course of "media literacy". The subject of digital citizenship was also included in the course of "citizenship knowledge", which is a compulsory field education course in the department of Social Studies (Council of Higher Education, 2018). It could be stated that the courses aforementioned are very insufficient for teachers who will train the digital citizens of the future. Accordingly, courses completely dedicated to digital citizenship education could be given at both elementary, secondary, high school and undergraduate levels.

According to the review of the related literature, many studies have been conducted on digital citizenship and its teaching in recent years. Among the studies examined, there was no literature review study except for the study conducted by Walters et al. (2019). The study carried out by Walters et al. (2019) covered studies conducted within the context of elementary school teachers' knowledge, beliefs and educational activities regarding digital citizenship. The present study, which has been observed that the number of studies which examined and classified the studies on digital citizenship and its teaching in the literature

was inadequate, will guide researchers who will work on digital citizenship and its teaching. The study will also contribute to the field of teaching digital citizenship.

Dijital Vatandaşlık ve Öğretimi: Bir Literatür Taraması

Özet

Son yıllarda insanların hayatlarına giren dijital araçları kullanmak COVID-19 salgın sürecinde bir zorunluluk haline gelmiş ve öğrenciler hem derslerinde hem de evde dijital araçları yoğun olarak kullanmaya başlamışlardır. Teknolojiyi günlük olarak yoğun kullanan öğrencilerin güvenli ve sorumlu bir şekilde çevrimiçi iletişim kurmaya ve işbirliği yapmaya hazırlama gereksinimi dijital vatandaşlık kavramını gündeme getirmiştir. Bu çalışmada dijital vatandaşlık kavramının teorik çerçevesi tanıtılmış ve literatürdeki dijital vatandaşlık ve öğretimi ile ilgili çalışmalar incelenmiştir. İncelenen çalışmalar (1) dijital vatandaşlık kavramı veya dijital vatandaşlığın elemanlarının tanıtımı ile ilgili çalışmalar, (2) katılımcıların dijital vatandaşlık düzeylerini veya algılarını belirlemeyle ilgili çalışmalar, (3) ders programlarının dijital vatandaşlık çerçevesinde incelendiği çalışmalar ve (4) dijital vatandaşlık ve elemanlarının öğretimine yönelik çalışmalar olarak sınıflandırılmış ve her bir gruptaki çalışmalar kısaca tanıtılmıştır. Çalışma sonucunda dijital vatandaşlık öğretimine yönelik olarak önerilerde bulunulmuştur.

Anahtar kelimeler: Dijital vatandaşlık, dijital vatandaşlığın elemanları, öğretim, literatür taraması

References

Akcil, U., Altinay, Z., & Altinay, F. (2016). Assessing the effects of managers in the digital age on the management process of digital citizenship roles. *The Anthropologist, 23*(1-2), 209-217. doi: 10.1080/09720073.2016.11891943

Al Raqqad, H. K. (2020). The impact of social networking on enhancing digital citizenship among Princess Alia College, Al- Balqa'a University students. *Journal of Educational and Social Research*, *10*(5), 53-65. doi: 10.36941/jesr-2020-0087

Al-Abdullatif, A. M., & Gameil, A. A. (2020). Exploring students' knowledge and practice of digital citizenship in higher education. *International Journal of Emerging Technologies in Learning (iJET), 15*(19), 122-142. doi: 10.3991/ijet.v15i19.15611

Alberta Education (2012). *Alberta education cataloguing in publication data, digital citizenship policy development guide*. Alberta: School Technology Branch. Retrieved from https://education.alberta.ca/media/3227621/digital-citizenship-policy-development-guide.pdf

Altınay Gazi, Z. (2016). Internalization of digital citizenship for the future of all levels of education. *Education and Science, 41*(186), 137-148. doi: /10.15390/EB.2016.4533

Al-Zahrani, A. (2015). Toward digital citizenship: Examining factors affecting participation and involvement in the Internet society among higher education students. *International Education Studies, 8*(12). 203–217.

Arcagök, S. (2020). Investigation on teachers' perceptions of digital citizenship. *Van Yuzuncu Yil University Journal of Education, 17*(1), 534-556. Retrieved from https://dergipark.org.tr/tr/pub/yyuefd/issue/51176/693832

Aslan, S. (2016). *İlköğretim sosyal bilgiler öğretmen adaylarının dijital vatandaşlık davranışlarının bazı değişkenler açısından incelenmesi (Fırat, Dicle, Siirt, Adıyaman Üniversiteleri örneği) [Digital citizenship behaviour of social studies teachers of primary investigation of some variables (The sample of Fırat, Dicle, Siirt, Adıyaman universities)]* (Master's thesis). Fırat University, Elazığ, Turkey.

Ata, R., & Yıldırım, K. (2019). Turkish pre-service teachers' perceptions of digital citizenship in education programs. *Journal of Information Technology Education: Research, 18*, 419-438. doi: 10.28945/4392

Aydemir, M. (2019). Examination of the updated middle school social sciences curriculum in terms of digital citizenship and its sub-dimensions. *International Journal of Contemporary Educational Studies (IntJCES), 4*(2): 15-38. Retrieved from https://dergipark.org.tr/tr/download/article-file/659848

Aygün, M. (2019). *Sosyal bilgiler öğretmenlerinin ve sosyal bilgiler öğretmen adaylarının dijital vatandaşlık durumlarının incelenmesi [Examination of in-service and pre-service social studies teachers' digital citizenship]* (Master's thesis). Yıldız Teknik University, İstanbul, Turkey.

Aygun, M., & Ilhan, G. O. (2020). Analysis of in-service and pre-service social studies teachers' digital citizenship. *International Online Journal of Educational Sciences, 12*(4), 123-146. doi: 10.15345/iojes.2020.04.009

Başarmak, U., Yakar, H., Güneş, E. & Kuş, Z. (2019). Analysis of digital citizenship subject contents of secondary education curricula. *Turkish Online Journal of Qualitative Inquiry (TOJQI), 10*(1), 26-51. doi: 10.17569/ tojqi.438333

Buchholz, B. A., DeHart, J., & Moorman, G. (2020). Digital citizenship during a global pandemic: Moving beyond digital literacy. *Journal of Adolescent & Adult Literacy, 64*(1), 11–17. doi: 10.1002/jaal.1076

Çebi, A., & Bahçekapılı Özdemir, T. (2019). The role of digital nativity and digital citizenship in predicting high school students' online information searching strategies. *Education and Science, 200*(44), 47-57. doi: 10.15390/EB.2019.8379

Çepni, O., Oğuz, S., & Kıcan, B. (2014). Primary school students' views of digital citizenship. *The Journal of Turkish Social Research, 18(*3), 251-266. Retrieved from https://dergipark.org.tr/tr/pub/tsadergisi/issue/21495/230453

Choi, M. (2016) A concept analysis of digital citizenship for democratic citizenship education in the internet age. *Theory & Research in Social Education, 44*(4), 565-607. doi: 10.1080/00933104.2016.1210549

Choi, M., Glassman, M., & Cristol, D. (2017). What it means to be a citizen in the internet age: Development of a reliable and valid digital citizenship scale. *Computers & Education, 107*, 100-112. doi: 10.1016/j.compedu.2017.01.002

Çubukçu, A., & Bayzan, Ş. (2013). Perception of digital citizenship in Turkey and methods of increasing this perception by using the internet conscious, safe and effective. *Middle Eastern & African Journal of Educational Research, 5*, 148-174. Retrieved from https://www.guvenliweb.org.tr/dosya/WRQDG.pdf

Cunningham, B. (2018). Teaching digital citizenship to kids with learning and attention issues. Retrieved from https://www.commonsense.org/education/articles/teaching-digital-citizenship-to-kids-with-learning-and-attention-issues

Dedebali, N. C., & Dasdemir, I. (2019). Social studies teacher candidates' perception of digital citizenship. *International Journal of Educational Methodology*, *5*(3), 465-477. doi: 10.12973/ijem.5.3.465

Dere, İ., & Yavuzay, M. (2019). Examination of prospective social studies teachers through digital citizenship indicators. *MANAS Journal of Social Studies, 8*(3), 2400-2414. doi: 10.33206/mjss.537592

Edtech (2016). 32 digital citizenship resources for K-12 teachers. Retrieved from http://blog.whooosreading.org/digital-citizenship-resources-for-every-teacher/

Elçi, A. C., & Sarı, M. (2016). Digital citizenship in the Information Technology and Software course: A scale development study. *International Journal of Human Sciences*, *13*(2), 3602-3613. doi: 10.14687/jhs.v13i2.3838

Elmalı, F., Tekin, A., & Polat, E. (2020). A study on digital citizenship: preschool teacher candidates vs. computer education and instructional technology teacher candidates. *Turkish Online Journal of Distance Education, 21*(4), 251-269. doi: 10.17718/tojde.803423

Farmer, L. (2011). Teaching Digital Citizenship. In C. Ho & M. Lin (Eds.), *Proceedings of E-Learn 2011--World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 99-104). Honolulu, Hawaii, USA: Association for the Advancement of Computing in Education (AACE). Retrieved from https://www.learntechlib.org/primary/p/38680/

Fingal, D. (2020). Infographic: Citizenship in the digital age. Retrieved from https://www.iste.org/explore/infographic-im-digital-citizen

Gleason, B., & Von Gillern, S. (2018). Digital citizenship with social media: Participatory practices of teaching and learning in secondary education. *Journal of Educational Technology & Society, 21*(1), 200-212. Retrieved from http://www.jstor.org/stable/26273880

Görmez, E. (2017a). The level of the teachers about the "digital citizenship and its subdimensions" (van city sample). *Academic Sight International Refereed Online Journal, 60*, 52-74. Retrieved from https://www.akademikbakis.org/file/60.pdf

Görmez, E. (2017b). The competency of the primary school social studies curriculum in terms of the digital citizenship and its sub-dimensions. *The Journal of Academic Social Science Studies, 60*, 1-15. doi:10.9761/JASSS7220

Government of Newfoundland and Labrador Education (2013). *Teaching digital citizenship.* Retrieved from https://www.gov.nl.ca/education/files/k12_safeandcaring_procedure_5.pdf

Hays, L. (2019). How to promote digital citizenship in the school library. Retrieved from https://ideas.demco.com/blog/how-to-promote-digital-citizenship-in-the-school-library/

Hertz, M. B. (2011). Teaching digital citizenship in the elementary classroom. Retrieved from https://www.edutopia.org/blog/digital-citizenship-mary-beth-hertz

Hollandsworth, R., Donovan, J. & Welch, M. (2017). Digital Citizenship: You Can't Go Home Again. *TechTrends*, 61, 524-530. doi: 10.1007/s11528-017-0190-4

Hollandsworth, R., Dowdy, L., & Donovan, J. (2011). Digital citizenship in K-12: It takes a village. *TechTrends, 55*(4)**,** 37–47. doi: 10.1007/s11528-011-0510-z

Hui, B., & Campbell, R. (2018). Discrepancy between learning and practicing digital citizenship. *Journal of Academic Ethics, 16*, 117-131. doi: 10.1007/s10805-018-9302-9

Impero Software & Digital Citizenship Institute (2016). *Digital citizenship: a holistic primer*. Digital Citizenship Summit 2016 in San Francisco. Retrieved from https://www.imperosoftware.com/us/wp-content/uploads/sites/16/2017/03/Digital-Citizenship-A-Holistic-Primer-v1.9.2.pdf

International Society for Technology in Education [ISTE] (2016). Digital citizenship defined: Teach the 9 elements to enhance students' safety, creativity and empathy. Retrieved from https://cdn2.hubspot.net/hubfs/1818747/Images/Marketing%20Campaigns/Digital%20Citizenship/Digital_Citizenship_Downloadable_10-2016_v11_web.pdf

International Society for Technology in Education [ISTE] (2018). Citizenship in the digital age. Retrieved from https://elearninginfographics.com/citizenship-digital-age-infographic/

İridağ, A. (2020). Young people's perception of digital citizenship. In Ö. Gökkaya, İ. Kılıcaslan, B. Demir, & K. Kahraman (Eds.), *International Marmara Social Sciences Congress (IMASCON 2020 - Autumn) Proceedings Book* (pp.121-133). Kocaeli, Turkey.

