ANADOLU ÜNİVERSİTESİ | SODİGEM

DISEM

Digital Security & Media

Volume 1, Issue 1
December, 2024
Anadolu University Social Media and Digital Security,
Education, Application and Research Centre (SODIGEM)

Editor's Note:

Welcome to the inaugural issue of Digital Security & Media (DISEM). Published biannually by the Anadolu University Social Media and Digital Security, Education, Application and Research Centre (SODİGEM), DISEM is an international peer-reviewed electronic journal with open access.

In today's rapidly evolving digital landscape, the intersection of digital security and media has become increasingly pivotal. As digital platforms expand and technologies advance globally, cyber security, digital ethics, and media integrity have emerged as fundamental challenges. Digital transformations continue to reshape educational, legal, and cultural domains across diverse contexts. Recognizing these developments, DISEM aims to create a dedicated platform for rigorous academic discourse, addressing these urgent topics that impact societies worldwide.

DISEM publishes academic studies that explore the social dimensions of digital security and media, covering topics such as new and digital media, digital law, digital ethics, digital literacy, digital transformation, digital culture, technology, distance education, cyber security, and other related fields. Our goal is to foster scholarly discussions that shape policies and practices in these vital areas.

In this inaugural issue, we present five research articles and a book review that reflect the diverse and interdisciplinary scope of our journal:

Articles

1. “A Connectivist Learning Activity for 8th Grade Students on Peer Bullying” by Elif Ezgi Karaca and others
   - This research article examines the effectiveness of a connectivist learning approach to address peer bullying among middle school students through blended learning practices.
2. “The Complex Adaptive Blended Learning System: A Systematic Review” by İstek Aksak Kömür, Yusuf Levent Şahin, and Mumammet Recep Okur
   - A systematic review of studies conducted within the framework of the Complex Adaptive Blended Learning System, providing insights into the application of this innovative educational approach.
3. “Digital Game and Technology Addiction in Early Childhood” by Selahattin Semiz
   - A review article exploring the developmental consequences of early exposure to digital devices and the potential risks of technology addiction in young children.
4. “The Relationship Between High School Students’ Social Media Usage and Metaverse Knowledge Levels” by Eray Yılmaz, Ceren Ünal, and İremnur Demir
   - An original research article analyzing how high school students’ engagement with social media correlates with their knowledge and understanding of the Metaverse.
5. “The Analysis of Postgraduate Studies on AI in Education in Türkiye” by Veysel Dağdemir
   - An in-depth analysis of postgraduate research on artificial intelligence in education conducted in Türkiye, highlighting trends and emerging themes in the field.

Book Review

6. “Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning” by İrem Ebru Yıldırım Şen
   - A critical review of a book discussing the integration of AI in education, its ethical considerations, and its impact on teaching practices across different educational levels.

We extend our heartfelt gratitude to all the authors who contributed their valuable work to this issue. We hope this collection of articles serves as a resource for researchers, educators, policymakers, and students interested in the rapidly evolving fields of digital security and media.

We look forward to your feedback and future contributions as we continue to explore these critical topics in the issues to come.

Dr. Hıdır Karaduman
Editor

VOLUME-1 / ISSUE-1 / DECEMBER 2024

DIGITAL SECURITY & MEDIA (DISEM)

PUBLISHER
Anadolu University

OWNER
(in the name of Anadolu University)
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PERIOD
DISEM is an international peer-reviewed journal is published two times a year. (July, December)

PUBLICATION LANGUAGES
English

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GRAPHIC DESIGN
Barış Berkant, Anadolu University

ABOUT DIGITAL SECURITY & MEDIA (DISEM)

Digital Security & Media (DISEM) is published twice a year (December and July) by Anadolu University Social Media and Digital Security Education Application and Research Centre (SODİGEM), and it is an international, open access, electronic and peer-reviewed journal. DISEM publishes academic studies on the social dimension of digital security and digital media in the world within the scope of new media, digital media, digital media and derivatives, social media, digital media law, digital media ethics, digital literacy, digital media education, digital transformation, digital culture, technology, distance education, digital security, digital security training, cyber security, regulation in cyber, legal processes, rights and ethical issues, personal and collaborative e-infrastructures as well as any other related topics. Moreover, authors can submit their manuscripts of original, qualified conceptual and empirical research, or compilation studies.

In each issue, significant attention is paid to the balanced distribution of the articles in the above-mentioned subject areas. Accordingly, manuscripts submitted to DISEM should not have been published before or should not be in the process of review in any other journal, academic work or anywhere else.
Authors are advised to write their manuscripts in accordance with the writing rules of the journal. After successful initial screening, in the review process, a double-blind review system is used, in which the identities of both authors and referees are hidden from each other.

AIM & SCOPE

The aim of the Digital Security & Media (DISEM) is to publish original theoretical and practical studies conducted in the social dimension of digital security and digital media in Turkey and around the world, and to contribute to the field within this scope.

DISEM covers new media, digital media, digital media and derivatives, social media, digital media law, digital media ethics, digital literacy, digital media education, digital transformation, digital culture, technology, distance education, digital security, digital security training, cyber security, regulation in cyber, legal processes, rights and ethical issues, personal and collaborative e-infrastructures etc. It also includes original, qualified conceptual and empirical research, as well as compilation studies, in which scientists can share their research. In each issue, attention is paid to the balanced distribution of the articles in the above-mentioned subject areas.

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Research Article

Digital Security & Media, *1*(1), 1-17

A connectivist learning activity for 8th grade students on peer bullying

Received: 11/09/2023
Revised: 05/12/2023
Accepted: 25/12/2023

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Abstract

This study was conducted in a holistic single case design to examine the peer bullying activity based on the connectivist learning approach for 8th grade middle school students. Thirteen eighth grade students attending a private educational institution that supports school programs in Bursa in the 2022-2023 academic year voluntarily participated in the study. In this study, in which the first 4 sessions of the 5-session Peer Bullying Awareness Program published by the Ministry of Education were implemented through blended learning, data were collected through focus group interviews, reflective diaries and Blogger environment records. The findings obtained from the research show that the students showed an average participation in the activities on Blogger, and the participation in the last activities decreased due to the short time left for high school entrance exam, that different network connections were not used sufficiently in the process, that although various difficulties were encountered, opinions were mostly positive about the activity, that a mobile application was preferred to the Blogger. As a result, most of the students gained awareness about peer bullying. Studies on a similar subject can be carried out at a different level than middle school and in a different social media environment than Blogger.

Keywords: Peer Bullying, Middle School, Connectivist Learning, Blogger, Blended Learning

Cite: Karaca, E. E; Özen, B.; Suzan Çardak, Ç. & Çimşir, E. (2024). A connectivist learning activity for 8th grade students on peer bullying. *Digital Security & Media, 1*(1), 1-17

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INTRODUCTION

Bullying, a subset of aggression (Griffin & Gross, 2004), is defined as aggressive behavior involving attacks, humiliation, or exclusion directed by an individual or a group towards a weaker and more vulnerable individual (Salmivalli, 2010). In this context, peer bullying can be described as harm, humiliation, and torment inflicted by one or more students on another student whom they perceive as weaker and defenseless (Ministry of National Education [MEB], 2021). Griffin and Gross (2004) categorize bullying behaviors into physical, verbal, and relational bullying. Physical bullying includes actions such as hitting, punching, and kicking; verbal bullying involves negative verbal expressions such as swearing, insulting, and gossiping, and relational bullying consists of behaviors like excluding and leaving someone alone. Additionally, cyberbullying has emerged as one of the bullying types in the 21st century with the widespread use of mobile phones and the internet (Smith, 2016). A meta-analysis conducted by Talu and Gümüş (2022) in Türkiye examined the prevalence of peer bullying among adolescents, revealing that students experienced bullying at least twice and engaged in bullying twice during an academic year. Children and adolescents witnessing peer bullying find themselves in a social dilemma as they attempt to understand and stop the behavior while simultaneously trying to secure their status and safety within the peer group (Salmivalli, 2010). However, peer bullying poses serious risks in terms of psychological and academic adjustment for students who play the roles of both the perpetrator and the victim, as well as those who witness it (Salmivalli, 2010).

Studies on peer bullying conducted in Türkiye have focused on various topics, including cyberbullying, identification of peer bullying, predictive characteristics of bullying, and factors influencing and accompanying bullying. Moreover, there is an increasing focus on studies that develop and implement educational programs to prevent bullying. For example, Kartal and Bilgin (2007), applied Garrity and colleagues' (2000) Bully-Proofing Your School Program to 40 fifth-grade students, resulting in positive changes in students' perspectives at the end of the training. In a study by Kantar and Uysal (2019), the impact of creative drama activities based on text types on the perception of peer bullying was examined. Findings from the experimental study with sixth-grade students revealed that before the intervention, peer bullying was perceived primarily in the physical dimension, whereas after the intervention, emotional and verbal dimensions were also recognized. In a study conducted by Kutlu and Karaca (2021), an awareness training program for peer bullying was developed and implemented in eight sessions for elementary school students. The findings suggest that, before the training, students' definitions of peer bullying shifted from physical fights to power imbalances, with bullying situations most commonly encountered in the schoolyard and during commuting to school. The study also revealed that the behaviors leading to bullying included disagreements during play in the pre-test, while in the post-test, they consisted of actions such as pushing for no reason. In a study led by Özbek and Taneri (2022), a bibliotherapy and creative drama-based peer bullying intervention program for elementary school students was found to raise awareness of peer bullying and contribute to finding solutions to combat bullying.

Despite the importance of peer bullying prevention/intervention programs, in Türkiye, there is no school-based program integrated into the curriculum aimed at preventing peer bullying (Doğan, 2022; Özbek, Taneri & Akduman, 2020). However, the Directorate of Special Education and Guidance Services provides brochures for teachers and parents on the topic of peer bullying, presentations for teachers and parents from preschool to high school, awareness programs, psycho-educational programs, and finally, storybooks for preschool and elementary school students (https://orgm.meb.gov.tr/www/akran-zorbaligi/icerik/2085). These programs have been developed by the Ministry of National Education (MEB) with the financial support of UNICEF (MEB, 2021). Among these, the Peer Bullying Awareness Program (PBAP) was published in separate booklets for preschool, primary school, middle school, and high school levels in 2021. It is recommended that these programs be implemented in schools by a guidance counselor or by the class guidance teacher under the control of a guidance

counselor. In the school implementation, the planning and execution of the program have been left to the responsibility of the school principals, and it is suggested that all materials needed for the implementation should be provided by the school administration. However, the irregular and unsystematic implementation of this program in schools may lead to students inevitably experiencing peer bullying, emphasizing the importance of addressing this issue. In addition to being incorporated into school programs, implementing this program as an extracurricular activity outside of school can contribute positively.

In the current digital age, it is evident that the use of information and communication technologies is essential for learners both in and out of school learning processes. Implementing PBAP as an extracurricular activity through a blend of face-to-face and e-learning processes can particularly meet the expectations of eighth-grade students. To achieve this, providing students with the opportunity for a blended learning experience is necessary. Blended learning, as the name suggests, represents the integration of online learning with more traditional learning methods, combining the innovative and technological advancements offered by online learning with the interaction and engagement provided in traditional learning (Thorne, 2003). In this study, blended learning has been implemented by uniquely combining the face-to-face learning process of the peer bullying activity with the learning processes in a blog page environment. The design of the learning processes for digital-age learners is based on the connectivist learning approach.

Siemens (2005) suggested that while behaviorist, cognitive, and constructivist theories are the three fundamental theories most utilized in learning environments, they emerged in times when learning wasn't influenced by technology. As an alternative theory, Siemens advocated for connectivism. Connectivism, which is based on the ubiquity of digital material and network connections between content, defines learning as the process of creating information, communication, and resource networks that are applied to real-world problems, and the learner's role is described as having the ability to find and apply information when and where needed (Anderson & Dron, 2011). Siemens (2005) emphasized that in this age of technology where knowledge changes every day, we cannot personally experience and acquire learning; it's crucial to benefit from others' experiences through networks. However, connectivism, being a new concept, has been criticized for being distant from traditional epistemological paradigms (Goldie, 2016) and not presenting a purely educational perspective on learning. It has also been criticized for reflecting a combination of ideas from previous theories and not being a novel learning theory, particularly due to its deviation from the traditional concepts of a teacher and teaching, providing learning solely from a virtual environment (Duke et al., 2013). Therefore, it seems appropriate to call this connectivist learning approach instead of connectivist learning theory.

As suggested, raising awareness of peer bullying among teenagers, namely 8th grade students in the case of this study, is critical. To achieve this, diverse engaging activities need to be planned in schools and special education institutions supporting schools (tutoring centers, prep schools, etc.) Furthermore, exploring the implementation of such activities for digital-age learners, informed by both the Web and the Peer Bullying Awareness Program (PBAP), is essential. In other words, it is important to focus on how activities related to PBAP can be designed based on connectivist learning principles, especially by exploring examples and results of extracurricular activities in the literature. In line with these needs, this study aims to examine the Connectivist Peer Bullying Activity (CPBA), a peer bullying activity based on the connectivist learning approach, for 8th-grade middle school students. The research questions sought to be answered in line with this goal are as follows:

1. What is the participation status of students in the Connectivist Peer Bullying Activity?
2. What are the thoughts and emotions of participating students regarding the process of the Connectivist Peer Bullying Activity?
3. What are the thoughts and emotions of participating students regarding peer bullying at the end of the Connectivist Peer Bullying Activity?

