Cypriot Journal of Educational Sciences

Volume 20, Issue 2, (2025) 127-136

www.cjes.eu

An Analysis of K12 Students' Digital Literacy and Cybersecurity Awareness in the Context of Teachers' Views

Hasan Tasay*, Erciyes University Graduate School of Educational Sciences, Erciyes, Turkey htasay@outlook.com
Semra Demir Basaran, Erciyes University Graduate School of Educational Sciences, Erciyes, Turkey sdemir@erciyes.edu.tr

Suggested Citation:
Tasay, H. & Basaran-Demir, S. (2025). An Analysis of K12 Students' Digital Literacy and Cybersecurity Awareness in the Context of Teachers' Views. *Cypriot Journal of Educational Science*, *20*(2), 127-136. https://doi.org/10.18844/cjes.v20i2.9745

Received from November 12, 2024; revised from December 19, 2024; accepted from March 21, 2025.
Selection and peer review under the responsibility of Prof. Dr. Hafize Keser, Ankara University, Turkey (retired)

iThenticate Similarity Rate: 8%

Abstract

This study aims to evaluate the digital literacy and cybersecurity awareness of K12 students based on teachers' views. The research adopts a qualitative design, and data were collected through semi-structured interviews with 15 teachers working at primary, secondary, and high school levels. The data are analysed by descriptive analysis method. Through the teachers' evaluations, various findings were obtained regarding students' skills to accessing, understanding, interpreting, producing, and using the information and awareness of cybersecurity. In conclusion, this study emphasises the need for systematic educational programs to enable students to use digital tools consciously, securely, and productively and the need for increased support for the teachers' professional development. It is also concluded that critical thinking, information verification, and creative problem-solving, as core components of digital literacy, should be included more in curricula. These findings point to the importance of a comprehensive educational reform to improve students' digital literacy and cybersecurity skills.

***Keywords*:** K12 Students; Digital Literacy; Cybersecurity Awareness; Teachers' Views.

* ADDRESS FOR CORRESPONDENCE: Najlatun Naqiyah, Universitas Negeri Surabaya, Kampus Lidah, Jalan Kampus Lidah Unesa, Surabaya 60213, Indonesia. *E-mail address*: najlatunnaqiyah@unesa.ac.id

1. INTRODUCTION

The necessity of integrating technology into education is a widely accepted idea in the field of educational science (Xie & Lavonen, 2024). Moreover, when the related literature is examined, there are many studies showing that the integration of technology into education and its use in the teaching-learning process increases students' academic achievement and motivation, positively affects their attitudes towards learning, supports the development of students' problem solving and collaborative learning skills, and provides teachers with more time to guide their students (Zeighner, 2020).

When evaluated in the context of digital literacy, the student's ability to recognize digital information, access information and understand digital communication means that the student is digitally literate at the awareness level (Leowus, 2016). At this point, students are asked to realize the integrity between concepts and to express this relationship. A student who is literate at the functionality level in digital literacy is expected to exhibit behaviours such as creating content for digital environments, understanding digital information, and acting in accordance with the rights of others in digital environments. The last stage, the level of agency, is defined as the ability to collect and synthesize information, to choose among alternatives, and to ensure the sustainability of agency. At this level, the student has reached a level where they can calculate the consequences of their actions and evaluate their impact. By feeling responsible, students can sustain their behaviour. A student who has reached the level of agency in digital literacy is expected to be able to take e-safety measures, use digital tools for their intended purpose, think critically, communicate, and share their feelings and thoughts using digital information. This feature of the agency level is not a level that includes only actions. The student evaluates his/her behaviours.

Current studies generally focus on artificial intelligence, digital competencies, the incorporation of virtual artificial intelligence robots into educational processes and the evolving digital learning environments (Yoo, 2019; Touretzky, Gardner-McCune, Martin, Seehorn 2019; Steinbauer, Kandlhofer, Chklovski Heintz, Koenig 2021; Prahani, Rizki, Jatmiko, Suprapto & Amelia, 2022; Adıgüzel, 2023; Bittencourt, Chalco, Santos, Fernandes, Silva, Batista, Hutz, Isotani, 2024; Wang, 2024). In the process of digitalization in education, it is of great importance to implement different learning environments, processes and methods to create behaviours specific to individuals. The aim of this study is to determine students' digital literacy and e-safety skills according to teachers' views. The research seeks answers to the following sub-problems.