Isman, A., & Gungoren, O. C. (2014). Digital citizenship. *TOJET: The Turkish Online Journal of Educational Technology, 13*(1), 73-77. Retrieved from http://www.tojet.net/volumes/v13i1.pdf

Jones, L. M., & Mitchell, K. J. (2016). Defining and measuring youth digital citizenship. *New Media & Society*, *18*(9), 2063–2079. doi: 10.1177/1461444815577797

Jwaifell, M. (2018). The proper use of technologies as a digital citizenship indicator: Undergraduate English language students at Al-Hussein Bin Talal University. *World Journal of Education, 8*(3), 86-94. doi: 10.5430/wje.v8n3p86

Kabataş, S. (2019). *Öğretmen adaylarının dijital vatandaşlık algılarının yaşam boyu öğrenme tutumları ve e-öğrenmeye hazır bulunuşluğu açısından değerlendirilmesi [Evaluation of teacher candidates' digital citizenship perceptions in terms of lifelong learning attitudes]* (Master's thesis). Bartın University, Bartın, Turkey.

Kara, N. (2018). Understanding university students' thoughts and practices about digital citizenship: A mixed methods study. *Educational Technology & Society, 21*(1), 172-85.

Kara, T., & Atasoy, E. (2019). The research of social studies books and teaching program (2018) within the framework of digital citizenship notion and sub dimension. *Balıkesir University the Journal of Social Sciences Institute, 22*(41), 133-154. doi: 10.31795/baunsobed.581917

Karakuş Yılmaz, T. (2020). Dijital haklar ve sorumluluklar [Digital rights and responsibilities]. In Ş. Sağıroğlu, H. İ. Bülbül, A. Kılıç, & M, Küçükali (Eds.), *Dijital okuryazarlık: Araçlar, metodolojiler, uygulamalar ve öneriler [Digital literacy: Tools, methodologies, practices and recommendations]* (pp. 127-180). Ankara: Nobel Akademik Yayıncılık.

Kaya, A., & Kaya, B. (2014). Teacher candidates' perceptions of digital citizenship. *International Journal of Human Sciences*, *11*(2), 346-361. doi: 10.14687/ijhs.v11i2.2917

Kim, M., & Choi, D. (2018). Development of youth digital citizenship scale and implication for educational setting. *Educational Technology & Society, 21*(1), 155–171.

Kocadağ, T. (2012). *Öğretmen adaylarının dijital vatandaşlık düzeylerinin belirlenmesi [Determining digital citizenship levels of prospective teachers]* (Master's thesis). Karadeniz Technical University, Trabzon, Turkey.

Korucu, A. T., & Totan, H. N. (2019). Researching into a course of information technologies and software in the context of digital citizenship through student opinions. *Participatory Educational Research, 6(*1), 84-97. doi: 10.17275/per.19.7.6.1

Krutka, D. G., & Carpenter, J. P. (2017). Digital Citizenship in the Curriculum. *Educational Leadership*, *75*(3), 50-55. Retrieved from http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?vid=0&sid=1c9ce3e5-e268-45fa-8491-c93c5e4f66e1%40pdc-v-sessmgr02

Kuş, Z., Güneş, E., Başarmak, U., & Yakar, H. (2017). Development of a digital citizenship scale for youth: a validity and reliability study. *Journal of Computer and Education Research, 5(*10), 298-316. doi: 10.18009/jcer.335806

Lauricella, A. R., Herdzina, J., & Robb, M. (2020). Early childhood educators' teaching of digital citizenship competencies. *Computers & Education, 158*, 103989. doi: 10.1016/j.compedu.2020.103989.

Lynch, M. (2017). 8 must have digital citizenship apps, tools, and resources. Retrieved from https://www.theedadvocate.org/8-must-digital-citizenship-apps-tools-resources/

Martin, F., Gezer, T., Wang, W. C., Petty, T. & Wang, C. (2020a). Examining K-12 educator experiences from digital citizenship professional development. *Journal of Research on Technology in Education.* doi: 10.1080/15391523.2020.1815611

Martin, F., Hunt, B., Wang, C., & Brooks, E. (2020b). Middle school student perception of technology use and digital citizenship practices. Computers in the Schools, 37(3), 196-215. doi: 10.1080/07380569.2020.1795500

Milli Eğitim Bakanlığı [Ministry of Education] (2018). Öğretim programları [Teaching programs] Retrieved from http://mufredat.meb.gov.tr/Programlar.aspx

Nazik, M. H., Demirel, H., & Bayraktar, A. (2020). Gençlerin dijital vatandaşlık düzeyleri ile siber zorbalık eğilimleri [Digital citizenship levels of young people and their cyberbullying trends]. In A. Görgün Baran, O. Hazer, & S. Öztürk (Eds.) *Gençlik ve dijital çağ [Youth and the digital age]* (pp. 124-138). Ankara: Hacettepe University Gençlik Araştırmaları ve Uygulamaları Merkezi.

Nordin, M. S., Ahmad, T.B.T, Zubairi, A.M., Ismail, N. A. H., Rahman, A. H. A., Trayek, F. A. A., & Ibrahim, M. B. (2016). Psychometric properties of a digital citizenship questionnaire. *International Education Studies, 9*(3), 71–80. doi:10.5539/ies.v9n3p71

Özer, Ü., & ve Albayrak Özer, E. (2020). *Etkinlik örnekleriyle dijital vatandaşlık eğitimi [Digital citizenship education with examples of activities]*. İstanbul: Kriter Basım Yayın Dağıtım.

Öztürk, C. (2019). *8. sınıf öğrencilerinin dijital vatandaşlık düzeyleri ile siber zorbalık eğilimleri arasındaki ilişki [The investigation of relation between digital citizenship levels and tendencies to cyberbullying of 8th grade students]* (Master's thesis). Sakarya University, Sakarya, Turkey.

Parent and Community Impact, Technology (2018). Respect, educate, and protect: Cultivating digital citizenship in 21st century learners. Retrieved from https://www.advancementcourses.com/courses/respect-educate-and-protect-cultivating-digital-citizenship-in-21st-century-learners/

Peker Ünal, D. (2017). Digital citizenship elements in a curriculum and secondary school students' states of having digital citizenship elements. *Karaelmas Journal of Educational Sciences, 5*(2), 180-195. Retrieved from http://ebd.beun.edu.tr/index.php/KEBD/article/viewFile/119/155

Ranchordas, S. (2020). We teach and learn online. Are we all digital citizens now? Lessons on digital citizenship from the lockdown. Retrieved from http://www.iconnectblog.com/2020/05/we-teach-and-learn-online-are-we-all-digital-citizens-now-lessons-on-digital-citizenship-from-the-lockdown/

Ribble, M. (2008). Passport to digital citizenship journey toward appropriate technology use at school and at home. *Learning & Leading with Technology, 36*(4), 14-17. Retrieved from https://files.eric.ed.gov/fulltext/EJ904288.pdf

Ribble, M. (2011). *Digital citizenship in schools, second edition*. Washington: International Society for Technology in Education.

Ribble, M. (2012). Digital citizenship for educational change. *Kappa Delta Pi Record, 48(4), 148-151*. doi: 10.1080/00228958.2012.734015

Ribble, M. (2014). Essential elements of digital citizenship. Retrieved from https://www.iste.org/explore/ArticleDetail?articleid=101

Ribble, M. S., Bailey, G. D., & Ross, T. W. (2004). Digital citizenship: Addressing appropriate technology behavior. *Learning & Leading with Technology, 32*(1), 6-12. Retrieved from https://eric.ed.gov/?id=EJ695788

Ribble, M. ve Bailey, G. (2007). *Digital citizenship in schools*. Washington: International Society for Technology in Education.

Sağıroğlu, Ş., Bülbül, H. İ., Kılıç, A., & Küçükali, M. (2020). Dijital okuryazarlık ve ötesi [Digital literacy and beyond]. In Ş. Sağıroğlu, H. İ. Bülbül, A. Kılıç, & M, Küçükali (Eds.), *Dijital okuryazarlık: Araçlar, metodolojiler, uygulamalar ve öneriler [Digital literacy: Tools, methodologies, practices and recommendations]* (pp. 2-46). Ankara: Nobel Akademik Yayıncılık.

Shelley, M., Thrane, L., Shulman, S., Lang, E., Beisser, S., Larson, T., & Mutiti, J. (2004). Digital citizenship: Parameters of the digital divide. *Social Science Computer Review*, *22*(2), 256–269. doi: 10.1177/0894439303262580

Som Vural, S. (2016). *Üniversite öğrencilerinin bakış açısıyla dijital vatandaşlık göstergelerinin incelenmesi [Investigation of digital citizenship indicators through university students' perceptions]* (Master's thesis). Anadolu University, Eskişehir, Turkey.

Somyürek, S. (2019). From traditional citizenship to digital citizenship. Retrieved from https://epale.ec.europa.eu/en/blog/traditional-citizenship-digital-citizenship

Tan, T. (2011). Educating digital citizens. *Leadership, 41*(1), 30-32. Retrieved from https://files.eric.ed.gov/fulltext/EJ965963.pdf

Tapingkae, P., Panjaburee, P., Hwang, G., & Srisawasdi, N. (2020). Effects of a formative assessment-based contextual gaming approach on students' digital citizenship behaviours, learning motivations, and perceptions. *Computers & Education, 159*, 103998. doi:10.1016/j.compedu.2020.103998.

TDK [Turkish Language Association] (2020). Güncel Türkçe sözlük [Current Turkish dictionary]. Retrieved from https://sozluk.gov.tr/

Turan, S., & Karasu Avcı, E. (2018). 2018 Sosyal bilgiler öğretim programı'nın dijital vatandaşlık bağlamında incelenmesi [Examining the social studies curriculum in the context of digital citizenship]. *Journal of Education and New Approaches, 1*(1), 28-38. Retrieved from https://dergipark.org.tr/tr/pub/jena/issue/42984/519671

Vlaanderen, A., Bevelander, K. E., & Kleemans, M. (2020). Empowering digital citizenship: An anti-cyberbullying intervention to increase children's intentions to intervene on behalf of the victim. *Computers in Human Behavior, 112*, 106459. doi: 10.1016/j.chb.2020.106459.

Walters, M.G., Gee, D., & Mohammed, S. (2019). A literature review: Digital citizenship and the elementary educator. *International Journal of Technology in Education (IJTE), 2*(1), 1-21.