METHOD

Research Design

Conducted to examine a connectivist learning approach-based peer bullying activity implemented through a blended learning process in the Blogger environment for 8th-grade students, this qualitative study was designed as a holistic single-case design. The holistic single-case design involves the examination of a single analysis unit (Yıldırım & Şimşek, 2021), and is recommended when the underlying theory and/or approach have a holistic structure (Yin, 2018). Indeed, the specific case to be investigated in this study is a connectivist learning activity related to peer bullying, planned to be implemented in the Blogger environment within the scope of the guidance course.

Connectivist Peer Bullying Activity

The Connectivist Peer Bullying Activity was designed in a doctoral course related to e-learning offered by a graduate education institute at a Turkish university. The activity, designed by two doctoral students participating in the course and the course instructor specializing in e-learning and was reviewed by an expert in the field of counseling, was conducted both face-to-face and on the Blogger platform. The choice of a blog environment as the e-learning platform is due to the perception of blogs more like web pages compared to other social networking sites, while still allowing participant interactions and minimizing risks associated with other platforms. The study preferred the free blog service provided by Blogger. The Peer Bullying Awareness Program (PBAP) consists of 5 sessions: (1) What is Peer Bullying? (2) Building Empathy, (3) Resisting Peer Bullying, (4) Don't be Silent to Bullying, and (5) If It Were Me! However, the 3rd and 4th sessions, deemed to have closely related content, were combined into a single week. The integration of the 5 sessions of PBAP with the 4-week activity in this research involved operationalizing the session outcomes, incorporating them into the activity, and adding visual elements such as knowledge cards and examples from the program into interactive video content. The details of the activity, conducted weekly, are outlined below week by week:

- In the first-week activity, during the face-to-face guidance class, the Blogger environment was introduced to students. Students with email accounts were identified, and those without were assisted in obtaining one. The purpose and process of the activity were explained, students were informed of their roles and responsibilities, a WhatsApp group was created for weekly updates and interpersonal communication, and finally, a discussion on peer bullying took place. The first session of PBAP, focusing on "What is peer bullying?" covered physical, verbal, relational, and cyberbullying types, along with examples. In the Blogger environment, students were first presented with interactive video content developed with H5P, and they commented on the video within the blog environment. Later, students were asked to create a slogan for the topic of the first week. According to Siemens (2005), the skills that learners must have in connectionist learning include the ability to create/infer meaning and the ability to think creatively and critically. For this reason, it was aimed for students to acquire and reveal these skills with the task of creating a slogan at the end of each activity. Both the first and second researchers actively participated in creating the slogan, serving as models and initiating the first interaction in the blog environment.
- In the second-week activity, a discussion about emotions was conducted during the face-to-face Guidance class using a sample scenario. In the Blogger environment, the second session of PBAP, titled "Building Empathy," presented a scenario/story through video, discussing whether the incident in the story was bullying, the feelings of the individuals involved, and the feelings and thoughts of the bystanders. This activity aimed to raise awareness among students about the three roles of peer bullying: the bully, the victim, and the bystander. Video content was presented to students, prompting them to comment on their feelings within the blog environment by putting themselves in the shoes of the three roles. Additionally, students were presented with five-story cards from PBAP on the blog, and they were asked to choose a scenario, responding to questions in the comment section. These questions included: "How do

you think the bully feels? Try to think of at least 5 emotions they might have," "What might the victim of bullying feel?" and "What might other children who witness this situation (bystanders) feel and think?" Through these questions, students were expected to reflect on their ideas by empathizing with the three roles of bullying. Lastly, students generated a slogan suitable for the topic of the second week.

- For the third week, the activities from the third and fourth weeks of PBAP were combined. One of these activities is "I Stand Against Peer Bullying," focusing on a story where a person who has been bullied decides to act assertively. This activity revolves around the person's actions based on the questions "What if they acted with anger?", "What if they did nothing?", and "What would be effective?" The other activity in the third week is the fourth session of PBAP, "Don't Stay Silent to Bullying," which addresses what bystanders can do in such situations. Therefore, these two sessions were perceived in a similar context and combined. In the face-to-face Guidance class of the third week, a role-playing activity was conducted based on a sample scenario, asking students to imagine how they would act if they were in a bullying situation. A video recording of this activity was made, depicting different reactions to bullying behavior and discussing how good and bad outcomes could be. In the Blogger environment, an interactive video content developed with H5P was presented, focusing on a bullying incident on a school bus. In this context, a fill-in-the-blank section was added to remind students how the three roles of peer bullying were reflected in this video's first part. Another shared post in the Blogger environment presented four scenarios from PBAP, and students were asked to choose one and respond to the following questions in the comment section:
    - In the scenario you read, what actions by the students observing bullying would allow the bullying behavior to continue?
    - What actions, if taken, would represent an appropriate response to prevent bullying?
- The activity for the fourth week was planned as the fifth session of PBAP, titled "If I were in that situation (coping strategies with bullying)." However, due to the students' entrance exams for high schools, a short break was taken in the fourth week of the activity. Nevertheless, considering that some students would be going out of town and not continuing with the educational institution, two different focus group meetings were conducted to gather the students' opinions on the first three weeks of the activity.

In this context, the learning process on the Blogger page has been complemented with face-to-face activities, aligning with the blended learning approach. On the other hand, to ensure the engagement and continued sharing of voluntary students, the peer bullying page on the Blogger platform has remained active, following the activity plan. Additionally, considering the sensitivity of peer bullying as a concept, a decision has been made by the researchers to prepare an informative brochure at the end of the activity and share it on the Blogger page, aiming to prevent misconceptions among students. An example of the weekly activity plan is provided in Appendix 1, focusing on the first week.

Participants and Procedure

This study was conducted with thirteen 8th-grade students, attending a private educational institution supporting school programs in Bursa province during the 2022-2023 academic year. Early adolescence is associated with peak hormonal and physical changes, which have significant social and emotional implications (Hamilton et al., 2013), one of which includes difficulties in peer relations. As a result, the selection of participants—8th graders (ages 13-14)—was made based on the literature connecting the changes in early adolescence and peer bullying (e.g., Holt et al, 2017; Kennedy, 2021) Since one of the researchers works at this institution, the participants were selected using a convenience sampling method, which includes the most accessible situations and provides ease in terms of effort, money, and time for the researcher (Marshall, 1996). Students participated in the research voluntarily, and both

a voluntary participation form for students and a parental consent form was created to obtain parental approval due to the students being under 18 years of age. In addition, the researchers conducting the lessons, both face-to-face and on the Blogger platform, are inherently part of this study's participants, given the nature of qualitative research.

Information About the Researchers

The first two authors designed this activity as doctoral students participating in an e-learning doctoral course and implemented it under the supervision of the third and fourth researchers. The second researcher conducted focus group interviews and managed face-to-face processes. The third researcher guided the connectivist learning process as an instructor in the e-learning doctoral course, while the fourth researcher, as an expert in counseling, monitored and guided the content and processes related to peer bullying. The researchers collaborated in other processes.

Data Collection Techniques

In case studies, obtaining in-depth data related to the situation is essential by utilizing multiple sources of information such as observation, interviews, documents, and audio-visual materials, and presenting an understanding based on this data (Creswell, 2013). In this context, the primary data was collected through focus group interviews using a semi-structured form. The secondary data collection tools consist of researcher logs and records of the activity environment conducted in the Blogger platform. Detailed information about the data collection tools is provided under subheadings.

Focus Group Student Interview Form for the Activity

The semi-structured interview form used in the study was created to obtain students' views on the peer bullying activity implemented in the Blogger environment based on their expressions (Bogdan & Biklen, 2007). When creating the interview form, the literature on connectivist learning was reviewed by the researchers. The interview form contains 10 open-ended questions. These questions are about students' opinions regarding the face-to-face Guidance course and Blogger environment activities, their participation in the activity, and what the contributions of the activity are. Later, a curriculum expert and a counseling expert reviewed the structure, clarity, and comprehensibility of the questions. Additionally, the questions in the interview form were examined for language and narrative suitability by a Turkish Language and Literature teacher. To prevent data loss in focus group interviews with students who voluntarily participated in the activity, audio recordings were taken with the students' permission. A total of 6 students participated in the first focus group and 7 in the second. Students who voluntarily participated in the focus group interviews were also actively involved in face-to-face classes. The interviews were conducted on June 5, 2023, in a suitable face to face environment and time for the students. After the interviews, the audio recordings were first transcribed into text, and the qualitative data obtained were analyzed using the thematic analysis method. In the analysis of the interviews, pseudonyms were given to students for direct quotations in the findings section.

Research Diaries

The first two researchers kept diaries reflecting their feelings, thoughts, and observations about the activity conducted each week. Researcher diaries were used to describe and interpret the findings revealed from the analysis of qualitative data collected from students and quantitative data obtained from the environment records.

Blogger Records

Interactive videos based on the connectivist learning approach were presented to students in the peer bullying activity conducted on the Blogger platform. Sample materials related to the Ministry of National Education (MEB) Peer Bullying Awareness Program were shared, and students commented on these posts, creating slogans for each week's topic. All content and interactions in the Blogger environment were recorded. The records in the Blogger

environment were keeped by the researchers by taking screenshots, in line with the approval of the students, and the students' status of participation in each activity was recorded and presented as a table in the findings section.

Data Analysis

The data were analyzed using the thematic analysis method, which involves the process of analyzing data based on similar, relational, and distinct aspects within a dataset (Gibson & Brown, 2009). In this context, the stages presented by Braun and Clarke (2021) for thematic analysis were followed in analyzing the data obtained from focus group interviews with students in this study, and these stages are summarized in Table 1:

Table 1. *The Data Analysis Process Followed in Focus Group Interviews*

Data Analysis Steps	*Procedure*
(1) Familiarisation	In the first phase, data obtained through interviews were transformed into text and independently read multiple times by researchers. During this stage, a inductive approach was preferred, focusing on the meaning of each word, and an approach from the specific to the general was adopted.
(2) Doing Coding	In the second stage, similarities, differences, and interconnected points within the data were examined, leading to the creation of draft categories from recurring information.
(3) Generating Initial Themes	In the third stage, initial categories were formed by connecting codes derived from small units of meaning to create a more comprehensive semantic coherence.
(4) Developing and Reviewing Themes	In the fourth stage, the categories created in the previous phase were reviewed once again and further developed within the framework of research questions.
(5) Refining, Defining and Naming Themes	In the fifth stage, themes were finalized and named through continuous examination of the codes and interconnected categories derived from the dataset.
(6) Writing Matters for Analysis (Reporting)	In the sixth stage, the findings obtained within the thematic framework were presented. Direct quotations from participants' expressions were included, and the results were further contextualized and interpreted by relating them to findings from other studies in the literature and specific theoretical contexts.

Based on this, a total of 26 codes, 6 categories, and 3 main themes were identified as a result of thematic analysis. The emerging sub and main categories are presented in Figure 1:

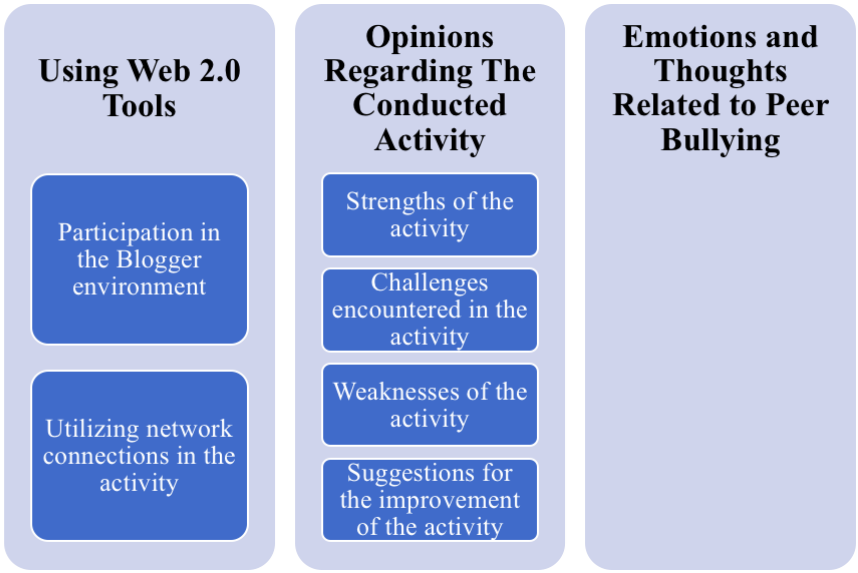

Figure 1. *Categories and Main Themes Derived from Data Analysis*

Validity & Reliability

The following measures were taken regarding validity and reliability in qualitative research:

- Both the activity and data collection tools were based on expert opinions.
- Prolonged engagement was formed between researchers and participants in Blogger and face to face courses.
- Data triangulation was ensured by using multiple data collection tools.
- The method and design of the research, as well as the demographic characteristics of the participants in the study group, were explained to ensure the repetition of similar procedures by different researchers and to reach consistent results (Miles & Huberman, 1994). The step-by-step process of data analysis was also elaborated.
- Direct quotations from participants have been included in the findings section.
- A two-stage process was followed for inter-coder reliability throughout the thematic analysis. In the first stage, the first two researchers independently analyzed the entire dataset and worked collaboratively until reaching a consensus on the findings they obtained. In the second stage, the findings presented by the first two researchers, as well as the entire dataset, were examined by the third and fourth researchers. All four researchers reached a consensus on any discrepancies in their interpretations.

Ethical Concerns

Adherence to scientific ethics has been maintained, and approval (number 517100) has been obtained from the ethics committee of Anadolu University. Additionally, participants were provided with a voluntary participation form, parental consent form, voluntary participation form for Blogger environment records, and a voluntary participation form for student interviews, all of which were signed. The names of participating students have been kept confidential throughout the study, and pseudonyms have been assigned to each.

FINDINGS

The research findings have been examined and interpreted under two separate headings based on the two fundamental questions of the study.