1. How do teachers evaluate their students' ability to access, understand, interpret, use and produce information in digital environments?

2. How do teachers define their students' privacy in the digital environment, their digital security awareness, the security threats they face, and what measures do they take against these threats?

2. METHOD AND MATERIALS

2.1. Research Model

This study was designed and implemented with a case study approach from qualitative paradigm methods. Case studies are methods in which one or more events, environments, programs, social groups or interconnected systems are examined in depth (Cresswell, 2007). In this study, it is thought that it is suitable for a case study since it is tried to understand students' digital literacy, digital privacy and e-safety, and skills of using digital tools appropriately according to the views of teachers.

2.2. Participants

The study group of the research consists of 15 teachers working in primary, secondary and high schools in a city located in the central region of Turkey, where mostly children from families with middle and lower socio-economic and socio-cultural levels, in the 2024-2025 academic year. The participants in the study were determined by maximum diversity sampling method, one of the random sampling methods. With this method, it is aimed to provide the maximum difference regarding the phenomenon examined by using one or more criteria (Cohen, Manion &Marrison, 2021). Digital elements are used by people at all school levels, different branches, different genders and different age ranges. For this reason, maximum diversity was tried to be created by ensuring the participation of teachers from primary, secondary and high school levels, different branches, different genders and different age ranges in the sample of the research. Table 1 shows the demographic information of the teachers who participated in the study.

Table 1.

Demographic Information of Participants

Participant	Gender	Branch	Seniority
T1	Female	Social Studies	17
T2	Male	Classroom Teacher	21
T3	Female	School Counseller	6
T4	Male	Turkish	9
T5	Male	Classroom Teacher	16
T6	Female	ICT Teacher	14
T7	Female	Turkish	17
T8	Male	Classroom Teacher	16
T9	Female	Classroom Teacher	16
T10	Male	Turkish	21
T11	Female	Turkish Literature	13
T12	Female	Physics	16
T13	Female	Math's	12
T14	Male	Biology	15
T15	Male	Technology Design	28

2.3. Instruments

Qualitative data was collected in the study. A semi-structured interview form was developed by researchers to collect data. Semi-structured interviews are organized around predetermined open-ended questions, and other questions are added as they arise during the interview (Cohen, Manion & Morrison, 2021). In the interviews, an interview form was used to understand teachers' thoughts on digital literacy and e-safety issues. This interview form was submitted to an expert opinion for the evaluation of content validity after the relevant literature review. Both experts' field of study is curriculum and instruction and both have been involved in pre-service teacher training in this field. The interview forms were organized in line with the expert opinions, pilot interviews were conducted with two teachers and then reorganized and made ready for implementation. In addition, some probe questions were added to the interview form after the review after each interview. For framing the questions in semi-structured interviews, probe questions should also be considered (Cohen, Manion & Morrison, 2021). The first part of the interview form included questions about the demographic information of the teachers, the second part included 10 questions about the research objectives and various probing questions related to these questions.

2.4. Data Collection Procedure

Qualitative data analysis consists of three successive phases: data representation, data reduction, and presentation and validation of results (Baltacı, 2017). Descriptive analysis method was adopted in this study. Descriptive analysis is a qualitative data analysis type that involves summarizing and interpreting the data collected with various data collection techniques according to predetermined themes. In this type of analysis, the researcher may frequently use direct quotations to effectively reflect the views of the participants in the research. (Yıldırım & Şimşek, 2013). Descriptive analysis takes place in four stages. In the first stage, the researcher creates a framework for data analysis based on the research questions, the conceptual framework of the research or the dimensions of the interviews and observations. Thus, it is determined under which themes the data will be organized and presented. Then, the researcher reads and organizes the data based on the framework he/she has previously created. In this process, it is important to bring the data together in a meaningful and logical way. After this stage, the researcher identifies the data he/she has organized. At the end of this process, the researcher explains, relates and makes sense of the findings. At this stage, the researcher also explains the cause-and-effect relationships between the findings in order to further strengthen his/her interpretations and makes comparisons between different cases if needed (Yıldırım & Şimşek, 2013).