Xu, S., Yang, H. H., MacLeod, J., & Zhu, S. (2019). Social media competence and digital citizenship among college students. *Convergence*, *25*(4), 735-752. doi: 10.1177/1354856517751390

Yalçınkaya, B., & Cibaroğlu, M. O. (2019). Investigation of digital citizenship perception: An empirical evaluation. *Business & Management Studies: An International Journal (BMIJ), 7*(4), 1188-1208. doi: 10.15295/bmij.v7i4.1140

Yaman, F., Kabakçı Yurdakul, I., & Dönmez, O. (2020). Dijital vatandaşlıktan dijital ebeveynliğe dönüşüm [Transformation from digital citizenship to digital parenting]. In A. Görgün Baran, O. Hazer, & S. Öztürk (Eds.) *Gençlik ve dijital çağ [Youth and the digital age]* (pp. 165-180). Ankara: Hacettepe University.

Yılmaz, M., & Doğusoy, B. (2020). Determination of the digital citizenship levels of prospective teachers. *Kastamonu Education Journal, 28*(6), 2362-2375. doi: 10.24106/kefdergi.692492

Yükseköğretim Kurulu [Council of Higher Education] (2018). Yeni öğretmen yetiştirme lisans programları [New teacher training undergraduate programs]. Retrieved from https://www.yok.gov.tr/kurumsal/idari-birimler/egitim-ogretim-dairesi/yeni-ogretmen-yetistirme-lisans-programlari

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Competition-based learning of blockchain programming

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Abstract

Blockchain, which is a disruptive technology, affects many technologies, and it will affect many other technologies. Main property of blockchain technologies is assuring trust without central authorization. This is achieved through immutable data and decentralization. Moreover, blockchain is founded on the principles of cryptography, which provides the required infrastructure for the trust. First application of the blockchain technologies is Bitcoin cryptocurrency. After the birth of Bitcoin, cryptocurrencies began to change financial systems. Learning of blockchain is difficult because blockchain and its related technologies are strange for most of the people. In order to figure out blockchain technologies, the concepts like cryptography, cryptocurrency, immutable data and decentralization should have been understood. Therefore, blockchain and its related technologies should be learned through efficient learning mechanisms. Project-based learning, team-based learning, active learning and competition-based learning can be used for efficient teaching of blockchain. Competition-based learning has been used in many areas successfully for years. Smart contract development is the programming part of blockchain technologies. In this paper, competition-based learning is applied to blockchain programming to increase learning efficiency. In addition, a methodology is presented to apply competition-based learning to blockchain programming.

1. Introduction

Blockchain is related to decentralization. Decentralization means that control of a system is distributed among nodes in network. In other words, the system cannot be controlled by central authorities. This property provides trust, security, and consensus to systems. Decentralization is achieved by distributing the data of the system to enough network nodes. The data of this kind of systems is called blockchain. Blockchain is empowered with cryptography to provide its principal properties.

Blockchain technologies were revealed after the birth of Bitcoin cryptocurrency. Bitcoin proved that trust to a system can be achieved without central authorities. In other words, decentralization can provide trust to systems. After ensuring the trust to the blockchain, various applications of decentralization became possible. Therefore, programming entered to the scene. Programs on blockchain were named as smart contracts. Especially, the word contract indicates the trust property of blockchain. Vitalik Buterin developed a general purpose blockchain programming platform Ethereum. Ethereum has also its native cryptocurrency called Ether, which is the required gas to drive smart contracts in addition to its being a cryptocurrency.

Blockchain technologies are spreading fast to new application areas by extending its current circle of applications. However, this fast progress does not go parallel with the understandability of blockchain

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technologies. In other words, learning and comprehending these technologies are very difficult. For students to understand blockchain, they should understand also its related technologies. Consequently, efficient learning mechanisms are needed to teach blockchain technologies to students. Competitions can be used to improve the efficiency of learning. In this paper, competition-based learning is applied to blockchain programming to increase the learning performance of blockchain technologies.

Smart contract development is part of software development. However, it needs special treatments because of its characteristics. Therefore, special software engineering methods should be applied. In particular, agile practices are crucial for smart contract development because of divide-and-conquer approaches of agile methodologies. Iterative and incremental approaches of agile methodologies can be included in an efficient learning process.

Competition-based learning is well applied with a project in teams. The project-based learning has also good contribution to learning processes. In addition, teams should be formed so that their members can embrace the power of mutual work of team-based learning.

Also, games can be used to improve learning performance. Especially, tournaments in the games can be included to preserve the willingness of learning of students to a long period of time. Tournaments in games correspond iterations in agile methodologies. Both provide sustainability in works.

Students can be included in the learning process for the efficiency of learning. Students can take active roles during learning. This time, active learning comes in view. Competition-based learning supports also active learning. In order to get good results in competitions, students act actively to learn earlier than others.

The rest of this paper is structured as follows. In the next section, related work is given. Then, the methodology is described. Application of the methodology will come next. Results of the application are handled then. After discussion, the paper will end up with conclusion.

2. Related Work

Blockchain (Swan, 2015) is a shining technology term. Blockchain is simply a database which is immutable and has chains among its data parts. The chains, or simply the links, are empowered by cryptography. This immutable database is distributed in networks so that blockchain is decentralized. In other words, it cannot be controlled by central authorities.

As recognizing the power of blockchain, its applicability to many technology areas becomes clear. Bitcoin which is a cryptocurrency is the first application area of blockchain technologies (Nakamoto, 2008). Cryptocurrencies are virtual money systems, and probably will take the place of current fiat currencies. Smart contracts or blockchain programs form another important application area of blockchain technologies (Buterin, 2013). A smart contract is a distributed program running on blockchain. In future, probably most of the real contracts will be implemented using these distributed blockchain programs. Ethereum (Buterin, 2013) is a blockchain platform where the first Turing-complete execution environment is created for smart contracts. Ethereum presents a virtual machine for execution of smart contracts. The virtual machine is called Ethereum Virtual Machine (EVM). EVM executes assembly level codes of smart contracts. In other words, EVM executes bytecodes of smart contracts which can be generated from higher level blockchain programs. Solidity (Dannen, 2017) is the main high-level programming language of Ethereum platform. Ethereum platform has also its own cryptocurrency named Ether. Smart contracts can only be executed on Ethereum with some Ethers. This method prevents Ethereum blockchain from denial-of-service type attacks.

Smart contract development is difficult for learning because blockchain technologies have not been understood sufficiently. In order to figure out blockchain technologies, people should become familiar with cryptography, cryptocurrency, immutable data, and decentralization. These are new for most of the people

so that learning something related to blockchain technologies is difficult. In this paper, competition-based learning (Altin, 2013) is applied to smart contract development to increase learning efficiency.

Smart contract development tasks increase with the increase of applications of blockchain technologies. Therefore, software engineering for smart contract development becomes important. Software engineering methods and practices should be adapted to smart contract development because of unique characteristics of blockchain (Chakraborty et al., 2018). In Marchesi, Marchesi and Tonelli (2018), a software development process is proposed for blockchain development, which is based on agile practices. Agile practices are enhanced for the specific requirements of blockchain development.

Competition-based learning uses the power of competitions in learning. Competitions increase eagerness of students. Competition-based learning (Marchesi, Marchesi & Tonelli, 2018) finds place in many education areas nowadays. It is applied in robotics (Altin, 2013; Jung, 2013). Another natural application area for competition-based learning is autonomous robotic vehicles. In the references (Paulik & Krishnan, 2001; Paulik & Krishnan, 1999; Hyyppä, 2004), it is applied in design courses where are competitions among autonomous robotic vehicles. The competitions are carried out through a project in teams. The project presents some challenges to the students, and motivates them to overcome them to produce a solution. Therefore, this kind of project-based learning also increases the efficiency of learning. Teams are also good ingredients for learning. Members of a team collaborate and do teamwork among themselves.

Game-based learning uses games to achieve learning outcomes (Plass, Homer & Kinzer, 2015). In Burguillo (2010), competition-based learning is combined with other learning methods as well as game-based learning under tournaments which are based on Game Theory (Myerson, 2013). Game Theory deals with equilibria in games. Each player in games internalizes a strategy which is unlikely to be changed. There are many equilibrium concepts in Game Theory. The most popular one is the Nash equilibrium (Nash, 1950). Game Theory tournaments make students to get intrinsic motivation which increases learning performance (Bergin & Reilly, 2005). Moreover, competitions mimic real-world projects where usually are strict deadlines to be obeyed. In Cagiltay, Ozcelik and Ozcelik (2015), competition-based learning is applied to a game-based learning environment. It is showed that learning performance is increased significantly by adding competitions to serious games.

Augmented Reality (AR) is used to better understand real-world environment by providing additional virtual information according to the real-world context. In Hwang et al. (2016), a learning environment based on AR is powered by applying competition-based learning. It is showed that not only learning attitudes of students but also learning performance of them are improved.

In Çulha (2016), competition-based learning is applied to agile software engineering. Agile software development has short development cycles including all the activities of a software development project (Schwaber, 2004). These iterations in software development resembles tournaments in games. Both freshen motivation and increase performance. In Latih et al. (2018), competition-based learning is applied to a computer programming course using a competition tool. The results show that competitive atmosphere of the course motivates students and improve their performances.

In Chung (2008), competition-based learning is applied in classes to get active learning. In active learning, students take active roles in learning processes. The results show that students become more motivated, study harder, and ask more questions. Eventually their learning performance is enhanced. A drawback is observed as a result of applying competition-based learning in teams. There is less cooperation among the teams because of competitions. This drawback can be eliminated by requiring teams to share their studies via presentations.

In Bornstein and Erev (1994), the relation between competition and cooperation in teams is investigated. When the competition among the teams is intensified, it results in an increase in the cooperation among in the members of the same team. Competitions increase communication within teams.

In Francese et al. (2015), competition-based learning is applied to a project-based learning course on mobile application development. The project is realized in teams. The competition among the teams increases the collaboration in the same teams.

In Desai (2014), an innovative business capstone course, which deals with real business problems, is powered by applying competition-based learning to prepare students to real world business environment.

Competition-based learning has not been applied to blockchain programming before. However, difficulties in learning new concepts of blockchain technologies point competition-based learning. In this paper, competition-based learning is applied to blockchain programming using a proposed methodology. Competition-based learning, active learning, team-based learning, and project-based learning work well together. Competition-based learning supports active learning and collaboration in teams. Project-based learning creates a goal that supports active learning. In this paper, these methods are harmonized to achieve stronger learning performance for blockchain programming.

3. Methodology

Competition-based learning is applied to smart contract development using a proposed methodology. The steps of the proposed methodology are the following:

- Determine the concepts which should be learned by students
- Prioritize the determined concepts, and sort them according to their priorities
- Take at most 5 determined concepts from the sorted list, and call them as learning concepts
- Design a project which includes the learning concepts
- Redesign the project to include competitions, which should not have preferably an ultimate solution
- Assign the project to teams, which should include 3-4 students
- Do 3 competitions, finish them in the class, and order the teams according to their competition results

The methodology is seen in Figure 1. Teams start a competition, finish it with an order, and start a new competition. After each competition, teams get stronger.