Students' Participation in the Connectivist Peer Bullying Activity

Findings related to the first research question were obtained from Blogger records, researchers' diaries, and focus group interviews. Students' participation status, both in face-to-face guidance classes and their contributions in the Blogger environment, is presented in Table 2:

Table 2. *Students' participation status in the activity*

	First Week Activities			Second Week Activities				Third Week Activities			
	Face to face	Blogger		Face to face	Blogger			Face to face	Blogger		
	Guidance class	H5P video comment	Creating a slogan	Guidance class	Video comments	Commenting on story cards	Creating a slogan	Guidance class	Video comments	Commenting on Scenarios	Creating a slogan
S1	√	√	√	√		√	√	√	√	√	√
S2	√	√	√	√	√			√		√	
S3	√	√	√	√	√		√	√	√		
S4	√	√	√	√	√			√			
S5	√	√	√	√	√			√			√
S6	√		√	√	√		√	√	√	√	√
S7	√		√	√				√			
S8	√		√	√	√	√	√	√		√	√
S9	√			√	√			√			
S10	√			√	√	√		√			√
S11	√			√			√	√			
S12	√			√				√			√
S13	√			√				√			

As seen in Table 2, since students made contributions in the Blogger environment using self-created pseudonyms, and the researchers did not know which pseudonym belonged to which student, student names were provided using code names (e.g., S1, S2). A total of 13 students voluntarily participated in the activity. In the weekly Guidance class, face-to-face interactions were allowed, and in the Blogger environment, activities were organized for four weeks. However, due to the High School Entrance Exam (LGS), the activity for the fourth week could not be completed. Within the first three weeks, a total of three face-to-face Guidance classes and eight Blogger activities took place. Although all students (n=13) participated in the face-to-face Guidance class, participation in the Blogger environment was not uniform. Some students actively participated in most of the Blogger activities (S1, S3, S6, S8), while others participated in less than half of the activities (S2, S4, S5, S10). Furthermore, only four students participated in just one of the Blogger activities (S7, S9, S11, S12), and S13 did not participate in any Blogger activities. Particularly in the first two weeks, student participation was higher, but it decreased towards the end of the activity. The slogan creation task was the activity with the highest student participation. The reflective diary of the first researcher includes the following statements regarding this:

> "Today, we posted the task of creating slogans for children on Blogger. To set an example, I created the first slogan: 'Don't give nicknames, don't bully.' The participation of children is great; a total of 7 students, including myself and Bünyamin teacher, participated" (Researcher 1 Reflective Diary No. 1, 16/05/2023, lines 1-4).

In addition, regarding the students' participation status, under the main theme of using Web 2.0 tools determined as a result of data analysis, two categories were reached: (1) Participation in the Blogger environment, and (2) Utilizing network connections in the activity. The codes within each category are presented in Table 3:

Table 3. *Codes within the main theme of using Web 2.0 tools*

Main Theme	Category	Codes
Use of Web 2.0 tools	Participation in the blogger environment	- Participating in all activities - Participating in some of the activities - Not participating in any of the activities
	Utilizing network connections in the activity	- Utilizing different sources for activity participation - Solely relying on individual views and efforts for participation (not utilizing different Web 2.0 tools)

As seen in Table 3, for the dimension of a connectivist learning activity conducted in the Blogger environment for 8th-grade students on the subject of peer bullying, the category of participation in the Blogger environment and a total of 3 related codes were identified. While most participants took part in all the activities on Blogger, some participated in only a portion, and very few students stated that they did not participate in any activity. This finding aligns with the data obtained from Blogger environment records.

The category of utilizing network connections in the activity is related to the research focus, which is the connectivist learning approach. It implies students benefit from web resources for the activity. Some participant expressions regarding the code of utilizing different sources for activity participation are as follows:

"I commented and utilized the internet" (Orhan, Focus Group Interview [FGI] 1).
"I sought a bit of help from the internet in challenging activities" (Ceren, FGI 1).
"I looked into the definition of peer bullying" (Merve, FGI 2)

On the other hand, exclusive reliance on individual perspectives and efforts in activity participation, specifically refraining from utilizing other network connections, particularly web resources, is evident in the statements of certain participants:

""I always used my dedication while commenting" (Muhammet, FGI 1).
"No, everything happened spontaneously" (Mehmet, FGI 2).

Students' Views on the Connectivist Peer Bullying Activity

The second question of the research was answered through two main categories derived from data analysis: (1) opinions regarding the conducted activity and (2) emotions and thoughts related to peer bullying. Under the main theme of opinions regarding the conducted activity, a total of 4 categories were identified: (1) strengths of the activity, (2) challenges encountered in the activity, (3) weaknesses of the activity, and (4) suggestions for the improvement of the activity. The codes within each category are presented in Table 4:

Table 4. *Codes and Categories Present in Students' Views on the Connectivist Peer Bullying Activity*

Main Theme	Category	Codes
Views regarding the activity	Strengths of the activity	- Finding role-playing activities effective in face-to-face classes - Enjoying the activity - Liking the interactive videos on Blogger - Enjoying creating slogans - Finding the activities conducted beneficial
	Challenges encountered during the activity	- Difficulty in finding answers to some questions in interactive videos - Facing challenges in creating slogans - The impact of the LGS factor reducing participation in the activity - Inability to effectively use the Blogger platform
	Weaknesses of the activity	- Finding the activity durations too long - Finding the activity durations too short - Disliking the Blogger environment
	Suggestions for the Improvement of the activity	- Preferring a mobile application instead of the Blogger environment - Suggesting more participants - Recommending the activity to be conducted only in face-to-face settings
Feelings and thoughts regarding peer bullying		- Feeling hatred towards the bully - Feeling empathy towards the victim - Gaining awareness about peer bullying - Lack of contribution to learning due to prior knowledge of the concept - Continuing with bullying behavior - Disapproving of bullying behavior

As can be seen in Table 4, students' opinions about the activity are grouped under the categories of (1) strengths of the activity, (2) challenges encountered in the activity, (3) weaknesses of the activity, and (4) suggestions for the improvement of the activity. Regarding the strengths of the activity, students found the role-playing activity in the face-to-face class impactful, enjoyed the activity, liked the interactive videos on Blogger, enjoyed creating slogans, and found the conducted activities beneficial. Participant expressions regarding these opinions are as follows:

"Thanks to those scenarios, it will be more memorable and impactful now" (Muhammet, FGI 1).
"It would have been better if the education on Blogger was animated" (Muhammet, FGI 1).
"Sometimes, there were moments when I struggled a lot while thinking of slogans, but I am happy because I found the best slogan" (Tardu, FGI 1).

The challenges encountered in the activity include not being able to find answers to some questions in the interactive videos, facing difficulties in creating slogans, the LGS factor reducing participation in the activity, and not being able to use Blogger effectively. Examples of student expressions are as follows:

"I struggled a lot on Blogger; there was one question, and it was challenging. I looked on the internet, but still couldn't find it; it was very difficult" (Orhan, FGI 1).
"Writing slogans was challenging" (Merve, FGI 2).
"It was bad because it was close to the LGS (exam), I couldn't look at it" (Seda, FGI 2).
"I still don't know how to use Blogger; I just did it by looking at the internet" (Tardu, FGI 1).

It can be seen in the reflective diary written by the first researcher that students were unable to find answers to some questions in the interactive videos, but it is also noted that they did not show the expected level of effort to find them:

> “In the interactive video added for the activity 'I Stand Against Peer Bullying' in the third week, we included a question for children to answer about the three roles in peer bullying at the beginning of the video. The video cannot progress until the question is answered correctly. Bünyamin, the teacher, thought that children might not remember these roles, and in such a case, they might not continue but leave it incomplete. However, like this study, the essence is for students to search for information, to access information sources. I thought that even if they forget, they can find the answer by looking at past shares or information on the internet. If they forget, the child can pause the video and research; after all, the goal is for them to access the forgotten information" (Researcher 1 Reflective Diary No. 4, 24/05/2023, lines 4-12).

The implementation of the activity close to the LGS (High School Entrance Exam) has significantly influenced the students' participation. About this, the sentences written in the reflective diary of the second researcher are as follows:

> “The third activity started very shortly before the exam. Therefore, I do not expect much participation in the third activity. Some students did not participate in any activity anyway. I believe the reason for this is the pressure from their families and the pressure of exams. ... And considering it as a burden reduced their participation in this activity" (Researcher 2 Reflective Diary No. 5, 28/05/2023, lines 1-5).

Especially in the slogan creating activity, it was identified that a student did not generate his own slogan but directly copied it from the internet. The same student was observed to have copied the slogan of a previous friend in the slogan creation activity of the third week as well. Regarding this, the reflective diary of the first researcher includes the following sentences:

> “One of the students has the same slogan as someone on the internet. This time, S3 wrote the same slogan as a friend who shared it about 10 minutes before. I thought, 'Could they have not read the comments above?' but there is no identical slogan on the internet. Writing the exact same slogan is too much of a coincidence. I realized that the students' determination and desire are important factors for a connectivist learning activity” (Researcher 1 Reflective Diary No. 5, 29/05/2023, lines 6-11).

On the other hand, finding the activity durations too long, finding the activity durations too short, and disliking the Blogger environment constitute the weaknesses of the activity. Participant expressions regarding this are as follows:

> "The duration, in my opinion, was even too much; one day would have been enough for that small thing" (Muhammet, FGI 1).
>
> "I think the time was insufficient; if one of us died, how would we manage that situation, if a close person died..." (Orhan, FGI 1).
>
> "I'm not very pleased because sometimes it creates problems about the environment where blogs are created, but there was no problem with commenting" (Muhammet, FGI 1).
>
> "Instead of Blogger, I think a live environment could have been better" (Mehmet, FGI 2).

Lastly, suggestions for the improvement of the activity include preferring a mobile application instead of the Blogger website environment, suggesting more participants, and proposing that the activity should be conducted only face-to-face. Some expressions regarding this are as follows:

> "Wouldn't it be better if it was from Blogger's application instead of the browser?" (Orhan, FGI 1).
>
> "It would be better if we conducted the activities entirely face-to-face" (Selda, FGI 1).
>
> "Through increasing the number of participants..." (Ceren, FGI 1).

At the end of the activity, participants' emotions and thoughts related to peer bullying were grouped under a single theme. This included feeling hatred towards the bully, experiencing empathy towards the victim, disapproving of bullying behavior, gaining awareness about peer bullying, not contributing to learning from the activity for those who were already familiar with the concept, and even some students expressing 'I am still a bully.' Some expressions from the participants regarding this are as follows:

> "I honestly felt hatred towards the bully" (Mehmet, FGI 2).
>
> "I was extremely saddened; I thought about those who experience these things" (Selda, FGI 1).
>
> "It was useful, and now I know what bullying is, and if someone becomes a bully, I'll report it immediately" (Orhan, FGI 1).
>
> "Actually, it was good, and I think it provided us with very valuable information about the activities. I'm very happy because I learned more about bullying" (Tardu, FGI 1).
>
> "I didn't learn much; I already knew a lot about bullying, so it was useless for me" (Ceren, FGI 1).
>
> "I am still a bully" (Belma, FGI 1).

In the reflective diary of the second researcher after the face-to-face Guidance class where the role-playing activity took place, the following expressions about the students' emotions and gains are included:

> "In the third week of the guidance class, we enacted a scenario and recorded it as a video. The most valuable thing they probably learned here was developing an intervention against bullying. Personally, while filming this video and students were playing their roles, I observed very closely, especially our student in the role of the one being bullied genuinely feeling the impact of bullying. I can say that some of the audience, other students, genuinely felt those emotions related to bullying. Yes, some were still in the spirit of fun, but at least, I believe we managed to send a message to their subconscious. We also filmed a second video outside the activity. Here again, it was for students to understand those emotions. Of course, it was a video in a playful tone, but, as I mentioned, at least I think we managed to embed something like that in their subconscious" (Second Researcher Reflective Diary No. 6, 29/05/2023, lines 1-11)"

DISCUSSION and CONCLUSION

This holistic single case study investigated a peer bullying activity utilizing a connectivist learning approach for 8th-grade middle school students. Thirteen 8th-grade students attending a private educational institution that supports school programs voluntarily participated. The study, which included the implementation of the first 4 sessions of the 5-session Peer Bullying Awareness Program by the Ministry of National Education through blended learning, was based on the data collected from focus group interviews, reflective diaries, and Blogger records. The findings indicate moderate participation in Blogger activities, with a decline in engagement due to the high school entrance exam that was approaching. Students faced challenges, yet overall, opinions about the activity were positive.

Specifically, findings related to the first research question indicate that some students participated in all activities of the project, while others attended only a few. However, a few students did not actively engage in the Blogger activity. Similarly, in a study conducted by Öztürk (2019), a connectivist mobile learning process was used to improve high school students' English-speaking skills. The findings revealed that students did not participate adequately in the activities due to reasons such as lack of time, technical issues, laziness, and lack of interest in the activities. Additionally, in this study, while some students utilized network connections for the activity, others contributed solely based on their existing knowledge and opinions. Some of the expected student tasks in the connectivist learning approach include connecting to different networks and demonstrating the skills to search, identify, and select the information needed to solve a problem. Siemens (2005) highlighted that learning occurs by navigating networks and benefiting from others' experiences. In this age of technology, where knowledge is constantly evolving, these skills are considered essential. From this perspective, it can be suggested that the participants of this study partially experienced the connectivist learning process. Expecting middle school students to exhibit roles and responsibilities in connectivist learning, which they are experiencing for the first time, might be unrealistic. Roles and responsibilities related to connectivist learning activities may be better fulfilled by students at the high school or higher education levels. For instance, a study conducted by Babayiğit et al., (2018) showed that university students experienced the connectivist learning process effectively.