During the research process, the data recorded with a voice recorder were listened to one by one by the first researcher. These data were then converted into written documents through the Microsoft Word program. The written data were confirmed by five participants in order to increase reliability in the study. The researcher then read these documents line by line and created codes on the right side of the paper in order to make meaningful wholes. The coding used in the research were tried to be created in accordance with the relevant literature and interview findings. After the coding of all participants was completed, the codes were reviewed once again and the participant responses in the interview form were re-examined. After the coding was completed, an attempt was made to create themes that could explain the codes at a general level. For this purpose, the codes were first analysed by bringing them together and the relationships between them were tried to be found. The main purpose of descriptive analysis is to present the findings obtained at the end of the interview to the reader in a summarized and interpreted form. To support the results obtained, one-to-one quotations from the teachers' opinions were included.

3. Findings

This study aims to understand teachers' thoughts about digital literacy and e-safety. The data obtained through the interview method, descriptions and statements of the participants are given in direct quotations. Participants were coded as given in Table 1 in accordance with confidentiality principles. The findings obtained as a result of descriptive analysis are reported in tables around themes and sub-themes.

3.1. Findings Related to Teachers' Skills of Accessing, Understanding, Interpreting, Using and Producing Information in Digital Environments

Sub-themes and codes are given in Table 2 and participant sentences are given after Table 2.

Table 2.
Codes for the Skills of Accessing, Understanding, Interpreting, Using and Producing Information

Access to Information	Sources	Difficulties	Understanding and interpreting information	Production

Widespread	Search	Distinguishing	Limited	Copying
Easy	Engines	Verification	Inadequate	Free-Loading
Adequate	Artificial	Relating to Life	Weak	Weak
Inadequate	intelligence			

3.1.1 Access to Information

Participants stated that it is common among students to access information easily in digital environments and that they can access information sufficiently. Only one of the teachers participating in the study evaluated their students' ability to access information in digital environments as inadequate.

Since access to information is very easy nowadays, their opportunities have improved, I think they access information more easily. (T2).

In the current society, it is not difficult at all in the current age because children can use the internet very comfortably. (T4).

Since I teach fourth graders, they are more competent in this subject than primary one, two and three. When I give them research assignments, they access information without any problems. I find them competent in this regard (T8).

Frankly, I don't think these skills are completely good. I mean, I think that children have concerns about accessing information (T3).

3.1.2. Sources

The common opinion of the teachers participating in the research is that students benefit from search engines in the process of accessing information in digital environments. Three teachers stated that their students also benefit from artificial intelligence applications.

and they use search engines like Google a lot. Artificial intelligence, as you know, is a very advanced technology, they can utilize the information they want in a very good way, whether it is for presentations or homework assignments. (T2)

They often use artificial intelligence products and search engines like Google a lot. Artificial intelligence, as you know, is a very advanced technology, they can utilize the information they want in a very good way, whether in terms of presentations or homework. (T4).

3.1.3. Difficulties

Teachers have the most difficulties in the process of students' accessing information in digital spaces at the verification and discrimination stage. Teachers state that students do not feel the need to verify the information they access easily from a different source, and that the idea that the information they see on the internet reflects the truth is common among students. In addition, students are unable to distinguish the scope of the information they obtain from digital media.

They don't know much about what and how to research. They are unable to go into the details of the subject, they write superficial subject names and accept the first information they come across as the right information, and this is usually the biggest problem we face. (T1)

Now, we say that the internet is an information dump, that not all information is correct, that anyone can enter information there, and that among these people, people with malicious intentions deliberately enter false information. In the social studies lesson, we convey that they can access the most reliable information

from government websites with the extension .gov and that they should not accept the information they learn from one source, i.e. from one website, as true, but that they should confirm it from at least a few more sources. But we don't measure it by any means (T7).

3.1.4 Understanding and Interpreting Information

Teachers negatively evaluate their students' ability to understand and interpret information. In addition, teachers think that students are inadequate in understanding and interpreting information and exhibit behaviours in a limited scope.

> *Understanding and interpretation skills, in other words, I think they are weak in this as I have seen in my own class.. Either they accept it immediately, they accept or reject this first finding without testing its veracity. Sometimes they refuse to access it, so they have difficulties in accessing the right information because they have weak comprehension and interpretation skills. If only they had the ability to interpret, if only they had the ability to weigh it, they could reach it more easily. (T3)*
>
> *Here, understanding and interpretation is generally what I see as follows: 10% of the class I attend have the skills to do this, and the remaining ninety percent bring it directly to us on digital platforms or by using technology. (T2)*
>
> *In other words, as I just said, children of our generation now have difficulty in understanding and interpreting not only from digital media but also because we have difficulty in understanding what they normally read.(T10)*

3.1.5 Production

Under the heading of producing, teachers think that their students are very weak in exhibiting productive skills by using the information they access from digital environments. Teachers state that students are inadequate in terms of producing, that they usually go to the method of directly copying the information they obtain from digital media, and that as a result, a great deal of free-loading behaviour develops among students.