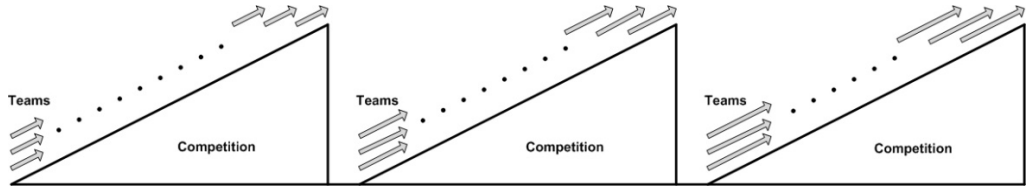

Fig. 1. The Methodology

3.1. Application of the Methodology

Competition-based learning is applied in the course SE427 Blockchain and Cryptocurrency Technologies in the Department of Software Engineering at Atilim University. 16 students are enrolled to the course. 5 teams are formed, of which one has 4 students, and the rest have 3 students. First, learning concepts are determined, and they are prioritized. A scale of 1 to 10 is used for prioritization where 10 represents the highest priority and 1 represents the smallest one. Table 1 shows the learning concepts with their priorities. In the second column, some details about learning concepts are given.

Table 1.

Learning concepts

Learning Concepts	Details	Priority (1-10)
blockchain	structure of blockchain, exploring blockchain	10
execution of smart contracts	editors, deployment, execution	9
public and private keys	signing	8
Solidity	programming with Solidity	8
interaction of smart contracts	calling smart contracts from a smart contract	8
smart contract	concept of smart contract	7
cryptocurrency	transferring, usage	7
cryptography	basics of cryptography	6
smart contract development	Solidity development	6
smart contract deployment	deployment in Remix	6
usage of cryptocurrency	transferring cryptocurrencies	5
user interaction with smart contracts	using Metamask	5
Ethereum	Ethereum platform	5
Ether	usage of Ethers	4
Ethereum Virtual Machine	bytecodes of Solidity programs	4
Remix	default editor of Ethereum platform	4
test network	Rinkeby test network	4
gas	required money to execute smart contracts	3
getting Ethers	getting test Ethers form https://faucet.rinkeby.io/	3
Metamask	connector to Ethereum blockchain	2
web3	connector library to Ethereum blockchain	2

According to the priorities, the most important learning concepts are taken. These are blockchain, execution of smart contracts, public and private keys, Solidity, and interaction of smart contracts. These most important learning concepts are included in the design of the project. Firstly, students should figure out what a real blockchain looks like. Therefore, the blockchain of the first Turing-complete smart contract development platform Ethereum is the starting point. The main Ethereum network which works with real currency Ethers is not suitable for the project. However, there are test networks for Ethereum. Rinkeby test network which is one of them is placed as the platform of the project. The smart contracts will be deployed there and will interact with others. The interaction of the teams with the smart contracts will be through their special accounts. Actually, these accounts are private keys. Therefore, for each team an account is generated via Metamask, which is a connector to the blockchain. Private keys of the accounts are given to corresponding teams who are responsible for the safety of their special accounts. At the center of the project, a central smart contract is thought, and the smart contracts of the teams can interact with it only through their accounts. All these developments should be done with Solidity because it is the main high-level programming language of the Ethereum platform.

After designing the framework of the project, competition logic is embedded to the project. For the competition logic, it is preferable that there should be no ultimate solution. Therefore, even teams can present their best performances, there would be enough room for later performances. These types of

competition problems can be taken from mathematics because flexible problems can be easily constructed with numbers. However, complex mathematical problems should not be selected because they change the aim of the project. As a simple competition, a counter is thought. The central smart contract will have a counter, and the smart contracts of the teams will increment the counter. How much teams increment the counter will be their competition scores which will be used to measure their performances.

The counter will be incremented by teams, and the teams will not reach the upper limit of the counter. Therefore, there is no ultimate solution for the teams so that they can increment the counter every time. Consequently, the problem is very suitable for competitions.

The description of the designed project is the following:

Smart contracts will be developed in Solidity and a central contact with a counter will be incremented on the Ethereum test network Rinkeby. Solidity program version "pragma solidity ^0.5.1" will be used in smart contracts.

The name of the central smart contract is CommonCounterContract. The address of the contract will be given. The interface of the central contract is shown in Figure 1.

```
contract CommonCounterContract {

  function setTeamContract(address contractAddress) public;

  function getMyTeamContract() public view returns (address);

  function getCounter() public payable returns (int);

  function getMyTeamCount() public view returns (int);

  function incrementCounter(int prediction) public payable;

}
```

Fig. 2. Interface of the central smart contract

Each team will develop a smart contract, and then set their contract address to the central contract by calling the function "setTeamContract". This operation can be realized only by the team own account. Teams may check their active contract address via the function "getMyTeamContract". Teams can learn the current value of the counter using the function "getCounter". This function is a "payable" function, and can be called with a 0.1 test Ether. Teams can increment the counter using the function "incrementCounter". This function is also a "payable" function, and can be called with a 0.5 test Ether. It takes the last counter value, and if the counter value is correct, it increments the counter by 1. Teams can learn their total increment count using the function "getMyTeamCount".

The project will be completed in 3 competitions. Each competition will be 2 weeks. For each competition, the following documents will be submitted also.

- The source code of the developed smart contract and its address
- Competition report which will include the followings:
    - Description of the developed smart contract
    - Challenges in the development, and solutions of them
    - Tasks which will be done in the next competitions or in the future
    - Effort which has been spent in hours

4. Findings

Table 2 shows the results of the competitions. In the first competition, Team 2 and Team4 incremented the counter whereas other teams did not increment. In the second competition, all the teams incremented the counter. Therefore, the second competition shows properties of a good competition. In the last competition, properties of a good competition continued because total count of the counter incrementations increased by nearly two times from the second competition to the third competition.

Table 2.

Competition results

	Competition 1		Competition 2		Competition 3	
	Count	**Order**	**Count**	**Order**	**Count**	**Order**
Team 1	0	3	16	4	81	5
Team 2	334	1	117	3	148	3
Team 3	0	3	263	1	452	1
Team 4	1	2	201	2	94	4
Team 5	0	3	9	5	387	2

In the first competition, only two teams incremented the counter. In the second competition, the other teams also incremented the counter. Therefore, in two competitions teams learned smart contract development and execution. In the third competition, all the teams presented good performances.

5. Discussion

At the beginning of the project, there are many things to learn for students. First of all, they realized that they need an editor to write code in Solidity. Remix which is the default online editor of the Ethereum platform was the first choice of the students, whereas some of them used also Visual Studio Code editor.

Teams have their own private keys. They learned how to use these keys. All of them used Metamask, and imported their private keys using Metamask to manage their special accounts. Some of them also searched for usage of Mist which is a wallet and a browser for Ethereum. Moreover, some students tried to use the library web3 for dealing with accounts.

Rinkeby test network needs test Ethers to execute smart contracts. In addition, the central contract works with Ethers. Therefore, the students began to get Ethers from the Rinkeby Faucet at the address https://faucet.rinkeby.io. Limited test Ethers are given for a duration from the Rinkeby Faucet so that students applied there periodically. Students learned how to transfer and get test Ethers. Students used test Ethers to deploy and execute smart contracts. Used Ethers for execution of this kind of transactions are called gas. Students learned the gas concept. In short, they have learned cryptocurrency concept.

Students need to explore transactions on the blockchain. Most of them used Etherscan at the address https://rinkeby.etherscan.io/ as a blockchain explorer. They analyzed their transactions and transactions of other teams. Moreover, they examined internal transactions and bytecodes of smart contracts.

The central contract is designed to allow interaction of smart contracts. In other words, its counter can only be incremented by other smart contracts. It cannot be incremented by team accounts directly. Therefore, teams developed their smart contracts, and incremented the central counter with their smart contracts. Moreover, getting current value of the counter and incrementing it are designed as payable. In order to execute them, the calling smart contract should have test Ethers, and should have been coded accordingly. These are new concepts and a bit tricky. Students also learned these mechanisms. Briefly, students learned interactions of smart contracts.

Team size was 3 except one team with size 4. According to the observations, 3 as a team size is very optimal for competitions. 2 as a team size is poor for being a team. Moreover, team size greater than 3 is redundant for course projects because at that time some team members could not interact enough with other team members. Competitions force teams to increase their internal communication. It is observed that communication among team members is maximized when the team size is 3. Maximized communication results in a good teamwork, and teams become real teams.

Number of competitions was kept as 3. According to the observations, 3 is optimal to preserve excitement of students. Usually, two competitions is not enough because students actually realize the excitement in the second competition. Therefore, another competition is required by students. However, after 3 competitions the excitement of students deplete. In short, 3 competitions are suitable to maximize learning period of students.

Competitions also resemble mining in blockchain. Mining means that if blockchain nodes find a valid block for appending to the blockchain, they get rewards of the current block mining competition. Then, new block mining competition starts for finding new valid blocks. Therefore, competitions fit to blockchain technology teaching very well in this perspective also.

Students said that they asked many questions to their friends and their teachers about blockchain. However, all of them could not answered their questions. They searched in internet. Likewise, they could not find enough material there. In brief, they tried to learn blockchain technologies actively. They practiced active learning. Some other students said that they had not studied for the capstone project as much as they had studied for this project. Some of the students said that they learned blockchain. This was the aim of the application of the competition-based learning, and the aim was realized. Students have become to view the whole picture of blockchain and cryptocurrency technologies.

Table 3 shows the efforts of the teams. In the first competition, they spent their maximum effort to learn many new concepts. In the second competition, their total effort shows that their attention to the project is good. In other words, they felt the excitement of the competition. In the third competition, their total effort decreased.

Table 3.

Efforts of the teams (in hours)

	Competition 1	**Competition 2**	**Competition 3**	**Total**
Team 1	15	9	7	31
Team 2	21	12	8	41
Team 3	38	46	14	98
Team 4	31	27	18	76
Team 5	13	8	22	43
Total	118	102	69	289

Grading of the project is designed as 30%, 40%, and 30% for the competitions respectively. The first competition passes with learning activities muchly, and in the last competition the excitement of students decreases. However, in the second competition teams present their best performances. Therefore, the grading is favored for the second competition.

6. Conclusion

Blockchain and its related technologies are comprehensive. Cryptography, cryptocurrency, immutable data, and decentralization are main concepts in these technologies. Smart contract development means programming on blockchain. In order to learn smart contract development, the related concepts should have

been understood also. However, these concepts are new or not easily understandable currently. Therefore, learning of smart contract development is difficult. In order to increase learning efficiency, competition-based learning is applied to blockchain programming.

Competition-based learning has been used in many areas successfully for years. In this paper, this approach is applied to the uncharted smart contract development area. A methodology is presented to design competition-based learning. Learning is realized through a project with teams. Therefore, project-based and team-based learning are also included in the methodology. Moreover, competitions force students to active learning implicitly. Students try to take active roles in the learning process to win competitions.

Results of the application of competition-based learning are presented. Basically, students studied harder and tried to learn blockchain and blockchain technologies through many channels like friends, teachers, books, and internet. They practiced active learning.

As an observation, project-based learning is well suited for teams of size 3 with 3 competitions. The applied methodology also emphasizes these numbers. Moreover, competitions should be finished in front of the students to increase their willingness. Main contribution of this paper is the application of competition-based learning to blockchain programming.