The findings also indicate that participants had concerns about not being able to find answers to some questions in interactive videos and facing difficulties, especially in creativity, when generating slogans. Although most students completed the fundamental tasks expected of them during the activity, some of them lacked sufficient motivation to seek and find more information. However, in a connectivist learning activity, students are expected to be independent learners, take responsibility for their learning, and be motivated to explore and access information (Siemens, 2005). In this process, it is important for students to critically think about the validity, accuracy, and currency of the information they acquire while navigating

networks. Despite the expectation that 8th-grade students should have acquired skills such as taking learning responsibility since the early years of middle school education, conducting web research, choosing information critically, and creative thinking, the reality might be different. Especially considering that critical and creative thinking skills are essential higher-order thinking skills expected of learners in the age of networks, this situation is thought-provoking. Ersoy and Başer (2011) noted in their studies that students at the primary education level tend to have lower tendencies for critical thinking, indicating that students may not acquire higher-order thinking skills. This calls for a critical examination of the education program in terms of instilling the characteristics required for connectivist learning and higher-order thinking skills at each education level. In addition to these considerations, the High School Entrance Exam (LGS) in the Turkish education system affects all aspects of eighth-grade students' school and extracurricular experiences. Some participants in this study mentioned LGS as a reason for not having the desired level of participation in the activity.

The findings also indicate that students found the face-to-face role-playing activity effective, enjoyed the overall implementation of the activity, liked the interactive videos developed and presented with H5P on Blogger, enjoyed the weekly task of creating slogans, and generally found the activities beneficial. The blended learning process, incorporating both face-to-face and e-learning environments and opportunities, contributed to students experiencing more effective learning. The use of blended learning that extends beyond face-to-face settings to include e-learning environments, especially in studies based on connectivism, has been shown to enhance teaching and learning performance (Al Maawali, 2022; Zedan, 2021).

It should be noted that this study utilized a learning environment outside the traditional face-to-face classroom, specifically a blogger platform. Participants expressed difficulties in effectively using the environment, as they were not familiar with Blogger. In a study conducted by Sarsar et al., (2015), aiming to determine the views of doctoral students regarding the use of social media in the teaching-learning process, Facebook was positively evaluated by all learners, while Blogger was deemed positive only by half of the learners. The current preference for social networking sites like TikTok, YouTube, Instagram, and Facebook over blogs, along with the popularity of Web 2.0 tools with mobile applications instead of web browsers, may explain these findings. One participant suggested using a mobile application instead of a website at the end of the activity.

Furthermore, students reported developing a sense of hatred towards the bully and empathy towards the victim role. In other words, the results show that students gained awareness about peer bullying and recognized it as inappropriate behavior. In a study by Akay (2019), various activities were developed to prevent peer bullying in primary school students, and the results indicated positive changes in emotions such as empathy and emotional awareness among students. In another study by Kartal and Bilgin (2007) where a 5-session peer bullying education was implemented with fifth-grade students, including activities such as slogan writing, story reading, and role-playing scenarios, positive changes were noted in students' views. Similarly, Özbek and Taneri (2022) demonstrated that a peer bullying intervention program based on bibliotherapy and creative drama created awareness about peer bullying and contributed to finding solutions to combat bullying among primary school students. Regarding the participants in this study, it can be suggested that the activity was beneficial for all but two students. One of these two students mentioned that the activity did not provide additional contributions because they had already learned about peer bullying in school. The recommendation for implementing similar activities in schools, especially those supporting the PBAP, aligns with the perspective of this student. However, the finding that this study was effective in gaining awareness about peer bullying for the majority of participants indicates that PBAP-related activities were potentially not included in school programs of these students, which raises concerns and questions.

One interesting finding of this study is that a student expressed being “still a bully" at the end of the activity. While this discovery is consistent with information suggesting that not every educational program can offer the same benefit to every student, it may also indicate a normalization of aggressive behaviors among adolescents. This normalization might be related to the prevalence of peer bullying resulting from peer pressure and the desire to follow group norms, specifically in schools (e.g., Ellwood & Davies, 2010; Thornberg, 2013; Wójcik, 2018). This also aligns with a recent research finding indicating that students in a bullying case developed shared beliefs about class dynamics and labeled behaviors, normalizing and conceptualizing bullying as a way to punish those who threatened class reputations (Wójcik & Mondry, 2020). To address this, Wójcik and Mondry (2020) recommended implementing targeted, non-punitive anti-bullying programs involving peers to reshape behavior and eliminate labels. Given this potential normalization of peer bullying, which can also be related to the prevalence of aggression in real and virtual environments, policymakers should consider proactive measures to create safer environments for children's development.

This study, which focused on peer bullying within the context of an activity with the participation of eighth-grade students in a private education institution, concluded that the activity enhanced peer bullying awareness, and empathy skills, and provided students with the opportunity to experience blended learning. However, within the specific context of the participating students in this study, it was observed that students demonstrated weaknesses in the skills essential for connectivist learning, such as conducting research on the web, selecting valid and reliable information, organizing, creatively rephrasing, and sharing information on the network. The findings of this study, which exemplifies how a connectivist learning activity for middle school students on the topic of peer bullying can be implemented, are expected to contribute as an exemplary activity for teachers, implementers of the PBAP, and researchers working on peer bullying who aim to increase awareness at the middle school level. Additionally, it is anticipated that this study will contribute to the relevant literature on examples of implementing connectivist learning approaches and provide insights into the application of a connectivist learning activity within a blended learning process for practitioners and researchers.

Limitations & Recommandations

There are also some limitations to this study, the first of which involves the use of a specific platform, Blogger, for the connectivist learning activity. Given that some students expressed difficulty effectively using the environment and were not familiar with Blogger, future research could explore connectivist learning activities on social media platforms other than Blogger. Another limitation of this study was the timing, which hindered a thorough application of the CPBA due to the approaching High School Transition Exam (LGS). Future research could benefit from better planning for the implementation process.

Statement of Researchers

Researchers contribution rate statement:

All researchers contributed equally to the study.

Conflict statement:

First Author declares that he/she has no conflict of interest.
Second Author declares that he/she has no conflict of interest.
Third Author declares that he/she has no conflict of interest.
Fourth Author declares that he/she has no conflict of interest.

Informed Consent

“All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.”

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Digital Security & Media

Research Article

Digital Security & Media, *1*(1), 18-29

The complex adaptive blended learning system: A systematic review

Received: 16/10/2023
Revised: 12/11/2023
Accepted: 17/11/2023

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Abstract

The complex adaptive blended learning system (CABLS) is an open system that optimizes the learning process by interacting in a non-linear and dynamic manner. This system consists of six subsystems: learner, teacher, technology, content, learning support, and institution. The purpose of this study was to systematically review studies conducted within the framework of the complex adaptive blended learning system between the years 2015 and 2023. Thus, selected studies regarding explicit inclusion and exclusion criteria, were analysed in terms of the year, type, subject areas, level of education, research methods, countries, and trends. The systematic review results identified 10 pieces of research studies that defined and described on CABLS. The studies were published mainly in 2022. Eight studies focused on education, two on health sciences, covering K-12 and higher education. Qualitative methods were prevalent, and research was global, with contributions from India, Indonesia, Malaysia, Pakistan, the UK, and the US, with the US leading in the number of studies. The results of this study may serve as a guide for future studies.

Keywords: Blended learning, Complex adaptive systems, Complex adaptive blended learning system, Systematic review, System-based perspective, System-based frameworks.

Cite: Kömür, A.; Şahin, Y. L. & Okur, M.R. The complex adaptive blended learning system: A systematic review. *Digital Security & Media, 1*(1), 18-29.

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INTRODUCTION AND BACKGROUND

Blended learning, which combines the traditional face-to-face classroom setting with online learning (BL), has gained significant attention in recent years, especially during the pandemic. BL provides unique opportunities for students to engage in real-world problem-solving, collaborate with others, develop creativity, communicate globally with technology, and become effective workers in the 21st century (Cummings, 2022). Although the benefits of BL are widely recognized, the process of implementing a blended learning course can present challenges (Evenhouse et al., 2017). Educators may face obstacles related to technology integration, curriculum design, and instructional strategies. In other words, with the advancement of technology, modern learning systems have become more complex and dynamic (Yeop et al., 2016).

Developing a conceptual framework for blended learning research will help to inform educational practitioner implementation of blended learning (Gulosino & Miron, 2017). Within this context, the Complex Adaptive Blended Learning System (CABLS) framework offers a comprehensive perspective on the intricate nature of blended learning.

This systematic review aims to address further contribute to the existing literature and serve as a foundation for future research in the complex adaptive blended learning system. Additionally, the distribution of the reviewed studies by various factors such as year, type, subject areas, level of education, research methods, and country can provide a holistic understanding of the field and highlight any patterns or trends that emerge. This study will further contribute to the existing blended learning literature and serve as a foundation for future research in the CABLS.

The Complex Adaptive Blended Learning System

The CABLS framework, which stands for Complex Adaptive Blended Learning Systems, provides a systems-based approach to understanding the non-linear relationships in blended learning environments (McGee & Poojary, 2020; Wang et al., 2015). Complex adaptive blended learning system is based on the principles of complex adaptive systems (CAS) theory. These systems are characterized by their complexity, self-organization, adaptability, dynamism, and coevolution. The CAS framework helps us understand the complexity of blended learning and how it can be effectively managed. It also reveals how blended learning can create new and innovative learning opportunities for students. CAS are described as living, open systems that exchange matter, energy, or information across boundaries to maintain their structure. The CAS framework helps us understand the complexity of blended learning and how it can be effectively managed. It also reveals how blended learning can create new and innovative learning opportunities for students. CAS are described as living, open systems that “exchange matter, energy, or information across boundaries to maintain their structure (Cleveland-Innes & Wilton, 2018). CAS as a lens through which blended learning may be more accurately viewed (Keiner, 2017). CAS are a powerful framework for exploring thresholds, resilience, and other related phenomena. CAS are systems of agents that interact with each other and their environment. Even simple agents with simple rules of behavior can produce complex, emergent behavior (Carmichael & Hadžikadić, 2019).

The CABLS framework is a holistic and systematic view of blended learning.It offers a comprehensive view of these six subsystems (teacher, learner, institution, learning support, technology, and content) that interact with each other in a blended learning environment (Figure 1). Rather than operating independently, these subsystems function as dynamic units. The CABLS framework assists stakeholders in gaining a better understanding of the various components of blended learning, resulting in increased effectiveness in the process.

Furthermore, this framework can guide blended learning research and promote the adoption of cohesive blended learning environments in educational institutions (Wang et al., 2015).

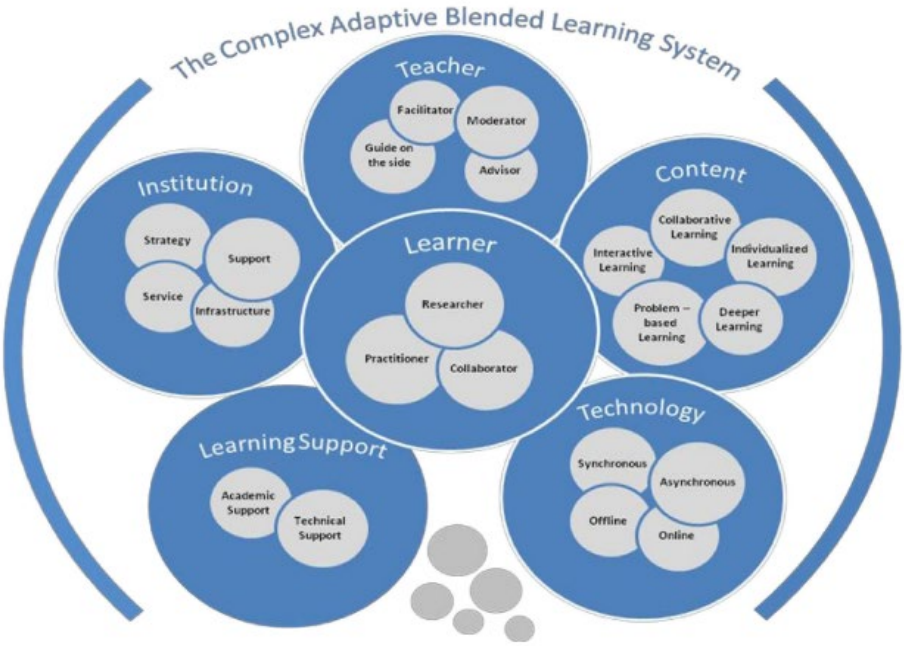


Figure 1. *The Complex Adaptive Blended Learning System (Wang et al., 2015)*

The learner's experience evolves from passive to active learning through interaction with various systems. In the context of blended learning, the role of the teacher shifts from being a lecturer to that of a facilitator. Blended learning offers dynamic and engaging content that continuously engages the learner, the teacher, and technology. Research has demonstrated that technological advancements inject fresh vitality into blended learning, catering to the requirements of both educators and students. Support structures for learning develop to meet the learner's needs, encompassing both academic and technological assistance. This extends beyond the individual course level to encompass the institution as a whole, highlighting the necessity for comprehensive support, which may include the development of strategies, plans, and policies (Wang et al., 2015).

In short, Blended learning in the CABLS framework involves the co-evolution of the learner, teacher, content, technology, learning support, and institution. Learners become active participants, teachers acquire new identities, content becomes rich and engaging, technology undergoes dynamic changes, learning support is foregrounded, and institutions provide support at an institutional level. The interdependency and dynamic interaction between these subsystems distinguish the CABLS framework from existing blended learning models.Therefore, CABLS framework is useful for understanding the complexity of blended learning and the interactions among the different elements of the system. It can be used by educators to design and implement effective blended learning programs (Kelly & Denson, 2017).