> *I don't see any productivity. I think they just paste the first information they find, they don't make any comparisons, they don't make any interpretations. (T7)*
>
> *Unfortunately, they are also incompetent in this regard. They mainly use it for entertainment purposes anyway. Since they don't use the internet much in terms of acquiring culture and information, they don't bother themselves too much. (T6)*
>
> *However, not all students are very active in producing knowledge, but rather they use digital environments to consume and use knowledge. (T10)*

3.2. Findings on Teachers' Digital Privacy in Digital Environment, E-Security Awareness, Identification of Security Threats Encountered and Precautions Taken Against These Threats

Sub-themes and codes are given in Table 3 and participant sentences are given after Table 3.

Table 3.

Codes for Digital Literacy and Cyber Security Skills

Considerations	Trainings	Suggestions	Treats	Precautions
No Sharing on Net	Informing	Using Under control	Phishing	Protection of Confidentiality of Personal Information
Awareness Raising	Activities in the Curriculum	Spending not Too Much Time Relating to Life	Cyberbullying	
Counselling			Blackmail	

Supporting with In-Class Activities	Mentioning in the lesson

3.2.1. Considerations

Under the heading of what teachers pay attention to, teachers frequently repeated the view that they do not share any data or images of their students on digital media in order to ensure the importance of their students' digital privacy and e-safety. However, it is understood that teachers include in-class activities and frequent counseling services in order to raise awareness of the negative consequences of the widespread use of the digital world among children.

I try to pass on my own precautions to children. (T3)

When we ask or tell our students about the concept of privacy, they often turn to us and say, "What is this, teacher?" This is really upsetting, and we constantly talk about it in lessons to combat this. (T2)

I mean, we inform them about this, but I don't think they pay much attention to what we say.. (T4)

3.2.2. Trainings

Teachers were asked whether they provided any training for their students in order to ensure their safety in digital environments. In this section, all of the teachers stated that they provided information to their students in the course rather than a special training, and the participants who were information technologies and technology design course teachers said that they mentioned it as a course activity because it was included in their curriculum.

Yes, since the feature of our course is to use technology, we definitely cover safe internet environment and safe e-digital systems in the first 2 weeks at the beginning of the year. I think I have shared this information with the classes I teach a lot.. (T6)

3.2.3. Suggestions

The teachers who participated in the research stated that they suggested to their students that their use of digital privacy and e-safety issues should be within a certain control framework and time limitations.

We even try to inform them not to own a smartphone until they finish middle school, if possible. But unfortunately, parents are not enough in this regard. Parents' control is very limited. Since students are not aware of the situation, some of them may have unlimited usage rights. (T9)

3.2.4. Treats

The teachers who participated in the research stated that students are most exposed to threats such as cyberbullying, phishing and blackmail in digital environments.

The biggest security threats are, of course, now that the virtual digital environment is a very large environment, there can be malicious software. Here are the environments where identity theft can occur. (T5)

3.2.5. Precautions

Teachers state that in order to ensure the safety of students in digital environments, personal information must be kept confidential, and for this reason, they do not share any information about their students in any digital media. In addition, they state that issues related to digital privacy and e-safety are mentioned in the form of information in in-class activities.

Except informing, I mean, there is nothing different, I mean, the process is going on by just raising awareness about this issue in my children, you know, by talking and informing them. (T15)

5. Conclusion, Discussion and Recommendations

Teachers think that students do not have any problems in accessing information. In particular, the intensive use of search engines accelerates students' access to information. Hobbs (2010), Erwin & Mohammed (2022), Budiman & Syafrony (2023), Habib, Buditjahjanto & Rijanto (2024in their studies, they state that students accessed information quickly and more comprehensively, especially through search engines, which facilitate access to information. However, the fact that few students use AI-based applications indicates that such technologies have not yet found widespread use among students. Elçiçek (2024) in his study, He emphasized the importance of studies to improve the use of artificial intelligence since students have limited access to artificial intelligence applications and this technology has not yet been used efficiently. However, teachers found that students were inadequate in terms of knowledge verification and discrimination skills. Doğusoy & İmer (2019) in their study, they stated that students' lack of a critical approach to digital content makes them vulnerable to misinformation spread on the internet. This reveals that not only access to digital tools is not enough, but also the conscious and responsible use of these tools should be taught.