Blokzincir Programlamanın Yarışma-Tabanlı Öğrenimi

Özet

Bir yıkıcı yenileşim teknolojisi olan blokzincir, birçok teknolojiyi etkilemektedir ve birçok başka teknolojiyi de etkileyecektir. Blokzincir teknolojilerinin ana özelliği, merkezi yetki olmadan güven sağlamasıdır. Bu özellik, değiştirilemez veri ve merkezsizleşme aracılığıyla gerçekleşmektedir. Ayrıca, blokzincir, güvenli altyapı sağlayan şifreleme biliminin ilkeleri üzerine kurulmuştur. Blokzincir teknolojilerinin ilk uygulaması, Bitcoin kripto parasıdır. Bitcoin'in doğuşundan sonra kriptoparalar, finansal sistemleri değiştirmeye başlamıştır. Blokzinciri öğrenmek zordur çünkü blokzincir ve ilgili teknolojileri, birçok kişi için tuhaftır. Blokzincir teknolojilerini kavramak için şifreleme, kripto para, değiştirilemez veri ve merkezsizleşme gibi kavramları anlamış olmak gerekmektedir. Bu nedenle, blokzincir ve ilgili teknolojilerini, etkin öğrenme yöntemleriyle öğrenmek gerekmektedir. Proje-tabanlı öğrenme, takım-tabanlı öğrenme, etkin öğrenme ve yarışma-tabanlı öğrenme, blokzinciri etkin öğretmek için kullanılabilir. Yarışma-tabanlı öğrenme, birçok alanda yıllardır başarıyla uygulanmaktadır. Akıllı sözleşme geliştirme, blokzincir teknolojilerinin programlama bölümüdür. Bu yazıda, yarışma-tabanlı öğrenme, öğrenme etkinliğini arttırmak için blokzincir programlamaya uygulanmıştır. Ayrıca, yarışma-tabanlı öğrenmeyi, blokzincir programlamaya uygulamak için bir yöntem de sunulmuştur.

Anahtar kelimeler: Blokzincir programlama, rekabet tabanlı öğrenme, blokzincir geliştirme

References

Altin, H., Pedaste, M. (2013). Learning approaches to applying robotics in science education. *Journal of Baltic Science Education, 12*(3), 365–377.

Bergin, S., & Reilly, R. (2005). The influence of motivation and comfort-level on learning to program.

Bornstein, G., & Erev, I. (1994). The enhancing effect of intergroup competition on group performance. *International journal of conflict management, 5*(3), 271-283.

Burguillo, J. C. (2010). Using game theory and competition-based learning to stimulate student motivation and performance. *Computers & Education, 55*(2), 566-575.

Buterin, V. (2013). Ethereum White Paper: A Next Generation Smart Contract & Decentralized Application Platform. [Online]. Available: https://github.com/ethereum/wiki/wiki/White-Paper

Cagiltay, N. E., Ozcelik, E., & Ozcelik, N. S. (2015). The effect of competition on learning in games. *Computers & Education, 87*, 35-41.

Chakraborty, P., Shahriyar, R., Iqbal, A., & Bosu, A. (2018, October). Understanding the software development practices of blockchain projects: A survey. *In Proceedings of the 12th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement* (p. 28). ACM.

Chung, C. J. (2008, April). Learning through competitions–competition based learning (CBL). In LTUCTL Conference poster session.

Çulha, D. (2016). Applying Competition-based Learning to Agile Software Engineering. Comput. Appl. Eng. Educ. doi: 10.1002/cae.21716

Dannen, C. (2017). *Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners.* New York, NY, USA.

Desai, A., Tippins, M., & Arbaugh, J. B. (2014). Learning through collaboration and competition: incorporating problem-based learning and competition-based learning in a capstone course. *Organization Management Journal, 11*(4), 258-271.

Francese, R., Gravino, C., Risi, M., Scanniello, G., & Tortora, G. (2015). Using Project-Based-Learning in a mobile application development course—An experience report. *Journal of Visual Languages & Computing, 31*, 196-205.

Hwang, G. J., Wu, P. H., Chen, C. C., & Tu, N. T. (2016). Effects of an augmented reality-based educational game on students' learning achievements and attitudes in real-world observations. *Interactive Learning Environments, 24*(8), 1895-1906.

Hyyppä, K. (2004). *Competition - An Efficient Method to get Students Committed.* ICALT. IEEE Computer Society. ISBN: 0-7695-2181

Jung, S. (2013). Experiences in Developing an Experimental Robotics Course Program for Undergraduate Education. *IEEE Trans. Education, 56,* 129-136.

Latih, R., Bakar, M. A., Jailani, N., Ali, N. M., Salleh, S. M., & Zin, A. M. (2018). Challenge-based programming learning design. *International Journal on Advanced Science, Engineering and Information Technology, 8*(5), 1912-1918.

Marchesi, M., Marchesi, L., & Tonelli, R. (2018, October). An agile software engineering method to design blockchain applications. *In Proceedings of the 14th Central and Eastern European Software Engineering Conference Russia* (p. 3). ACM.

Myerson, R. B. (2013). *Game theory.* Harvard university press.

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.

Nash, J. F. (1950). Equilibrium points in n-person games. *Proceedings of the national academy of sciences, 36*(1), 48-49.

Paulik, M. J., Krishnan, M. (1999). An autonomous ground vehicle competition-driven capstone design course. *Proc. 1999 Frontiers Educ. Conf.* Nov 1999.

Paulik, M.J., Krishnan, N.M. (2001). A competition-motivated capstone design course: the result of a fifteen-year evolution. *IEEE Trans. Education, 44*, 67-75.

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist, 50*(4), 258-283.

Schwaber, K. (2004). *Agile Project Management with Scrum,* Washington, Microsoft Press.

Swan, M. (2015). *Blockchain: Blueprint for a new economy.* " O'Reilly Media, Inc.".

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Reflective writing in the pandemic period: A university students' reflection

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Abstract

This qualitative study analyzed pedagogical aspects based on reflections of experience of 7th-semester students in reflective writing activities while working on thesis assignments in the undergraduate program of Elementary School Teacher, Universitas Pendidikan Indonesia at Serang Campus during the COVID-19 pandemic. By involving 67 students, reflective writing learning data were analyzed based on learning feedback and online guidance collected through an online survey and a combination of semi-structured interviews via teleconference. This study confirmed that reflective writing activities could make students overcome difficulties in writing online guidance. Students can independently implement the context of reflection in the writing process and develop logical thinking in scientific writing. Reflective writing activities are considered appropriate for medium-term structured learning and assignments such as theses. These results can be a basis for using reflective writing practices in other writing assignments during the online learning period. Reflective writing practice was expected to be integrated into learning to encourage students to get used to reflective practice.

1. Introduction

Many works of the literature showed the effectiveness of reflective writing practice for learning. Not only in education, but every human activity also contains a process of reflection. Reflection occurs when students consciously consider, review, and evaluate their learning experiences. When students are not aware of their learning experiences, they tend to fail to assess and evaluate them independently. Awareness of the learning experience is an essential component of learning. Reflection is a process that allows students to pay more attention to their learning (Pratiwi, 2012). The reflection process's emergence also shows students' seriousness in learning something and is an essential skill as a lifelong learner. The process of independent learning and the skills of being a lifelong learner are essential during the COVID-19 pandemic, where all levels of education are doing distance learning, including final-year students who are preparing their final project or thesis. On the other hand, they need guidance to complete their final assignments in a clear and detailed manner, but face-to-face supervision is not permitted. Students are required to equip themselves with evaluative skills to anticipate this situation. The thesis itself demands specific writing skills to meet the quality, such as structure, coherence, and cohesion (Clarke, 2004).

According to several experts, there are several benefits from the application of online learning in learning, including facilitating classroom management, increasing interaction, developing learning independence, expanding access to learning resources, and overcoming distance and time limitations. Concerning independent learning, online learning is appropriate for self-directed or reflective learning (Rais & Aryani, 2019). Through online learning, students have the opportunity to learn at their pace, style, and

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comprehension. Various learning content facilities that provide students with an alternative to choosing their preferred way of absorbing information are expected to personalize themselves and enjoy learning activities to create motivational and independent learning (Bovermann, Weidlich, & Bastiaens, 2018).

How lecturers and students work towards developing their writing skills online is very important to emerging. Reflective writing is one of the methods used by students in preparation for their thesis writing during an online situation (Steele, 2015). This reflective writing habit will later become the initial capital in writing a final project in online supervision situations. It aims to strengthen quality by connecting other ideas and knowledge independently (Gordijn et al., 2018). Referring to this, researchers are interested in seeing the results of students' reflections who use reflective methods to write theses through online learning.

Therefore, this study seeks to analyze the pedagogical aspects of reflection based on students' experiences who carry out reflective writing activities during online supervision. This study investigated to what extent the reflective writing method used in students' thesis based on students' point of view. In addition to analyzing student reflections, this paper also discusses the benefits and limitations of reflective writing used in writing theses.

2. Literature Review

Reflection is a process of connecting theory and practices through a continuous thought process. The reflective thinking process is defined as reconsidering every possibility, belief, and all forms of knowledge in depth to support the conclusions that have been and will be drawn (Livingstone, 2019). There are three components of reflective training, namely Experience (an event that someone experienced), Reflective (deliberative processes that a person might learn from their experiences, and Action (move taken from the results of reflection) (Jasper, 2005). Based on the process of concluding, the reflection process can occur when students experience the learning process (in-action) and at the time after the learning process (on-action) (Malthouse & Roffey-Barentsen, 2013). The reflection process allows students to gain knowledge from what they experience, then transforming it into knowledge to anticipate experiences that will be faced in the future because the reflection process can significantly develop thinking and problem-solving skills (Cisero, 2006; Farrah, 2012; O'Connell & Dyment, 2011).

The reflection process is also related to critical thinking since it is considered to encourage students to expand and improve natural consideration in evaluating situations before taking action. Considering arguments, theories, reality, thoughts, and other experiences makes a person who does the reflection process more critical and responsive in identifying the action choice. (Jung, 2011). To develop critical thinking and attitude, reflective writing must be done frequently. Writing on specific topics through continuous evaluation and reflection can improve the quality of the depth of the writing produced (Lyons, 2010). Reflective writing is recognized as an effective alternative to facilitate students' critical thinking processes. (Gorlewski & Greene, 2011; Purcell, 2013). Reflective writing is also considered a part of higher-order thinking skills because it involves cognitive, affective, social, and meta-cognitive aspects (Williams, Woolliams, & Spiro, 2012). From the cognitive aspect, reflective writing can help students deepen learning. An in-depth learning process, it will simultaneously increase learners' self-confidence and cognitive abilities. From a metacognitive perspective, reflective writing requires students to analyze and organize ideas into complete, structured, and coherent knowledge. Affective aspects appear in the reflective writing process because students express and describe their experience emotionally in written form and reflect the values, thoughts, and knowledge into one written idea (Prosser & Webb, 1994). Therefore, good reflective writing skills have an essential role in the learning process, especially for high school institutions, because of their impact on improving learning performance.

Even though it is assumed very useful, several things must be considered in choosing reflective writing activities as learning. Reflection is a cognitive activity exploring the writer's ideas and experiences, so it is difficult to judge how robust the reflection process is in student writing activities (Kembe et al., 2008).

However, this is also an advantage as more flexible in the assessment process. The depth of reflection so far has only been assessed from the results of the writing produced and the activity observations during the writing process (Boud & Falchikov, 2006). In measuring this reflective process's depth, a hierarchical cognitive structure represents the learning process as described by (Ono & Ichii, 2019).