METHOD

Research Design

This paper utilized a systematic review methodology to provide a comprehensive overview of research on complex adaptive blended learning systems. A systematic review is a rigorous

and transparent method of reviewing existing research to address specific questions (Gough, Oliver & Thomas, 2017). It can also summarize the current evidence in a field and enhance the accuracy of conclusions by determining the consistency and generalizability of findings across studies (Juhl & Lund, 2018). Based on the objective of this study, the following questions were formulated:

1. What is the overall bibliometric landscape in the context being studied?
   a. What is the distribution of the reviewed studies by year?
   b. What is the distribution of the reviewed studies by type?
   c. What is the distribution of the reviewed studies by subject areas?
   d. What is the distribution of the reviewed studies by level of education?
   e. What is the distribution of the research methods applied in the reviewed studies?
   f. What is the distribution of the reviewed studies by country?
2. What are the trends related to the Complex Adaptive Blended Learning System (CABLS) in the context being studied?

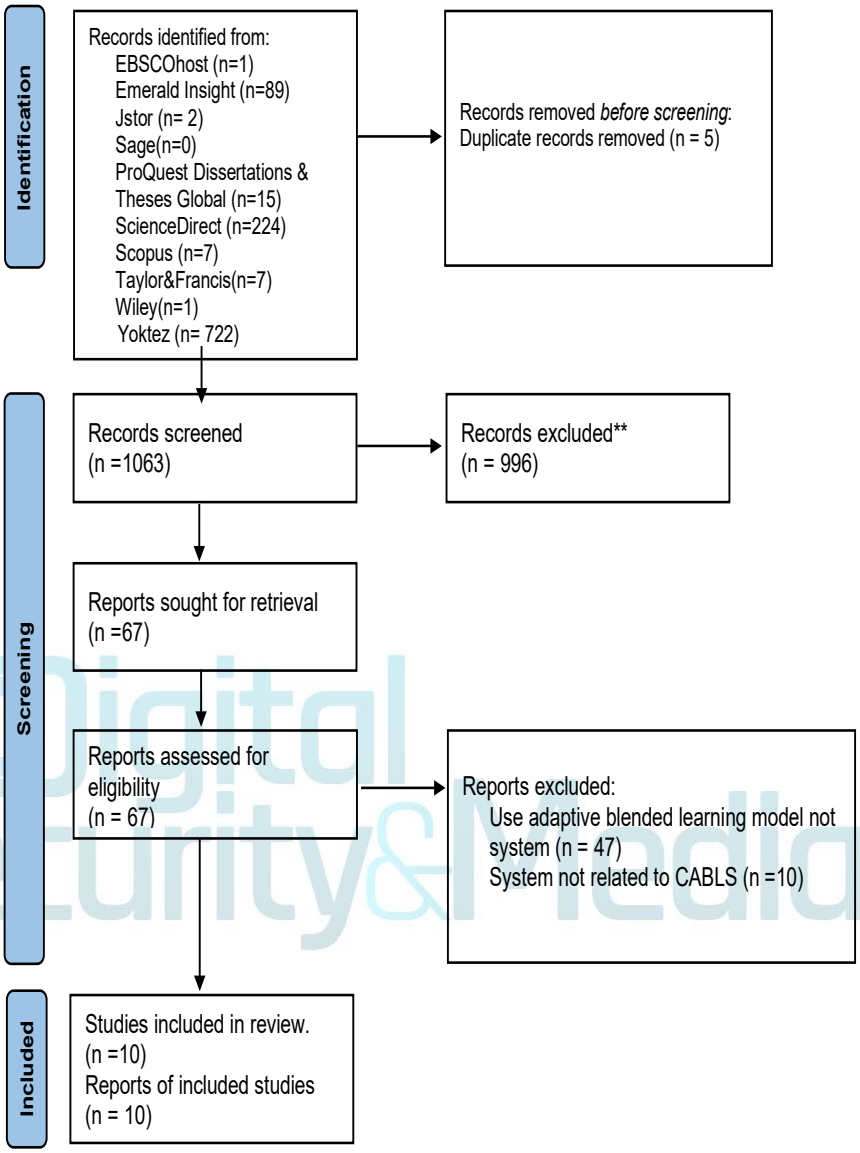
Sampling and Data Collection Techniques

The authors used a search string (see Table 1) and inclusion criteria to select the articles for their review. The research considered the period between 2015 and June 2023, starting from when CABLS was first introduced by Wang et al. They conducted searches in ten electronic scientific databases, namely EBSCOhost, Emerald Insight, JSTOR, ProQuest, Sage, Sciencedirect, Scopus, Taylor & Francis, Wiley Online Library, and YOKTEZ, through the Anadolu University Library. Only relevant studies in English and Turkish that pertained to CABLS were included in the review (Table 1). Consequently, the research's inclusion criteria are articles published between 2015 and 2023, peer-reviewed, written in English and Turkish, and accessible in full-text online.

Table 1. *Search Strategies for Databases*

Database	Search strategy
EBSCOhost	"blended learning" OR " Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS"
Emerald Insight	"blended learning" OR " Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS"
JSTOR	"Blended learning" OR "Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS"
ProQuest Dissertations and theses	"Complex Adaptive Blended Learning System" OR "CABLS"
SAGE	All "blended learning" AND "("blended learning" OR " Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS"
Sciencedirect	Title, abstract, keywords: ("blended learning" OR "Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS" OR "CABL")
Scopus	Başlık-özet- anahtar kelimeler "blended learning" AND "Complex Adaptive Blended Learning System" OR "Blended Learning System Frameworks" OR "CABLS"
Taylor&Francis	"Blended learning" AND "Complex Adaptive Blended Learning System" OR "Blended Learning System Frameworks" OR "CABLS"
Wiley Online Library	"Complex Adaptive Blended Learning System" OR "Blended Learning System Frameworks" OR "CABLS"
YOKTEZ dissertations and theses	"Blended learning" OR "Blended Learning System Frameworks" OR "Complex Adaptive Blended Learning System" OR "CABLS" OR "CABL"

After removing duplicate articles, 1063 articles were reviewed. Of these, 996 were excluded because they were not directly related to CABLS or were not primary research. The researchers then reviewed the full text of the remaining 67 articles and excluded 57 more that were not primary research or not related to the study topic. This left them with 10 studies that met their inclusion criteria and were therefore used in this analysis (see Figure 2).



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372: n71. doi 10.1136/bmj. n71

Figure 2. *Flow of the Systematic Review Process*

Data Analysis

The researchers coded and analyzed all articles in this study independently using content analysis, a method of textual analysis that enables data comparison, contrasting, and categorization (Fraenkel & Wallen, 2000). To analyze the data, the authors initially identified descriptive themes in the data and subsequently used content analysis to find out the trends related to the CABLS. Additionally, a Microsoft Excel form was created to record the analysis results.

Validity & Reliability

Several steps were taken to enhance the validity and reliability of the systematic review search, Firstly, the included studies were coded into pre-set categories. In the second phase, another

researcher independently recoded the same articles. The researchers only proceeded to the next phase when they reached a consensus. To ensure accurate recording of the analysis results, a Microsoft Excel form was used. The categories in the form were aligned with the research question codes of the reviewed studies. Finally, all researchers involved in the study article coding process contributed to enhancing the overall validity and reliability of the systematic review search.

Ethical Concerns

Since there are no participants in this review, no informed consent was needed for this study.

FINDINGS

Descriptive Findings

The distribution of studies referring to CABLS by years is shown in Figure 3. Notably, the year 2022 stands out with the highest number of published articles. This surge in publications can be attributed to the significant impact of the Covid-19 pandemic.

Figure 3. *Distribution of the Reviewed Studies by Year*

The distribution of the reviewed studies by type shows that there are 5 doctoral dissertations and 5 articles specifically focused on the complex adaptive blended learning system shown in Figure 4. This balanced representation of research types in the literature review indicates the importance and relevance of this learning approach in the educational context. It highlights the need for further exploration and investigation to better understand the potential benefits and challenges associated with the complex adaptive blended learning system.

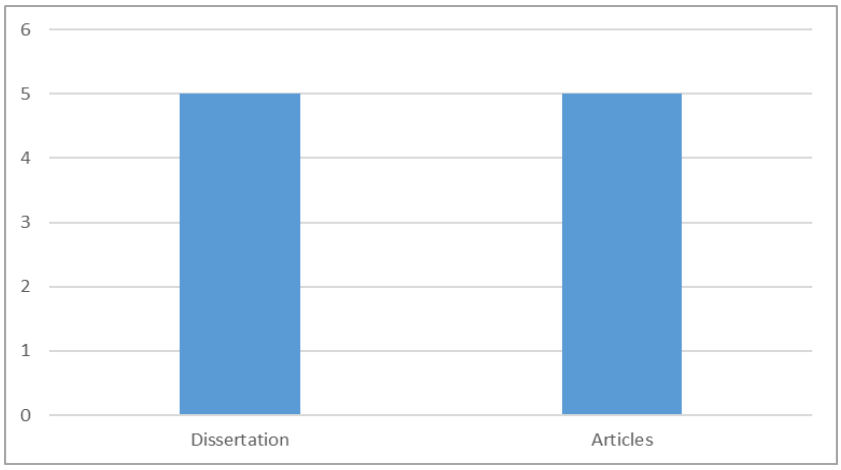


Figure 4. *Distribution of the Reviewed Studies by Type*

Two studies have been conducted on the complex adaptive blended learning system in the health sciences, while eight studies have focused on education. This indicates that the majority of research on this topic has been carried out in the field of education (Figure 5). Additionally, it is important to note that the existing research in the field of education suggests a strong emphasis on exploring the applications and effectiveness of the complex adaptive blended learning system. This indicates a growing interest in utilizing this approach in educational settings. Further research in the health sciences can provide valuable insights into the potential benefits and challenges of implementing this system in healthcare education and training.

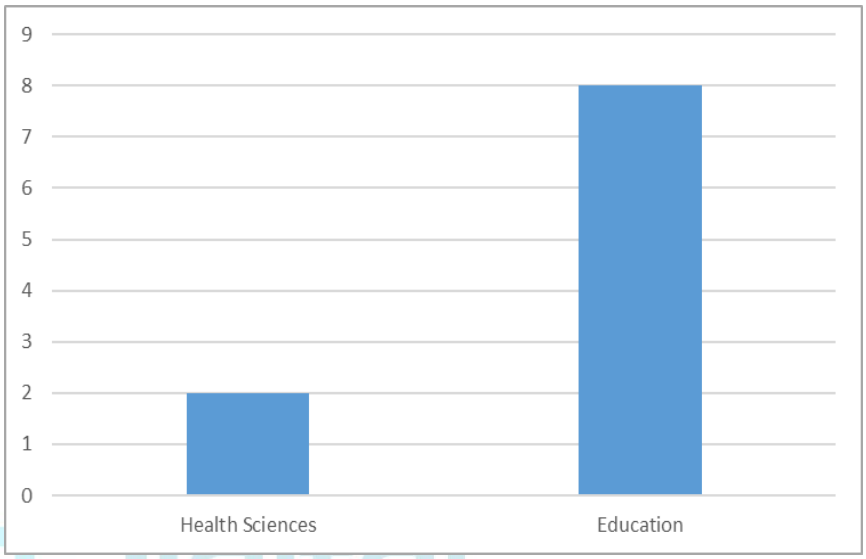


Figure 5. *Distribution of the Reviewed Studies by Subject Areas*

Based on the data from the CABLS, it can be observed that there are 4 studies focused on K-12 education and 6 studies focused on higher education. The distribution of these studies is relatively even, although there is a slightly higher number of studies conducted at the higher education level (Figure 6).

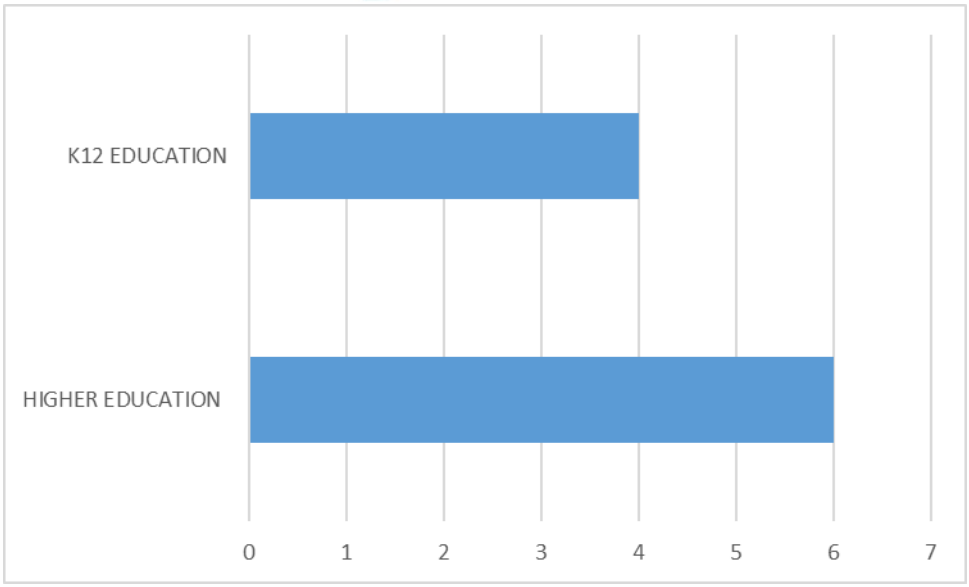


Figure 6. *Distribution of the Reviewed Studies by Level of Education*

Qualitative research is the primary research method used in the field of complex adaptive blended learning systems. This is because CABLS are complex in nature, making them challenging to study using quantitative methods. Qualitative research methods, such as

interviews, case studies, and focus groups, allow for a deeper understanding of the intricate interactions and dynamics that occur within CABLS (Figure 7).