The research shows that students' capacity to make sense of the information they obtain from digital sources and analyse it in depth is limited. It is thought that this situation may be related not only to the information density of students in digital environments, but also to the inadequacy of digital literacy practices in the education system. Erwin & Mohammed (2022), Jung, Choi & Fanguy (2024) and Rohmanurmeta, Susilo Zainuddin & Hadi (2024) in their studies, they emphasize the importance of developing digital literacy skills in order to improve students' ability to make sense of and interpret the information they access in digital media. Teachers assess students' ability to be productive with digital tools and use information creatively as largely inadequate. The results of the research reveal that the “copy-paste” method is common among students and that this encourages a passive attitude towards knowledge. Getenet, Cantle, Radmont & Albion (2024) in their study, they state that students' digital skills should be assessed not only by the acquisition of knowledge, but also by the innovative and ethical use of that knowledge. This deficiency, Alajmi (2022) states that digital literacy skills are not limited to technical knowledge, but also include critical thinking, ethical consciousness and creative productivity.

According to teachers' assessments, students often face threats such as cyberbullying, phishing and blackmail in digital environments. This situation reveals that students' awareness and defence skills against digital threats are limited. Senadheera, Rupasinghe & Ediriweera (2024) in their study, they draw attention to the lack of guidance on how students should behave when faced with such threats. Theachers state that teachers take various measures to ensure the safety of their students. Kapucu, Özcan & Özyer (2021) in their study, they state that not sharing personal information, protecting digital privacy and teaching security awareness through in-class activities are among the measures teachers take to protect their students' digital privacy. This shows that teachers are committed to ethical rules in digital environments and embrace the responsibility to ensure students' digital safety. However, teachers rated students' awareness of how to protect their own digital privacy as limited. List (2019 emphasised that, emphasizes that although today's students are called digital natives, they are unaware of the dangers of the digital world. For this reason, it suggests that there is a need for more comprehensive training in this field.

Teachers' evaluations show that students often use digital tools for entertainment and consumption purposes, and that their educational and productive use skills are insufficient. Lack of awareness on digital

privacy and e-safety issues leaves students vulnerable to cyber threats, while inadequacies in technical infrastructure and device access stand out as the main factors preventing the development of digital skills. These findings clearly demonstrate the need for systematic training programs and technical support mechanisms to enable students to use digital tools in a conscious, safe and productive manner.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study adheres to the ethical guidelines for conducting research.

Funding: This research received no external funding.

REFERENCES

Adiguzel, T. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Conteporary Educational Technology, 15(3), ep429.

AlAjmi, M., K. (2022). The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. *International Journal of Educational Research,Volume 112,2022, https://doi.org/10.1016/j.ijer.2022.101928*

Baltacı, A. (2017). Nitel veri analizinde Miles-Huberman modeli. Ahi Evran Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 3(1), 1-14.

Bittencourt, I.I., Chalco, G., Santos, J. *et al.* Positive Artificial Intelligence in Education (P-AIED): A Roadmap. *Int J Artif Intell Educ* **34**, 732–792 (2024). https://doi.org/10.1007/s40593-023-00357-y

Cohen, L., Manion, L., Morrison, K., (2021). *Research Methods In Education. New York : Routledge*

Creswell, J. W. (2017). Research Design. (S. B. Demir, tra. Ed.). Ankara: Eğiten Kitap.

Doğusoy, B., & İmer, G. (t.y.). Investigation of Secondary School Students' Assessments of Digital Native Characteristics. *İlköğretim Online*1766-1778. https://doi.org/10.17051/ilkonline.2019.639322

Elçiçek, M. (2024). A Study on Students' Artificial Intelligence Literacy. *Bilgi ve İletişim Teknolojileri Dergisi, 6*(1), 24-35. https://doi.org/10.53694/bited.1460106

Erwin, K., & Mohammed, S. (2022). Digital literacy skills instruction and increased skills proficiency. International Journal of Technology in Education and Science (IJTES), 6(2), 323-332. https://doi.org/10.46328/ijtes.364