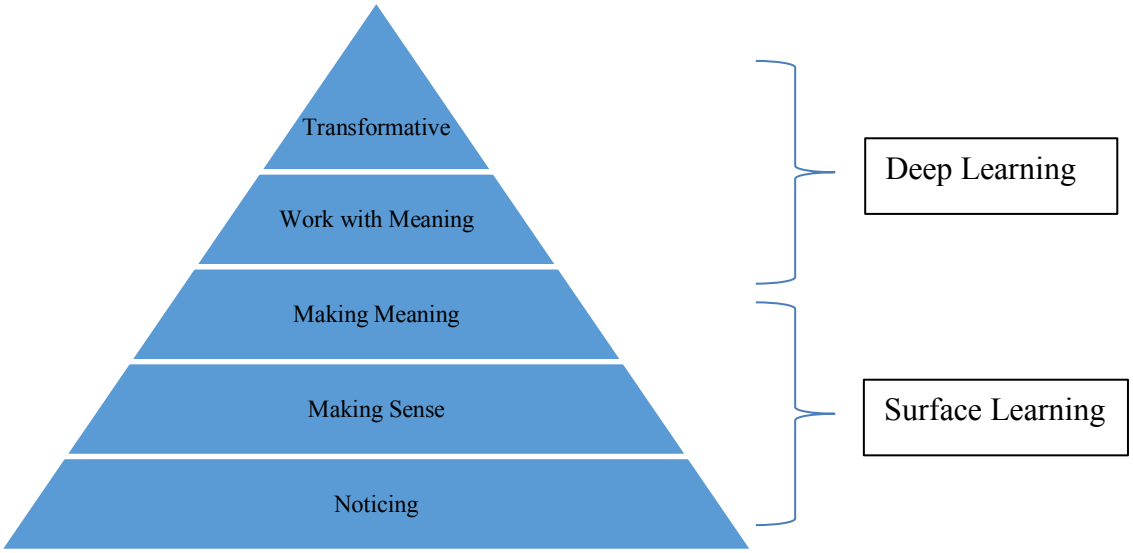

Fig. 1. Hierarchy Pyramid of Cognitive Structure in Reflective Writing

The Noticing stage occurs when students begin to find topics or focuses that are interesting or important to explore further. The Understanding stage is where students think more about the topic or theme that has been selected and look for coherence between ideas. The making sense stage is marked when students begin to understand the topic or theme conceptually, then question and connect ideas into writings. These steps start to enter the cognitive structure. In the Making Meaning stage, students can make connections between ideas and other things. Students will begin to refer to research and other literature sources. This stage ends with arranging understanding and ideas towards specific goals. Meanwhile, in the Transformative Stage, students with high self-motivation can show where they can formulate their new ideas. This stage can repeatedly occur without having to contact the original learning material.

Those stages are reflected in the output of the writing as shown below.

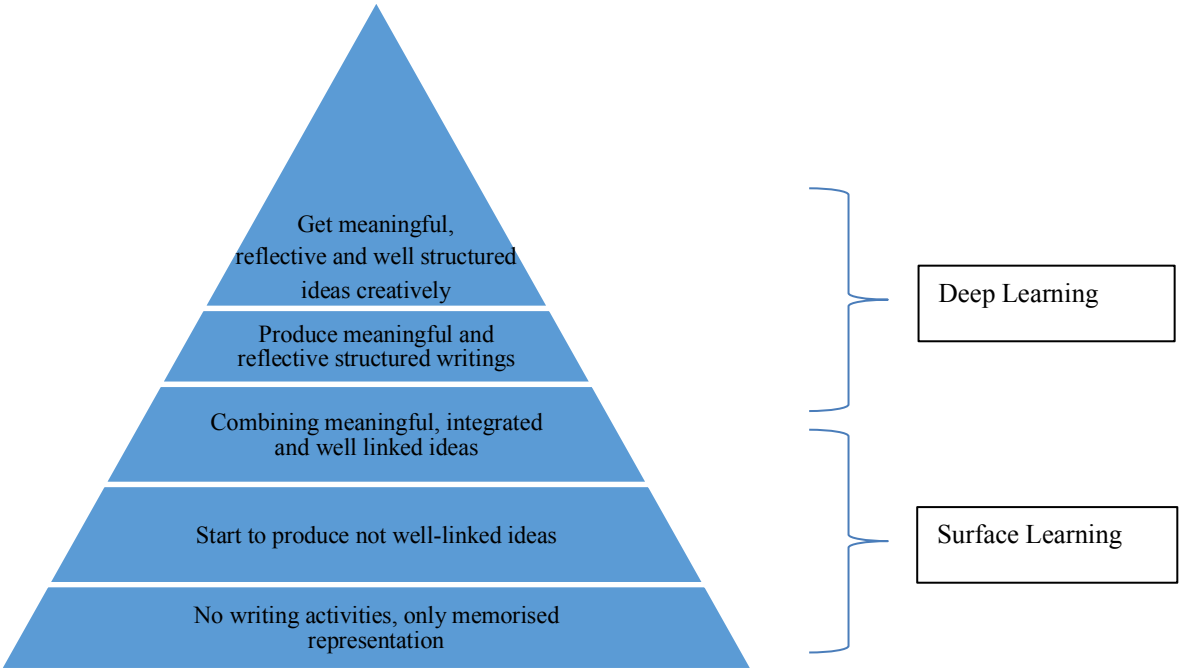

Fig. 2. Pyramid of Output Representation of Cognitive Structure Hierarchy in Reflective Writing

The structure of reflective writing learning is also a stage of learning. This learning stage is hierarchical, developing from surface (low) to deep (high) learning. In the last two learning stages -working with meaning and transformative learning- students reach the pinnacle of deep learning.

Online reflective writing in this study refers to some form of writing activities including a stand-alone assessment task to reflect on students in light of educational theory incorporated into some type of writing, such as essays, with an online situation of supervision or guidance. Through this study, the authors try to analyze the reflections of students who experienced a critical reflective writing process. Referring to this, researchers are interested to see students' points of view after using reflective methods to write theses through online learning. The significance of this study will contribute to the limited description of the reflective writing successful from the students' side. Since the effectiveness of reflective writing is mostly measured by the result of writing. In reflective writing models, students take the main role so that investigating students' point of view and pedagogical aspect they found will ideally construct the implementation further.

2.1. Objective of the Study

This study examined the results of the Elementary School Teacher Program students' reflections at Universitas Pendidikan Indonesia Serang Campus after carrying out reflective writing activities in writing their thesis by online supervision in the odd semester of 2020/2021.

3. Methodology

3.1. Participants

Participants involved in this study were 67 7th-semester students who contracted the thesis course taken from the total of 180 final-year students population. Students who participated in this study were the experimental group in improving thesis writing skills using reflective method research. These students have conducted the reflective writing learning process through a reflective writing guide book and online supervision. The students employed Google Meet and WhatsApp application to conduct thesis supervision. They wrote their thesis in Google Docs platform and share to the supervisor and 3-4 students so that they can commented and share the essay improvements. They synchronously meet the supervisor and group

discussion for each chapter of thesis completed using online platform. This reflection is a follow-up research on the learning outcomes of these students.

3.2. Data Collection

Reflective writing reflection data were analyzed based on two data sources, namely learning feedback and online guidance, through a Google Form survey and a combination of semi-structured interviews via teleconference. All of 67 students were interviewed one-on-one to deepen the result of survey questions related to their process of online supervision, feedback and their improvements on their thesis result. In the survey and interview, students were asked about the practice, benefits, and limitations of the reflective writing method and how it supports them to achieve maximum results in thesis writing (Dyment & O'connell, 2014).

3.3. Data Analysis

The data collected were analyzed quantitatively using percentages and means for the sake of descriptive analysis. The objective was to determine the current practice, benefits and limitation of reflective writing process. The data collected from the interview was utilized to support and triangulate the findings of the questionnaire. The in-depth descriptive analysis of the interview data supported several findings of the online survey. To indicate the number of participants interviewed, authors used code of alphabetic and number order, A to Z (first 26 students) and continued by A1 to Z1(for students number 27 to 52) then A2 to O2 (for students number 53 to 67). This research is essential to bridge the gap between research and teaching in using reflective writing activities in the final project. As noted in the introduction, a growing body of literature has examined the value of reflective writing, but few studies have used qualitative data analysis. Besides, this study is useful for increasing our understanding of the effects of students' reflective writing activities, covering knowledge acquisition and retention, and improving their experience of knowledge and learning satisfaction. The data analysis used was the qualitative method.

4. Findings and Discussions

4.1. Students' Reflective Writing Activities

In this aspect, the researcher used 16 items as indicators to determine the most frequently used reflective writing practice. The survey results from the 16 activities are illustrated in the following Table.

Table 1.

Students' Reflective Writing Activities

Reflective Writing Statements	Participants	Percentages
I wrote the essence of advice online into a note	46	68.66%
I had a special book or application to record online supervision results	31	46.27%
I developed notes on online supervision results by themselves	48	71.62%
I wrote my opinions on the written revision	20	29.85%
I included other sources in the writing ideas	58	86.57%
I asked questions about unclear during online guidance	59	88.06%
I asked questions about material I has missed	60	89.55%
I reviewed the writing rules sentence structure and punctuation as well as typing errors	66	98.51%

I reviewed writing rules as well as sentence structure	59	88.06%
I reviewed punctuation and typing errors	58	86.57%
I reviewed my writing before online consultation	66	98.51%
I often exchanged guidance notes with friends in the group	64	95.52%
I faced problem with online consultation	40	59.70%
I was always excited about facing online tutoring	56	83.58%
I found their own mistakes	63	94.03%
I applied the solutions independently	56	83.58%

Most of the participants carried out the 16 indicators of reflective writing activities. For example, the first indicator -*writing the essence of advice online into a note*- is done by approximately 68.66% of participants. Even though only 46.27% of students *have a special book or application to record online supervision results* (2nd indicator), they record their guidance well. *They developed notes on online supervision results by themselves* (3rd indicator) in their writing (71.66%). Even though 29.85% students still tend to follow the supervisor's direction compared to *writing their opinions on the written revision* (4th indicator), 86.57% of them always *include other sources in the writing ideas* into their thesis chapter (5th indicator).

The activity that students often commit (88.06% and 89.55%) is to *ask questions about unclear during online guidance* (6th indicator) even though the *material has been missed* (7th indicator). Other activities such as *reviewing writing rules* as well as *sentence structure* and *punctuation and typing errors* are also quite often done by 85% of students (8th-10th indicator). In addition to *reviewing their writing* before online consultation, 95% of participants admitted that they often exchanged guidance notes with friends in the group (11th-12th indicators) when using the reflective writing method guide. Participants also felt that they were always *excited about facing online tutoring* because they *found their own mistakes* and *applied the solutions independently* before the mentoring process (above 80%).

From the analysis of students' reflective writing practices, it can be seen that the majority of students meet the criteria for reflective writing. If it is done evenly, about 79% of students' reflective writing activities have been carried out. These results classify them at the level of deep learning. It is indicated by the results of a survey where students can formulate their ideas and then reflect on other sources and knowledge. Thus it can be seen that the participants have entered the high category reflective learning stage.

4.2. Increasing Self-Confidence

The participants recognize reflective writing practice to have several benefits. Among them are being able to increase self-confidence as a consequence of improving logical thinking skills and structured writing. Reflective writing is considered useful to give students opportunities to develop their thinking and writing skills. Some of the phrases that refer to the race of self-belief are as follows.