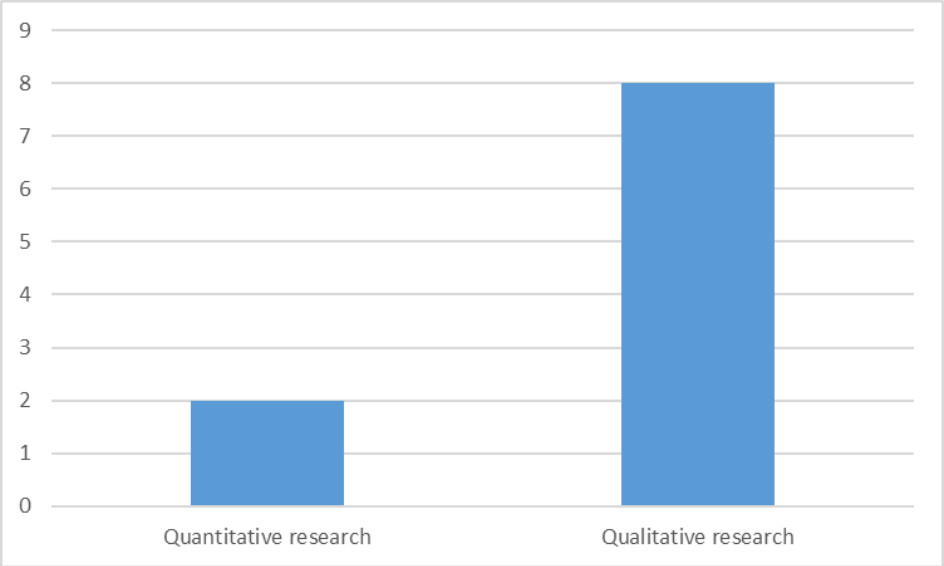


Figure 7. *Distribution of the Research Methods Applied in the Reviewed Studies*

The distribution of the reviewed studies among six countries is as follows: India, Indonesia, Malaysia, Pakistan, the United Kingdom, and the United States. There are five studies conducted in the United States, while one study has been conducted in each of the other five countries. The study is a doctoral thesis conducted in the UK with a primary focus on Nigerian higher education. Data is shown in Figure 8.

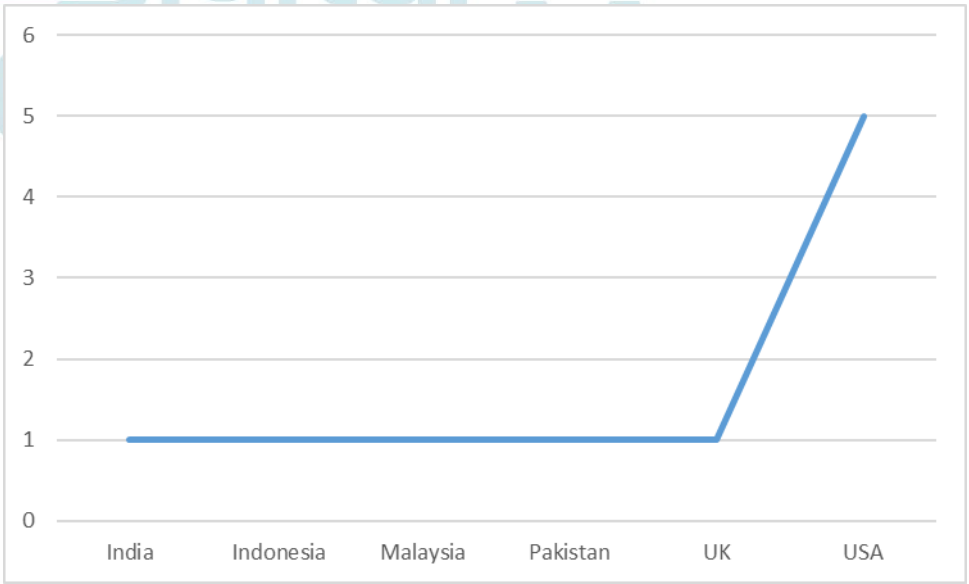


Figure 8. *Distribution of the Reviewed Studies by Country*

Analysis of the Trends

This section presents emerging research trends identified through content analysis. The systematic review on the CABLS identifies several trends: Blended learning accelerated by the pandemic, hybrid models and student perceptions, integration of ICT in education, blended learning in higher education, student satisfaction and high-order thinking, teacher perspectives and professional development, frameworks and models in blended learning research, content analysis and research gaps, teacher motivation and pedagogical goals, and understanding relationships within CABLS.

The COVID-19 pandemic has accelerated the adoption of blended learning in education. Researchers are investigating the use of the CABLS frameworks to develop guidelines for creating effective blended curricula, particularly in fields like medical education (Rafi et al., 2022). Keiner (2017) explores how hybrid instructional models based on the CABLS influence student experiences and outcomes, noting that teacher expectations and attitudes play a significant role in shaping student perceptions. The integration of Information and Communication Technology (ICT) and student-centered learning approaches within the CABLS framework is seen to enhance teaching and learning, especially in STEM subjects (Giwa, 2022).

Blended learning is increasingly important in higher education due to its flexibility and efficiency. However, there is a need for common frameworks and metrics to assess the maturity and success of blended learning programs (Duarte, 2016). Some studies are examining the impact of CABLS on student satisfaction and their ability to develop high order thinking skills. These studies often cluster students based on their experiences and examine different levels of contentment (Sudrajat et al., 2019).

Research is also exploring the perspectives of teachers experienced in blended learning within the CABLS framework. These studies highlight the importance of professional development and technology coaching to help teachers effectively utilize blended learning (Cummings, 2022). Various frameworks and models, including CABLS and Community of Inquiry (COI), are used to understand the components and interactions within blended learning environments (Mathur & Shukla, 2022). Content analysis is employed to systematically review existing literature on blended learning, identifying gaps in current practices and emphasizing less explored aspects (Yeop et al., 2016).

Furthermore, studies emphasize the significance of teacher motivations and clear pedagogical goals when implementing blended learning. These factors influence the choice of online resources and the transformation of teaching methods (Arfanakis, 2022). Researchers are also conducting interviews with stakeholders to gain insights into the complex relationships within the CABLS framework and promote collaborative approaches to blended learning in higher education (Mcgee & Poojary, 2019).

In summary, researchers are exploring the use of the CABLS in various educational contexts to enhance teaching and learning outcomes. This exploration focuses on technology integration, teacher perspectives, student satisfaction, and the development of high order thinking skills. The need for clear guidelines, frameworks, and professional development to effectively implement blended learning is also emphasized.

DISCUSSION AND CONCLUSION

The research paper presents findings of a systematic review on complex adaptive blended learning system (CABLS) and discusses gaps in current research. The review revealed a need for exploring all six subsystems of CABLS. Analyzing the distribution of studies related to the CABLS provides valuable insights into the evolving research landscape in this field. The systematic review results identified ten research studies that defined and described the theory. The significant increase in the number of published articles in 2022 indicates the growing importance of the CABLS. This surge in publications can be attributed to the global impact of the Covid-19 pandemic, which compelled educators and institutions to quickly adapt to blended learning environments. The balanced representation of research types, with an equal number of dissertations and articles, highlights the multifaceted nature of the CABLS and its relevance in various educational contexts. This balance underscores the need for further investigation into the potential benefits and challenges associated with complex adaptive blended learning systems. The study's findings also highlight gaps in current studies and practices, such as the absence of discussion on all six subsystems, the importance of considering subsystem

relationships, and the exploration of significant interactions between subsystems. Potential areas for future research include investigating the effects of subsystem interactions and addressing the shortcomings in blended learning practices (Yeop et al., 2016).

The distribution of studies across fields reveals a notable concentration of research in the education domain, with eight studies focusing on education compared to two in the health sciences. This emphasizes the significance of additional research and development in this area. Within the education sector, the distribution of studies is also noteworthy, with four studies focused on K-12 education and six on higher education. This suggests that the CABLS are being examined and applied at different educational levels, highlighting their versatility and adaptability in diverse learning environments. Additionally, the prevalence of qualitative research methods in studying the CABLS can be attributed to the complex and dynamic nature of these systems. Furthermore, the reviewed studies span across six countries, including India, Indonesia, Malaysia, Pakistan, the United Kingdom, and the United States, indicating a global interest in the CABLS in blended learning environments. While the United States has conducted the highest number of studies, the inclusion of research from different countries suggests the universal applicability of the CABLS concepts and the need for cross-cultural insights to inform their implementation.

Regarding the analysis of CABLS trends, researchers investigate the use of the CABLS in various educational settings to enhance teaching and learning outcomes. They explore aspects such as technology integration, teacher perspectives, student satisfaction, and the development of higher-order thinking skills. Additionally, the importance of clear guidelines, frameworks, and professional development for successful blended learning implementation is emphasized.

In conclusion, this study highlights the importance of continued research on the complex adaptive blended learning systems to achieve effective and adaptable education. The findings provide a foundation for future research and emphasize the need to address the identified gaps in current studies and practices. The global interest in CABLS, as demonstrated by the distribution of studies across six countries, indicates the universal applicability of CABLS concepts and the necessity of cross-cultural insights to inform their implementation. The study also underscores the significance of CABLS in the education domain, with potential implications for improving teaching and learning outcomes. Clear guidelines, frameworks, and professional development are identified as crucial factors for the successful implementation of blended learning. Overall, this study contributes to the understanding of the CABLS and calls for further research to enhance educational practices and outcomes.

Limitations & Recommendations

The limitations of the analysis include a focus solely on published articles and dissertations from ten electronic scientific databases, potentially excluding relevant research presented in other forms such as conference papers or unpublished studies. The study also only examined studies related to Complex Adaptive Blended Learning Systems (CABLS), which may have limited the scope and excluded other related research within the broader field of blended learning. Additionally, the analysis did not consider the quality or impact of the included studies, which could have influenced the overall findings. Furthermore, the distribution of studies across countries may not be representative of the global landscape of CABLS research, as it relied on the availability of published literature from specific countries.

Recommendations for future research include incorporating a wider range of sources, such as conference proceedings and unpublished studies, to ensure a more comprehensive analysis of the research landscape in the field of the CABLS. To provide a more global perspective, future studies could aim to include a broader range of countries and regions, ensuring representation from diverse cultural and educational contexts. Cross-cultural insights and

collaboration among researchers from different countries can contribute to a better understanding of CABLS. Addressing these gaps can advance the field of blended learning and maximize the potential of CABLS for improving learning outcomes.

Statement of Researchers

Researchers' contribution rate statement: The contribution rates of the authors in the study are equal.

Conflict statement:

First Author declares that he/she has no conflict of interest.
Second Author declares that he/she has no conflict of interest.
Third Author declares that he/she has no conflict of interest.

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Review Article

Digital Security & Media, *1*(1), 30-44

Digital game and technology addiction in early childhood

Received: 22/11/2023
Revised: 28/12/2023
Accepted: 07/01/2024

Selahattin Semiz[1]

Abstract

Digital addiction in early childhood refers to the excessive and compulsive use of digital devices such as smartphones, tablets, computers, and video games by young children, leading to negative consequences on their physical, cognitive, social, and emotional development. This phenomenon has become a growing concern due to the widespread availability and accessibility of digital technology. Children exposed to digital devices at a young age are susceptible to addiction as they may become engrossed in screens for extended periods, leading to a lack of engagement in other essential activities like physical play, social interactions, and educational pursuits. Excessive screen time can adversely impact a child's attention span, cognitive development, and learning abilities. Parents and caregivers play a crucial role in mitigating digital addiction by setting limits on screen time, providing alternative activities, and establishing healthy technology use habits. Educational institutions and policymakers also have a responsibility to promote digital literacy and create guidelines for appropriate technology use in early childhood settings.

Keywords: digital addiction, digital game addiction, early childhood.

Cite: Semiz, S. (2024), Digital game and technology addiction in early childhood. *Digital Security & Media, 1*(1), 30-44.

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INTRODUCTION

The discussion concerning young children's early use of digital technologies originated in the 1980s. Initially, this debate focused on the notion that the use of digital technologies had adverse effects on the physical, cognitive, and social development of children. These discussions focus on the negative effects of this technology due to reasons such as diminishing children's physical activity, not promoting motor development as it involves only mouse usage, lacking verbal interaction, and failing to provide multisensory experiences and Replacing children's non-screen-based natural games (Cordes & Miller, 2000; Haugland, 2000; Healy, 2000; Hohmann, 1998).

Today young children are exposed to diverse digital experiences from an early age, engaging with a wide range of information and communication technologies that have become readily accessible within their homes thanks to the swift progress of technology (Holloway, Green, & Livingstone, 2013; Marsh, 2010). Children exposed to a range of digital devices like TVs, computers, tablets, and phones from a young age and raised in a tech-savvy environment tend to develop alongside these technologies (Kol, 2017). The increase in technological usage among children in the early childhood period is also highlighted in statistics from various studies. Based on a report by the OECD (2019), in the United Kingdom, it is indicated that 1% of children aged 3-4 have their own smartphones, 10% have their own tablets, 96% watch an average of 14 hours of television per week, and 36% play digital games. According to a study conducted by the Erikson Institute in the United States (2016), among 1,000 children under the age of 6, it was reported that 85% of the children used some form of technological device, 78% watched television, 53% used tablets, 42% used smartphones, and 32% used computers. The report from the comprehensive study on children and play conducted by Marsh et al. (2020) in the United Kingdom and South Africa is noteworthy. The study included 2,429 children aged 3-11 from the United Kingdom and 1,286 from South Africa. In the United Kingdom, 94% of the children had access to tablets, 84% to smartphones, 48% to smart speakers like Amazon Echo, Apple HomePod, or Google Home, 28% to wearable technologies, 17% to virtual reality equipment, and 15% to smart toys. In contrast, children in South Africa had less access, with 34% having access to tablets, 41% to smartphones, and only 10% having wearable technology or smart toys. Another study conducted by Tena et al. (2019) in Spain which included 412 children aged 0-6, revealed that these children dedicate an average of 92 minutes daily to TV viewing. Furthermore, 92% of them possess a tablet and allocate an average of 60 minutes each day for computer or tablet usage.