Getenet, S., Cantle, R., Redmond, P. *et al.* Students' digital technology attitude, literacy and self-efficacy and their effect on online learning engagement. *Int J Educ Technol High Educ* **21**, 3 (2024). https://doi.org/10.1186/s41239-023-00437-y

Habibi, M. W., Buditjahjanto I., G., P., A., , Rijanto, T. (2024). Digital literacy ability of private vocational students in Surabaya City. Journal of Education and Learning (EduLearn) Vol. 18, No. 3, August 2024, pp. 745~752 ISSN: 2089-9823 DOI: 10.11591/edulearn.v18i3.21104

Hobbs, R. (2010). The Aspen Institute Communications and Society Program, *Digital and Media Literacy: A Plan of Action,* Washington, D.C.: The Aspen Institute, November 2010.

Jung, J., Choi, S. and Fanguy, M., (2024). Exploring Teachers' Digital Literacy Experiences. *International Review of Research in Open and Distributed Learning,Volume 25, Number 2*

Tasay, H. & Basaran-Demir, S. (2025). An Analysis of K12 Students' Digital Literacy and Cybersecurity Awareness in the Context of Teachers' Views. *Cypriot Journal of Educational Science*, *20*(2), 127-136. https://doi.org/10.18844/cjes.v20i2.9745

Leowus, L., (2016). What Is Digital Literacy?: Digital Literacy: An Evolving Definition. Educationweek. Erişim Adresi: https://www.edweek.org/teaching-learning/what-is-digital-literacy/2016/11 Erişim Tarihi: 11.12.2024

List, A. (2019). Defining digital literacy development: an examination of preservice teachers' beliefs. *Computers & Education,* (138), 146-158.

Ma'rufah Rohmanurmeta, F., Susilo, H., Zainuddin, M., & Hadi, S. (2024). The digital technology literacy profiles of students as prospective elementary school teachers. *Cogent Education*, *11*(1). https://doi.org/10.1080/2331186X.2024.2332839

Prahani, B. K., Rizki, I. A., Jatmiko, B., Suprapto, N., & Amelia, T. (2022). Artificial Intelligence in Education Research during the last ten years: A review and bibliometric study. International Journal of Emerging Technologies in Learning, 17(8), 169–188. https://doi.org/10.3991/ijet.v17i08.29833Park J. H., Shin N. M. (2017). Students' perceptions of artificial intelligence technology and artificial intelligence teachers. *Journal of Korean Teacher Education*, 34(2), 169–192.

Seçkin-Kapucu, M., Özcan, H. & Karakaya-Özyer, K. (2021). The relationship between middle school students' digital literacy levels, social media usage purposes and cyberbullying threat level. International Journal of Modern Education Studies, 5(2), 437-566. http://dx.doi.org/10.51383/ijonmes.2021.136

Senadheera, V.V., Rupasinghe, T.P., and Ediriweera, D.S. (2024). 'Connective Alignment' as *Journal of Learning for Development*, *11*(1), 172-180.

Steinbauer G., Kandlhofer M., Chklovski T., Heintz F., Koenig S. (2021). A differentiated discussion about AI education K-12. *Kunstliche Intelligenz*, 35(2), 131–137. https://doi.org/10.1007/s13218-021-00724-8

Sun H., Xie Y. and Lavonen J.(2024). Effects of the use of ICT in schools on students' science higher-order thinking skills: comparative study of China and *Finland*, Research in Science & Technological Education, 42:2, 276-293, DOI: 10.1080/02635143.2022.2116421

Touretzky D., Gardner-McCune C., Martin F., Seehorn D. (2019). Envisioning AI for K-12: What should every child know about AI? *Proceedings of the AAAI Conference on Artificial Intelligence, Proceedings of the AAAI Conference on Artificial Intelligence*, 33, 9795–9799. https://doi.org/10.1609/aaai.v33i01.33019795

Yıldırım, A. ve Şimşek H. (2013). *Qualitative research methods in social sciences* (9. Baskı). Ankara: Seçkin Yayıncılık.

Yoo J. (2019). A study on AI education in graduate school through IPA. *Journal of the Korean Association of Information Education*, 23(6), 675–687.

Zeighner, O. (2020). Using simulations to ımprove achievements and motivation in ICT studies. İ-Manager's Journal on School Educational Technology, 16(1), 11-24. http://dx.doi.org/10.26634/jsch.16.1.17426