> *In this way, I can learn by practicing writing, I feel this really helps me to think coherently …… [Student A]*
>
> *I think my ability and thinking skills have improved….. [Student B]*
>
> *By reflecting, I am more confident before facing supervision ….. [Student E]*
>
> *Even though there is rarely consultation, but during the exam, We are quite sure because it is following the examiner's way of thinking….. [Student G]*

This result supports several studies stating that reflective writing benefits are believed to improve writing skills and critical thinking (Farrah, 2012; O'Connell & Dyment, 2011). Most students find it useful to acquire these skills. Some students highlighted the effects of reflective writing on online tutoring and feel confident when they face exams because they can develop logical thinking and structured writing skills (Livingstone, 2019). It is also in line with the statement by Ryan & Ryan (2013), where successful academic reflective writing must be taught with structure and address awareness and its relation to task perception, self-regulation, and self-evaluation of performance (Negretti, 2012).

4.3. Deeper Understanding

As shown by several studies, students feel that deeper understanding is one of the critical benefits of reflective writing. During the reflection process, several signs of reflection make learning deeper, such as continuous thinking. Students' independent evaluation in reflective writing activities helps students be closer and more intensive to the topic or theme, helping them deeper on processing their ideas and thought flow. The following statements are some examples.

> *I like it because I felt that I had to focus on the topic, and couldn't just skim reading….. [Student K]*
>
> *I have to write down the main points and then development….. [Student M]*
>
> *After having an idea, I became really curious to read, and made me think more about the chapter I am writing….. [Student O]*

These results support Livingstone's (2019) research, which shows that a strong and transferable knowledge process characterizes deep learning. The learners understand how, why, and when to apply their knowledge to solve problems. The reflective writing process allows students to develop sustainable thinking and solve problems in writing. The students assumed by reflective writing they can enrich and explore their writing without supervisor instruction (Jensen, 2010).

Another sign of deep learning, besides transferable knowledge, is a critical sign of successful reflection and the use of reflective writing opportunities to advance these abilities (Pellegrino & Hilton, 2012). Several comments representing this opinion are among others.

> *I feel I have a deeper understanding of what I write .... [Student C]*
>
> *In this method, I learn to make concepts, and logical thinking flows about the results of the lecturers' revisions in-depth ..... [Student F]*
>
> *The lecturer asked me to criticize my writing many times by making our own assessments - or asking friends in online tutoring….. [Student G]*

4.4. Limitations of the Online Reflective Writing Method

Apart from the students' various benefits, they also noted some difficulties in reflective writing activities after online supervision. Student K, for example, explained that they face a problem with reflective writing, not reflective writing but at stages that do require a long process before it becomes writing:

> *The flow becomes longer, usually, we write directly then corrected, but we don't have to check it several times ..... [Student K]*
>
> *If you have an idea, you have to communicate it directly with friends because the response is sometimes long…. [Student O]*

Another challenge is the difficulty some students have in expressing their ideas and integrating them with appropriate literature to support them. Participants are expected to write their ideas more analytically by adding other figures' opinions, not just personal assumptions.

> *Every sentence must have a quotation, so you have to really look for and read a lot …. [Student P]*

The most challenging thing is to synthesize and continue to differentiate where we get the opinion of a character or theory….. [Student W]

The product of reflective writing, which combines many ideas being one conclusion, does tend to be valued higher than personal reflection (Williams, Woolliams, & Spiro, 2012). It is also a challenge because students have different preferences and levels of understanding of the topic being written; thus, some students feel that they are the central place of reference.

I don't know why I am asked to review by many friends… [Student U]

Because of online communication, I often ask lecturers even for elementary things according to my friends….. [Student S]

This is following Pratiwi (2012) research results that offering reflective writing must be adjusted to the academic level of different students because the reflection process will be different for each individual. The tendency to ask one or two people who are considered to have a higher academic level will be evident (Ross, 2014).

5. Conclusion and Suggestions

In situations where learning and supervision should be executed using online methods, reflective writing activities are considered very suitable for scientific writing final assignments. The majority of students enjoy and carry out reflective writing activities as seen from the activity indicators that are fulfilled 78%. The level of learning carried out by the Elementary Teacher Education Program students of Universitas Pendidikan Indonesia at Serang Campus can also be categorized at a high level of deep understanding because they are able to compile ideas and reflect them into a structured outcome. On average, participants are at the Work with Meaning processing stage and are already aware of the benefits of the reflective method. This study confirms that students appreciate the use of reflective writing methods in their final assignments in pandemic situations. They see benefits for the transfer of knowledge, critical thinking, and writing skills through a logical and systematic process. Students feel deeper learning and are confident in compiling writing ideas. Apart from the benefits, students also face challenges in reflective writing. Most felt that the winding process made the writing process longer and slower. On the other hand, the learning process becomes more intense because online communication is considered very easy so that the tendency to clarify ideas becomes wider. Paying attention to the academic ability level and making it into a smaller reflective group will help apply the same method in the other assignment.

6. Limitations and Future Research

This research limits some pedagogical aspects found by undergraduate students' writing activity. More in-depth research and practice will enhance the use of reflective writing methods in other appropriate assignments. Instructors, teachers, and lecturers are expected to use similar adaptative methods because they are proven to provide benefits and are assumed to provide students with learning satisfaction during online learning. In addition, broader practice will also encourage students to become familiar with reflective practice across courses and assignments. This research can contribute to marking the first steps for future reflective learning practice.

References

Boud, D., & Falchikov, N. (2006). Aligning assessment with long-term learning. *Assessment and Evaluation in Higher Education, 31*(4), 399-413.

Bovermann, K., Weidlich, J., & Bastiaens, T. (2018). Online learning readiness and attitudes towards gaming in gamified online learning – a mixed methods case study. *International Journal of*

Educational Technology in Higher Education, 15(1), 27, https://doi.org/10.1186/s41239-018-0107-0.

Cisero, C. (2006). Does reflective journal writing improve course performance? *College Teaching, 54*(2), 231-236.

Clarke, M. (2004). Reflection: journals and reflective questions: a strategy for professional learning. *The Australian Journal of Teacher Education, 29*(2), 1-13.

Cornish, M. M., & Cantor, P. A. (2008). Thinking about thinking: It's not just for philosophers. *Journal of Early Childhood Teacher Education, 29*(4), 326-339.

Dewey, J. (1910). *How We Think.* Boston: D.C. Heath and Co. Publishers.

Dyment, J. E., & O'connell, T. S. (2014). When the ink runs dry: implications for theory and practice when educators stop keeping reflective journals. *Innovative Higher Education, 39*(5), 417-429.

Farrah, M. (2012). Reflective journal writing as an effective technique in the writing process. *Najah University Journal Research, 26*(4), 1-29.

Gordijn, F., Eernstman, N., Helder, J., & Brouwer., H. (2018). *Reflection Methods Practical Guide for Trainers and Facilitators.* Belanda: Wageningen University & Research.

Gorlewski, J., & Greene, K. (2011). Research for the classroom: the power of reflective writing. *The English Journal, 100*(4), 90-93.

Jasper, M. A. (2005). Using reflective writing eithin reserrach. *Journal of Research of Nursing, 10*(3), 247-260.

Jensen, K. (2010). The panoptic portfolio: Reassessing power in process-oriented writing instruction. *JAC: A Journal of Rhetoric, Writing, Culture, and Politics*, *30*(1), 95-141.

Jung, J. (2011). Reflective writing's synecdochic imperative: process descriptions redescribed. *College English, 71*(6), 628-647

Kember, D., McKay, J., Sinclair, K., & Wong, F. K. (2008). A four-category scheme for coding and assessing the level of reflection in written work. *Assessment and Evaluation in Higher Education, 33*(4), 369-379.

Lawrence, H. (2013). Personal, reflective writing: a pedagogical strategy for teaching business students to write. *Business Communication Quarterly, 76*(2), 192-206.

Livingstone, K. A. (2019). Reflective Essay on Learning and Teaching. *International Journal of Arts and Social Science, 2*(5), 57-65.

Lyons, N. (2010). *Handbook of reflection and reflective inquiry: Mapping a way of knowing for professional reflective inquiry*. New York, NY: Springer.

Malthouse, R., & Roffey-Barentsen, J. (2013). *Reflective Practice in Education and Training Second Edition.* Bodmin: MPG Books Group.

Negretti, R. (2012). Metacognition in student academic writing: A longitudinal study of metacognitive awareness and its relation to task perception, self-regulation, and evaluation of performance. *Written Communication, 29*(2), 142-179

O'Connell, T. S., & Dyment, J. E. (2011). The case of reflective journals: is the jury still out? *Reflective Practice, 12*(1), 47-59.

Ono, A., & Ichii, R. (2019). Business students' reflection on reflective writing assessments. *Journal of International Education in Business, 12*(2), 247-260.

Pellegrino, J. W., & Hilton, M. L. (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century.* Washington, DC: National Academies Press.

PPRI. (2020). *PPRI No 21 Tahun 2020 tentang Pembatasan Sosial Berskala Besar dalam Rangka Percepatan Penanganan COVID-19.* Indonesia: Kementrian Republik Indonesia.

Pratiwi, D. (2012). Pengajaran Reflektif sebagai Upaya Peningkatan Kualitas Pendidikan dan Profesionalisme Guru. *Jurnal Manajemen Pendidikan*, 1-12.

Prosser, M., & Webb, C. (1994). Relating the process of undergraduate essay writing to the finished product. *Studies in Higher Education, 19*(2), 125-138.

Purcell, D. (2013). Sociology, teaching, and reflective practice: using writing to improve. *Teaching Sociology, 41*(1), 5-19.

Rais, M., & Aryani, F. (2019). *Pembelajaran Reflektif Seni Berpikir Kritis, Analitis dan Kreatif.* Makassar: Badan Penerbit UNM.

Randjelovic, J., O'Rourke, A., & Orsato, R. J. (2003). The emergence of green venture capital. *Business Strategy and the Environment, 12*(4), 240-253.

Ross, J. (2014). Performing the reflective self: Audience awareness in high-stakes reflection. Studies in Higher Education, 39(2), 219-232

Ryan, M., & Ryan, M. (2013). Theorising a model for teaching and assessing reflective learning in higher education. . *Higher Education Research and Development, 32*(2), 244-257.

Schön, D. (1983). *The Reflective Practitioner: How Professionals Think in Action.* New York: Ashgate Publishing.

Steele, M. L. (2015). *Talking back: a qualitative walking back: a qualitative study of reflectiv writing in a writing in a first-year college composition classroom.* Ph.D. (Doctor of Philosophy) Thesis. University of Iowa.

Williams, K., Woolliams, M., & Spiro, J. (2012). *Reflective Writing.* Reflective Writing. Basingstoke: Palgrave MacMillan.

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Book review: Education and technology support for children and young adults with ASD and learning disabilities

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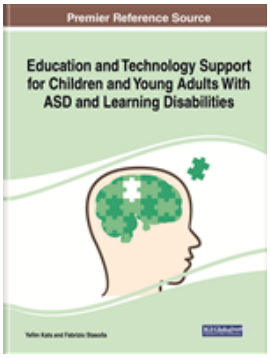
Book Review

Abstract

"Education and Technology Support for Children and Young Adults with ASD and Learning Disabilities" is edited by Yefim Kats (Trident University International, USA) and Fabrizio Stasolla (University Giustino Fortunato of Benevento, Italy). The book was published in 2021 by IGI Global. The book has 391 pages. The ISBNs of the book for different versions are; ISBN13: 9781799870531; ISBN10: 1799870537; EISBN13: 9781799870555, and ISBN13 Softcover: 9781799870548. DOI number of the book is 10.4018/978-1-7998-7053-1. The edited book focuses on learning disabilities from the perspectives of Autism Spectrum Disorder (ASD) and provides suggestions for assistive technologies and tools throughout 16 chapters.