The statistics provided by the Turkish Statistical Institute in their reports on the use of information technology by children aged 6-15 in 2013 and 2021 also draw attention to the rapid increase in technology usage among children. According to these reports, the internet usage rate for children aged 6-15 was 50.8% in 2013, but it increased to 82.7% in 2021. It was observed that children in the 6-15 age group spend approximately 3 hours a day on social media. Among children aged 6-15 who reported regularly playing digital games, 96.2% of boys and 91.8% of girls engaged in this activity. Regarding the types of digital games played, among those who reported playing digital games regularly in the 6-15 age group, 54.3% mentioned playing war games, followed by adventure/action games at 52.0%, strategy games at 41.8%, simulation games at 27.5%, and sports games at 26.5%. Role-playing games were the least played, with only 19.1% of children in this age group participating in them. Another study conducted by Merdin & Şahin in Turkey (2023), which included 412 children aged 0-6, revealed that 85% of the children started watching television before the age of two, 30% played computer games, 75% watched videos on tablets and smartphones, 58% played games on tablets and smartphones, and 60% could use tablets and smartphones on their own.
The growing involvement of young children with technology remains a subject of continuous attention, often raising both curiosity and apprehension, given the widespread presence of technology in their lives. Debates regarding the advantages and potential risks of digital technology in children's daily routines have been a prominent topic of discussion, both in

anecdotal conversations and research, for more than a decade. Touchscreen devices have emerged as a prominent means of engaging and entertaining children (Johnston, 2021).
Concerns regarding children's utilization of digital technology have been exacerbated by the influence of COVID-19 and the resulting alterations in societal norms. A study conducted by Koran et al. (2022) indicates that during the pandemic, there was an increase in the use of mobile technology devices among children in the early childhood period. The research compared the technology usage of children aged 3-6 before and after the pandemic. The findings show a significant increase in the usage of these devices by these children compared to the period before the pandemic. In the study conducted by Mesce et al. (2022), it is also mentioned that technology usage among children and adolescents increased during the pandemic. Similarly, in the research conducted by Limone & Toto (2021), it is emphasized that there was a 15% increase in technology usage among children and adolescents during the pandemic, with a remarkable 61% increase in smartphone usage. These results suggest that the pandemic may have had an enhancing effect on children's access to and use of technology. These findings indicate that the pandemic has been an important factor that has affected children's lives and altered their technology usage habits. In the literature, while the increasing use of technology by children is considered a danger, some studies also highlight the contributions of technology use to children's development. According to a study conducted by Ilgar and Karakurt (2018), 57% of the participating mothers believe that increased technology use supports their children's development, and 71% think it enhances hand-eye coordination. Studies emphasizing the positive contributions of developmentally appropriate technology use to children's learning also hold a significant place in the literature (Blackwell, 2013; Blackwell et al., 2014). In these studies, technology use is particularly noted to contribute to children's literacy skills (Plowman et al., 2011) and motivation (Lindahl & Folkesson, 2010). Additionally, it is mentioned that technology use can facilitate the development of social skills through collaboration (Alper, 2011) and support children with special needs (Starks & Reich, 2023).

In the literature, the risks (Livingstone & Smith, 2014) and contributions (Blackwell, 2013, Alper, 2011) of children's technology use are widely discussed. However, it is emphasized that in early childhood, digital technologies should be used in a manner that supports children's development by promoting appropriate learning, fostering collaborative problem-solving, and incorporating play-based and inquiry-based approaches (Rosen & Jaruszewicz, 2009). In this study, the risks associated with technology use in early childhood will be examined within the scope of digital game and digital technology addiction. In this context, the definitions of digital game and technology addiction will be provided, and the study will discuss the consequences of these variables on children's development. The purpose of this study is to promote awareness about the potential risks associated with the use of digital technology during early childhood. It aims to provide an understanding of the mechanisms that lead to addiction to digital games and technology among children, and highlights the negative impact that inappropriate use of technology can have on their development.

Definition of Digital Game and Technology Addiction

During the early stages of childhood, there is a significant period of rapid growth in fundamental cognitive, physical, and social abilities. Children in this developmental phase engage in exploration through play, develop their social interaction capabilities, and gain valuable learning experiences by tapping into their imagination. Consequently, play is widely recognized as an essential component of a child's daily routine (Madej, 2016). For centuries, conventional games have served as both sources of amusement and educational tools for children. Nonetheless, the swift progression of technology in recent times has transformed the way children engage in play. This shift, known as digital play, has now firmly established itself as a significant aspect of children's daily routines and is increasingly becoming a preferred choice for their recreational activities (Fang et al., 2021; Rajić & Tasevska, 2019).

Children are being exposed to digital games at increasingly younger ages, thanks to the prevalence of technological devices like computers, tablets, and smartphones. This widespread adoption of technology has given rise to terms such as technological play, modern play, and digital gaming (Marsh, et al., 2016). Fleer (2018) points out that the notion of digital play has emerged relatively recently and highlights the absence of a unanimous consensus regarding its definition. In its most general definition, digital game refers to the use of technological tools for the purpose of playing games (Marsh, et al., 2016). Digital play encompasses activities such as playing digital games and apps, watching videos, creating content, and capturing images. This emerging mode of play has gained popularity as a cultural context among young children Also digital technology usage encompasses the time spent on any electronic device equipped with a screen, including computers, tablets, televisions, gaming consoles, and mobile phones (Lee et al.,2014). There are four types of digital games: console games, desktop games, online games, and mobile games (Digital Game Report, 2020). During the preschool period, children prefer digital games mainly because they find them entertaining, interesting, and colourful (Genç, 2014; Toran et al., 2016)

Children find digital games more engaging than non-digital games due to their inclusion of sounds and visual effects. In this context, children spending extended periods of time with digital games brings the concept of digital gaming addiction to the forefront (Lee & Morgan, 2018). Besides digital games, it's also essential to consider children's recreational use of these technologies. It's noted that children in the 0-6 age range frequently use these devices for playing games and watching videos for entertainment purposes (Yıldız ve Kanak, 2021). Especially during the COVID-19 pandemic, there has been a noticeable increase in children's recreational use of technology (Aguilar-Farias et al., 2021). At this point, technology has become an integral part of human life and the increasing duration of its usage has brought the concept of technology addiction to the forefront (Karadağ & Kılıç, 2019).

Digital game and technology addiction are two terms that have been increasingly used in recent years, especially among younger generations (Hazar & Hazar, 2017). Digital game addiction is defined as excessive and uncontrollable use that leads to social and emotional problems in a person's life, causing disruptions in their daily activities (Lemmens et al., 2009). Technology addiction refers to the excessive use of technology that leads to negative consequences, such as impaired social skills, reduced physical activity, and decreased academic performance (Alter, 2017). The inability of individuals to use digital tools appropriately and in moderation gives rise to technological addiction, digital game addiction, social media addiction, internet addiction, and digital addiction, all of which result from the interaction between the individual and digital devices (Budak & Işıkoğlu, 2022).

Digital Game and Technology Addiction in Early Childhood

The deficiency of the self-regulation mechanism present in adults within children may contribute to a heightened occurrence of digital technology and gaming addiction in youngsters. This occurs because children are capable of watching videos and playing digital games for extended periods with parental consent (Alter, 2017). Hence, the initial stage in the emergence of digital addiction during early childhood occurs when parents start entrusting their childcare duties to technology and begin relying on technological devices as caregivers (Karateke, 2020).

Karateke (2020) emphasizes that technology addiction begins during infancy due to the behaviors exhibited by parents while managing situations where they encounter difficulties in caring for the baby and need to establish control. At this point, the transition to supplemental food becomes the primary focus. Many parents face difficulties when transitioning their children to supplementary food. In order to control this situation and encourage their children to eat, they often resort to using various forms of digital media such as smartphones, tablets, and televisions. They may use videos and games as a means of making mealtime more appealing

and engaging for their children. Apart from using technological tools during the transition to supplementary food, parents can also use them as an emotion regulator to calm their children when they are cranky or anxious, for example, during visits to the doctor or guests. It has become common to rely on videos and digital games to calm infants and children in negative situations, but this practice can actually hinder the development of their emotion regulation skills. Moreover, it places the responsibility of calming their children solely on technological tools, rather than on parents gaining the necessary skills to do so (Karateke, 2020).

Important organizations, both national and international, provide recommendations for the use of digital technologies from infancy through early childhood. These recommendations are crucial and should be taken into consideration. The Green Crescent, a part of the Turkish Anti-Addiction Education Program, recommends limiting screen time for young children. They suggest that children aged between 0 to 3 years should avoid screens as much as possible. For those aged between 3 to 5 years, the recommended screen time should be limited to a maximum of 20 to 30 minutes (Yeşilay, 2021). The American Psychological Association (APA) released the "Digital Guidelines: Promoting Healthy Technology Use for Children" in 2019. The guidelines state that children aged 0-18 months should not be exposed to screens except for video chatting. For infants between 18-24 months, only qualified digital content should be used, and parents should watch this content with their children. In children aged 2-5 years, screen time should not exceed one hour per day, with only high-quality content (APA, 2019).

However, research conducted in our country, as well as in other countries, has revealed that infants are already starting to use screens. Children aged 0-6 now have their own digital devices and spend long hours using them, which is not conducive to their development. It is worth noting that most of the content children consume on their digital devices is purely for entertainment, such as watching videos and playing games. (EI, 2016; Marsh et al., 2020; Merdin & Şahin, 2023; OECD, 2019; Tena et al., 2019). It's crucial to pay attention to the latest research that indicates a continuous surge in screen usage time (Byrne et al., 2021; Veldman et al., 2023). This increased use of screens has raised concerns among medical experts, researchers, and educators regarding the timing and consequences of screen time (Bustamante et al., 2023). The increased use of digital technologies in early childhood is a major risk factor for the development of digital technology addiction and behavioral problems such as depression and aggression in children (Wu et al., 2014). Digital gaming and technology addiction are closely related concepts, especially when it comes to young children's use of digital tools. It's crucial to understand how addiction symptoms manifest in this context. Lemmens et al. (2009) identified seven symptoms of digital game addiction, which are listed in table 1 below.

Table 1. Digital Game Addiction Addiction Criteria

Digital Game Addiction Addiction Criteria	**Symptoms**
Salience	The game starts to direct thoughts (worry, anxiety), emotions (desire, craving) and behavior (excessive consumption)
Tolerance	Increasing frequency and time spent playing games in direct proportion
Modd Modification	Turning the game into a means of entertainment in order to get rid of personal problems
Withdrawal	Sudden reactions such as moodiness and irritability.
Relapse	Increase in the desire to play repeatedly to an uncontrollable size
Conflict	Conflict with the environment, lying in order to continue playing
Problems	Problems in school and social life

In the addiction process, the games played by the child first start to direct the child's thoughts, behaviors and emotions. As time passes, children are increasingly drawn towards digital

games and tools, resulting in a gradual increase in screen time. The use of digital tools and games to regulate emotions and reduce personal distress is also a sign of addiction. The continuous desire of a child to play games and the inability to control it can lead to symptoms such as mood swings, irritability, and anger over time. These symptoms may occur when the child is unable to access digital tools or when the digital game suddenly stops or gets interrupted. Children who are addicted to digital tools and games often face a conflict with their environment. This can lead to lying in order to access digital games, which can cause problems both in the child's school and social life. In this context, Firstly we will address the variables that cause digital addiction in early childhood and then focus on the developmental consequences of digital technology and game addiction (Lemmens, 2009).

Understanding the Reasons behind Technology and Digital Game Addiction in Young Children.

In today's digital age, it's not uncommon for young children to get hooked on games and technology. However, excessive use of digital devices can lead to addiction and negatively impact a child's development (İlvan ve Ceylan, 2023). Young children have a higher risk of developing a digital addiction due to their incomplete mental development. This risk is further increased by the frequent use of digital devices from infancy and the use of these devices as a pacifier by parents (Karateke, 2020; Park & Park, 2014).

It's crucial to understand the causes of digital game and technology addiction in early childhood, which can include factors such as easy access to devices, lack of parental supervision, and the instant gratification that these technologies provide (Zahariades, 2018). Some studies have stated that technology addiction may be related to an individual's personality traits (Hussain, & Pontes, 2018). However, given that the self-regulation skills found in adults in early childhood are not yet developed in children, and that children can use digital tools with their parents' permission (Alter, 2018), the factors influencing digital addiction are discussed in the context of family and child-related factors. In Park & Park's (2014) conceptual model of smartphone addiction in early childhood, the antecedents of addiction are analyzed under two headings as child and family-related antecedents. Factors related to the family were parental education level, age, income, employment status of both parents and attitudes towards and use of smartphones. Child-related factors were age, gender, siblings, and participation in early childhood education (Park & Park, 2014).

Parents' low level of education increases the likelihood of problematic technology use by children. Because the educational level of parents decreases, their awareness of smartphone addiction also decreases. Parents with low education levels have a high tendency to give smartphones to their children. This leads to an increase in children's smartphone addiction rates (Park & Park, 2014). According to the research carried out by Merdin and Şahin (2023), it was found that parents possessing advanced levels of education tend to be more involved in managing their children's electronic media usage.