1. Introduction



"Education and Technology Support for Children and Young Adults with ASD and Learning Disabilities" is edited by Yefim Kats (Trident University International, USA) and Fabrizio Stasolla (University Giustino Fortunato of Benevento, Italy). The book was published in 2021 by IGI Global. The book has 391 pages. The ISBNs of the book for different versions are; ISBN13: 9781799870531; ISBN10: 1799870537; EISBN13: 9781799870555, and ISBN13 Softcover: 9781799870548. DOI number of the book is 10.4018/978-1-7998-7053-1. The edited book (Kats & Stasolla, 2021) focuses on learning disabilities from the perspectives of Autism Spectrum Disorder (ASD) and provides suggestions for assistive technologies and tools throughout 16 chapters.

2. Review of the Chapters

There are a total of 16 chapters that explore ASD and assistive technologies. The first chapter, "Integrated Support of Students with Autism Spectrum Disorders and Learning Disabilities", written by Yefim Kats (2021). Chapter 1 provides an integrated approach to support individuals with ASD by linking psychological and neurological aspects of learning disabilities. The second chapter, "Bridging the Gap: Supporting Students with Autism in Higher Education", written by Bryan M. Peightal, Scott Browning, and Loren Pease (2021). This chapter targets learners with ASD at higher education level and provides suggestions to create an autism-friendly educational climate. The third chapter, "Online Gaming Environments as a Potential Conduit to Support Friendships for Individuals with Autism Spectrum Disorder", written by Jenn Gallup and Celal Perihan (2021). Chapter 3 examines emerging online

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environments such as multiplayer online role-playing games (MORPGs) and immersive technologies such as virtual reality and explores how these environments can be used to build social connections for individuals with ASD. The fourth chapter, "Psychoeducational Strategies in School Context to Support Students with Specific Learning Disorders in a Sample of Children Aged 6 to 16", written by Giulia Binaghi and Marco Guida (2021). This chapter provides a meta-perspective and presents a literature review on the evidence-based practices for students with learning disabilities. The fifth chapter, "The Role of Teaching Materials in Cognitive Development Focusing on the Emergence of Symbolic Functioning and Behaviour Issues", written by Eiko Tatematsu (2021). This chapter specifically covers "Emergence of Symbolic Functioning" and latent behaviour issues and discusses factors preventing social adaptation. The sixth chapter, "Longitudinal Study of Motor Coordination Development in Children with Autism Spectrum Disorder", is written by Kiyoji Koreeda (2021). Chapter 6 investigates the development of the motor function in children with ASD through a longitudinal approach. The seventh chapter, "School Activities for Autistic Children Using Newly Developed Software and Tools", written by Shigeru Ikuta, Chisato Ouchi, Jinko Tomiyama, Yayoe Katagiri, Shoko Hoshi, Naoki Sakai, Chiaki Kisaka, Nobuo Hara, Hiromi Nakamura, and Keiko Ozaki (2021). The chapter provides activities for ASD with intellectual and expressive language disabilities through mobile devices and explores how these approaches would be helpful for the improvement of expressive language disabilities. The eight chapter, "Creating Inclusive Functional Content Using Dot-Codes: An Exploration of Multistep Recipes for Individuals with Autism in Post-Secondary Settings", written by Jenn Gallup, Celal Perihan, Yoshie Tatsuma, and Shigeru Ikuta (2021). Chapter 8 provides a walkthrough and step by step guide for creating handmade content to support functional skills. The ninth chapter, "Assistive Technology-Based Programs and Cognitive-Behavioral Interventions for Helping Adaptive Responding of Children and Adolescents with Rett Syndrome: A Selective Overview", written by Fabrizio Stasolla, Alessandro O. Caffò, and Viviana Perilli (2021). The chapter focuses on Rett syndrome and explores categories of communication skills, adaptive skills, challenging behaviour, and on-task behaviour through empirical pieces of evidence. The tenth chapter, "Cogni-Prelit: Empowering Executive Functions Embedded with Preliteracy Learning in Preschool Children at Risk for Reading Difficulties", written by Eleni Rachanioti, Anastasia Alevriadou, Tharrenos Bratitsis, and Eleni Laskaraki (2021). Chapter 10 covers reading difficulties and examines Cogni-Prelit app in this regard. The eleventh chapter, "Treating Stuttering in Children with Autism Spectrum Disorder", is written by Shoko Miyamoto and Masayoshi Tsuge (2021). Based on the notion that the number of ASD with shutter is increasing, the chapter examines strategies to lessen to reduce stuttering and improve fluency. The twelfth chapter, "Fostering Inclusion of Children and Adolescents with Autism Spectrum Disorders in Daily Settings Through Technological Supports: A Selective Overview", is written by Fabrizio Stasolla, Alessandro O. Caffò, and Viviana Perilli (2021). Benefiting from s systematic review approach, chapter 12 examines the use of assistive technology for the inclusion of children with ASD through 5 themes, namely, communication skills, (adaptive and/or social skills, life skills, challenging behaviours, and academic performance. The thirteenth chapter, "Remediation and Assistive Technologies for Communication Deficits in Autistic Spectrum Disorders", is written by Katharine P. Beals (2021). In this chapter, assistive technologies to remedy verbal communication deficits is examined through pedagogical strategies and effective approaches to select working solutions to select these technologies are presented. The fourteenth chapter, "Humanoid Robot-Mediated Communication Teaching for Children With ASD: A Case Study", is written by Toyokazu Mizuuchi, Tomohito Yamazaki, and Masayoshi Tsuge (2021). As a result of the pervasive use of educational technology, there are innovative approaches and robot mediated communication can be counted as one of these technologies. In this chapter, the authors examine the best practices of humanoid robots and their use in improving communication skills. The fifteenth chapter, "Let's Play!: The Use of Educational Games as an Intervention Tool for Autism Spectrum Disorder", is written by Corrie L. Jackson, and G. Tanner Jackson (2021). Chapter 15 spots on serious games and provides a wide range of applications of serious games to improve different skills. The sixteenth chapter, "Statistical Perspectives and Machine Learning Algorithms: Research Analysis of Technological Support for Autism

Diagnosis", is written by N. Ajaypradeep, R. Sasikala (2021). Artificial Intelligence (AI) is widely used in many areas of our daily lives and this chapter, innovatively, suggests how AI-powered machine learning technologies can be used for the diagnosis of ASD.

3. Conclusion

Autism Spectrum Disorder (ASD) is seen approximately 1 in 54 children without discriminating any race, ethnicity, or any other groups in social structures. ASD is a complex disorder with many unknowns and every working solution is significant. In this regard, this book serves as a useful resource which provides explanations with a special interest in assistive/educational technologies. Educational technology is fueled by recent developments and beyond mechanical technologies, emerging digital technologies promise a lot. From this perspective, it is important to keep the field of special education and this book plays an important role. However, some suggestions can be considered. Taking account that the parents are an important part of special education, such publications can be disseminated in a way that is free from technical and academic jargon. Besides, different from many other scientific fields, suggestions derive from evidence-based research is vital for families, educators, and practitioners. Taking this pint into account, it should be highlighted that we have to frequently report findings and suggestions of the empirical research to help individuals with ASD.

References

Ajaypradeep, N., & Sasikala, R. (2021). Statistical Perspectives and Machine Learning Algorithms: Research Analysis of Technological Support for Autism Diagnosis. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 315-338). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch016

Beals, K. P. (2021). Remediation and Assistive Technologies for Communication Deficits in Autistic Spectrum Disorders. In Kats, Y., & Stasolla, F. (Eds.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 246-274). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch013

Binaghi, G., & Guida, M. (2021). Psychoeducational Strategies in School Context to Support Students With Specific Learning Disorders in a Sample of Children Aged 6 to 16. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 51-72). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch004

Gallup, J., & Perihan, C. (2021). Online Gaming Environments as a Potential Conduit to Support Friendships for Individuals With Autism Spectrum Disorder. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 29-50). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch003

Gallup, J., Perihan, C., Tatsuma, Y., & Ikuta, S. (2021). Creating Inclusive Functional Content Using Dot-Codes: An Exploration of Multistep Recipes for Individuals With Autism in Post-Secondary Settings. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 149-166). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch008

Ikuta, S., Ouchi, C., Tomiyama, J., Katagiri, Y., Hoshi, S., Sakai, N., Kisaka, C., Hara, N., Nakamura, H., & Ozaki, K. (2021). School Activities for Autistic Children Using Newly Developed Software and Tools. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 125-148). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch007

Jackson, C. L., & Jackson, G. T. (2021). Let's Play!: The Use of Educational Games as an Intervention Tool for Autism Spectrum Disorder. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 294-314). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch015

Kats, Y. (2021). Integrated Support of Students with Autism Spectrum Disorders and Learning Disabilities. In Kats, Y., & Stasolla, F. (Eds.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 1-14). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch001

Kats, Y., & Stasolla, F. (2021). Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities. IGI Global. http://doi:10.4018/978-1-7998-7053-1

Koreeda, K. (2021). Longitudinal Study of Motor Coordination Development in Children With Autism Spectrum Disorder. In Kats, Y., & Stasolla, F. (Eds.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 98-123). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch006

Miyamoto, S., & Tsuge, M. (2021). Treating Stuttering in Children With Autism Spectrum Disorder. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 208-222). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch011

Mizuuchi, T., Yamazaki, T., & Tsuge, M. (2021). Humanoid Robot-Mediated Communication Teaching for Children With ASD: A Case Study. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 275-293). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch014

Peightal, B. M., Browning, S., & Pease, L. (2021). Bridging the Gap: Supporting Students With Autism in Higher Education. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 16-28). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch002

Rachanioti, E., Alevriadou, A., Bratitsis, T., & Laskaraki, E. (2021). Cogni-Prelit: Empowering Executive Functions Embedded With Preliteracy Learning in Preschool Children at Risk for Reading Difficulties. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 189-207). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch010

Stasolla, F., Caffò, A. O., & Perilli, V. (2021). Assistive Technology-Based Programs and Cognitive-Behavioral Interventions for Helping Adaptive Responding of Children and Adolescents With Rett Syndrome: A Selective Overview. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 167-188). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch009

Stasolla, F., Caffò, A. O., & Perilli, V. (2021). Fostering Inclusion of Children and Adolescents With Autism Spectrum Disorders in Daily Settings Through Technological Supports: A Selective Overview. In Kats, Y., & Stasolla, F. (Ed.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 224-245). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch012

Tatematsu, E. (2021). The Role of Teaching Materials in Cognitive Development Focusing on the "Emergence of Symbolic Functioning" and Behaviour Issues. In Kats, Y., & Stasolla, F. (Eds.), Education and Technology Support for Children and Young Adults With ASD and Learning Disabilities (pp. 73-97). IGI Global. http://doi:10.4018/978-1-7998-7053-1.ch005