Also, parents' low level of income increases the likelihood of problematic technology use by children. Families with limited financial means might have a lower incidence of smartphone addiction among their children, as they may not be able to afford expensive smartphones. It is important to note that families with low-income may face various limitations that can affect their children's development. Due to the lack of resources and access to different activities, parents with low-income levels may find it easier to allow their children to use smartphones more frequently (Park & Park, 2014). However, some studies show that parents with higher incomes tend to allow their children more freedom in using digital tools and direct them towards digital technologies more frequently (Güzen, 2021).

A systematic analysis was conducted by Veldman et al. (2023) on research focusing on factors associated with screen time in children aged 0-5 years. The findings indicate that the presence

of electronic devices in children's bedrooms is linked to increased screen time. Furthermore, the study suggests a negative correlation between family income and parental education level with children's screen time. Additionally, it was observed that higher parental self-efficacy in regulating screen time is associated with reduced screen time in children. Yalçın et al. (2022) discovered that video game participation is more prevalent among older children, males, families with lower parental education levels, households with three or more children, households equipped with game consoles, computers, and tablets, children with daily screen time exceeding two hours, those who do not comply with parental screen time regulations, and households with other individuals who play video games. Many parents allow their young children to use electronic devices like mobile phones, tablets, and computers, thinking it will make them calm and obedient. However, this decision is often based on a lack of awareness and unfounded concerns (Hilčenko & Jakovljević, 2019).

The study findings from Keya et al. (2020) indicate that strained parent-child relationships and parental tendencies to push their children to excel academically, alongside parental neglect, the child's feelings of loneliness and anxiety, and permissive parenting, are linked to the development of digital game addiction in children. According to a study conducted by Süral (2022), children's digital addiction can be caused by negative role modeling, indifference, lack of guidance, and free parenting behaviors of their parents. The study also highlights that the increasing digitalization of the world, the pandemic process, and problems in urbanization are environmental factors that contribute to the development of digital addiction in children.

In some studies, children's digital game and technology addiction is addressed in the context of parent-child relationships. According to Hazar (2019), children are more likely to develop digital game addiction if their parents play digital games and have weak parent-child relationships. Similarly, Chang and Kim (2020) suggested that low family closeness is a strong predictor of children's addiction to digital games. On the other hand, Choo et al. (2015) found that strong relationships between parents and children help reduce such addiction. Ilvan and Ceylan (2023) conducted a study that examined the correlation between digital game addiction and the relationship between mothers and their children, as well as mothers' usage of digital devices. The study concluded that negative mother-child relationships and mothers' usage of digital devices were significant predictors of children's digital game addiction.

Some studies examine parents' guidance strategies and their own use for children's digital gaming and technology use. Güzen (2021) conducted a study on digital parenting and found that fathers tend to give their children more freedom when it comes to technology use than mothers. Additionally, fathers prefer strategies that encourage their children to use digital tools more often. Moreover, it has been found that allowing children unrestricted access to digital tools and encouraging them to use such tools can significantly increase the risk of digital game addiction in children. This situation is a major predictor of digital game addiction (Güzen, 2021). Şenol et al. (2023) conducted research that found that active parenting strategies can reduce children's tendencies towards digital game addiction, while strategies that involve directing and releasing children to play digital games can actually increase their tendencies towards addiction. In a study conducted by Maddox (2023), a significant correlation was found between children's screen time and the media they consume at home with their parents. Accordingly, it is stated that parents' media habits and behaviors can significantly affect and shape children's screen time. According to Wu et al. (2014), a restrictive parenting approach toward children's digital technology usage has been identified as significantly effective in managing and controlling their screen time. During the pandemic, children have been spending more time with digital tools which has led to an increase in their tendency towards digital game addiction (Güzen, 2021). As for digital parenting, it has been observed that parents are now more likely to use free guidance strategies to direct their children towards digital tools (Güzen, 2021). At the same time, when both parents work, children tend to spend more time in front of screens. This is because the child is left alone more often and the amount of time parents allocate to their child is more limited (Park & Park, 2014).

Child-related factors affecting digital addiction include the child's age, gender, number of siblings, and whether the child attends early childhood education institutions. The less developed the mental faculties are in younger children, the easier it is for them to become deeply engrossed, increasing the likelihood of digital addiction (Park & Park, 2014). When it comes to gender differences, studies suggest that boys may be more prone to digital addiction. The reason for this could be that boys are generally more curious about experimenting with digital devices than girls, and they also tend to have lower levels of self-control than girls. (Park & Park, 2014). Research has shown that parents may be more restrictive when it comes to their daughters' use of digital tools. This is because boys tend to spend more time with these tools than girls, as concluded by studies conducted by Işıkoğlu et al. (2021) and Küçük & Çakır (2020). Additionally, boys are more likely to develop a digital game addiction compared to girls, as found by Budak and Işıkoğlu (2023). Children without siblings or with fewer siblings may be more prone to higher levels of digital addiction due to their increased likelihood of spending more time alone, as compared to children with more siblings with whom they can interact. This may be a reflection of children spending time alone with digital devices and a lack of social interaction (Leung, 2007). Moreover, when children participate in educational settings such as preschool or kindergarten, they are guided by teachers and have more opportunities to interact with their peers, which in turn reduces the likelihood of developing a digital addiction. In contrast, children who do not attend any preschool or kindergarten often spend more time alone at home, which can potentially increase the risk of digital addiction due to a lack of parental resources (Park & Park, 2014).

Developmental Consequences of Digital Technology and Game Addiction

Digital technology and game addiction have become a growing concern in recent years due to their potential developmental consequences. Children and young adults who spend excessive amounts of time on their devices can experience negative effects on their cognitive, emotional, social and physical development. Excessive reliance on technology, viewed as a societal health concern by educators and parents, induces anxiety and stress in children. This dependency may result in heightened introversion, diminished self-esteem, and an elevated risk of social isolation. Research indicates that children often experience feelings of anxiety, helplessness, and frustration upon disengaging from digital devices (Celebi, 2023).

In recent years, numerous studies have been conducted on the correlation between digital game and technology addiction and the social and emotional well-being of children. According to Akaroğlu (2022), children who are addicted to digital games tend to have poor social-emotional health. Similarly, Durmaz (2023) suggests that digital addiction is linked to lower levels of social skills in children. Budak's (2020) research findings indicate that as children's digital game addiction increases, their social competence decreases and negative social behaviors increase. In addition, Ilgar and Karakurt's (2018) study, which includes mothers' views on the impact of digital game addiction on their children's development and behavior, highlights that digital game addiction leads to a disconnection from real life and negative influences on behavior. Research indicates a correlation between high levels of digital game addiction and increased aggression in children (Jeong et al., 2017; Lee & Morgan, 2018). Excessive and unsupervised engagement in digital gaming can have negative impacts on children's emotional regulation, cognitive patterns and behavior. It can lead to an inability to control play urges and result in aggressive behaviors during everyday activities (Mustafaoğlu & Yasacı, 2018). Furthermore, children tend to incorporate the content they see in these games into their daily lives and may prefer playing digital games over spending time with their families. As a result, digital technology and game addiction negatively affect children's social-emotional development (Şenol et al., 2023). It is crucial to recognize this connection and take steps to prevent the potential negative effects that can arise from prolonged exposure to digital games. Another developmental area where the effects of digital addiction are examined in research is cognitive development. It is predicted that digital addiction affects the release of dopamine and

serotonin, causing irregularities in the child's brain (Langley, 2020), which may negatively affect the child's cognitive development. According to Endert's (2021) study, children with strong self-control abilities tend to have lower levels of digital addiction. Additionally, the study found that prolonged use of digital tools negatively affects children's academic performance. Similarly, Öndeş and Kılıç (2022) concluded that digital game addiction has an adverse impact on children's math skills. Research has shown that exposing children to digital media at a very young age can have negative effects on their cognitive development and executive functions. According to a study conducted by Barr et al. in 2010, children who started watching TV at the age of one showed negative effects on their cognitive development when they turned four years old. Similarly, Zimmerman and Christakis found in their study that children who started watching TV before the age of three had negative effects on their cognitive development when tested at the age of six to seven. On the other hand, children who started watching TV between the ages of three to five did not seem to have such negative effects.

Excessive use of digital games and technological devices can negatively impact children's physical development. Early childhood digital addiction is linked to sleep problems, and studies have shown that having digital devices in the room where children sleep (Cespedes et al., 2014) or allowing them to sleep with mobile devices (Levenson et al., 2016) can lead to reduced sleep duration and sleep disorders. Digital addiction is a serious concern as it can lead to lifelong obesity. This problem can occur from early childhood, as shown by a study conducted by Cox et al. in 2012. Fullerton et al. (2014) found that digital game addiction is linked to a sedentary lifestyle. Furthermore, the habit of eating in front of a screen during prolonged screen time reduces physical activity among children and increases their calorie intake, thus posing a significant risk of obesity. It has been reported that excessive use of digital devices from a young age can lead to vision problems such as myopia in children (Langley, 2020). Additionally, prolonged exposure to technology during childhood can result in musculoskeletal disorders. Research suggests that digital game addiction is linked to cardiovascular health issues, as well as an increased risk for conditions such as diabetes, cancer, and cardiovascular diseases in later stages of life (Çelik & Bektaş, 2023).

Conclusion and Implications

As a result, early childhood authorities suggest that technology use before the age of 2 isn't conducive to children's development. It's advisable for children, even at later ages, to engage actively with high-quality content under parental guidance for no more than an hour a day. During infancy, when parents rely on technology to soothe their children, it can foster digital dependency, potentially leading to excessive technology use in the future. This overuse of digital tools and games during early childhood may result in addiction and hinder a child's healthy development. It can reduce their social interaction skills, decrease physical activity levels, and cause distractions. This addiction can affect the emotional and mental health of children, disrupt their sleep patterns, and negatively affect their school performance. Therefore, it is crucial for parents and caregivers to be mindful of balanced and controlled use of digital technology from an early age to ensure healthy growth and development of children.

National and international organizations recommend limited screen time for young children. The Green Crescent and the American Psychological Association both suggest avoiding screens for children under 2 years old and limiting screen time to 1 hour per day for those aged 2-5 years. In this context, parents can use technology in line with their children's development by following these suggestions:

1- Setting Limits: Establish clear boundaries and rules for technology use based on your child's age and maturity level. Define specific time limits and guidelines for device use, ensuring they do not exceed healthy limits.

2- Content Control: Choose age-appropriate and educational content for your child. Focus on interactive and educational apps, games, and content that align with your family values and interests.
3- Interactive Engagement: Encourage your child to engage interactively with technology rather than passively consuming content. Encourage activities that promote problem-solving skills, creativity, and critical thinking.
4- Activities: Participate in technology-based activities together as a family. Play educational games, watch informative videos, or explore creative apps collectively, fostering bonding and shared experiences.
5- Be a Role Model: Demonstrate balanced and responsible technology use yourself. Your behavior serves as an example for your child, so exhibit healthy tech habits and limit your screen time.
6- Open Communication: Maintain an open and ongoing dialogue about technology use with your child. Educate them about both the positive and negative aspects of technology and encourage them to ask questions and share concerns.
7- Safety and Privacy: Teach your child about online safety, including issues related to privacy, cyberbullying, and appropriate online behavior. Monitor their online activities and ensure they understand the importance of safeguarding personal information.
8- Monitor and Supervise: Keep an eye on your child's technology use, especially for younger children. Be aware of the content they are accessing and the amount of time spent online.
9- Encourage Balance: Emphasize the importance of a balanced lifestyle that includes various activities such as outdoor play, reading, social interactions, and creative pursuits, alongside technology use.
10- Stay Informed: Stay updated on technological advancements, trends, and potential risks associated with different platforms and devices to make informed decisions about your child's technology use.
11- By following these recommendations, parents can help their children utilize technology in ways that support their development, learning, and overall well-being while mitigating potential negative effects. Adjusting these recommendations according to your child's individual needs and interests is crucial for effective guidance.

Statement of Researcher

Researcher's contribution rate statement: Since the study has a single author, the entire contribution belongs to the author.

Conflict statement: The author declares that he/she has no conflict of interest.

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Research Article

Digital Security & Media, *1*(1), 45-59

The relationship between high school students' social media usage and Metaverse knowledge levels

Received: 27/09/2023
Revised: 05/12/2023
Accepted: 25/12/2023

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Abstract

Metaverse is the new digital environment to socialize and experience. Builders consider it to be the next step of technological evolution. Social media is used intensively, especially by young people. The aim of this research is to reveal the relationship between high school students' social media usage and Metaverse knowledge levels. A correlational survey model was used in the research. The participants are 568 students studying at different grade levels from different types of high schools in Balıkesir. Data was collected with "personal information form", "Social Media Usage Scale" and "Metaverse Scale." In conclusion; it was revealed that the duration of high school students' engagement with social media and their competence in terms of use are at a medium level and female students are more engaged with social media. It was observed that students who use smartphones and have social media accounts, interact with social media for longer periods of time and more competently. Also, the Metaverse knowledge levels of the participants were above average. Male students have higher levels of knowledge within the scope of digitalization and lifestyle. As the grade level increases, so does the Metaverse knowledge level. Students from two schools that receive students with higher base scores, have higher levels of knowledge. It was observed that using social media both continuously and competently has a positive relationship with Metaverse knowledge levels. To increase the knowledge level, classrooms can be created and Metaverse content added to the curriculum of Computer Science courses.

Keywords: Social Media, Metaverse, High School, Student.

Cite:, Yılmaz, E.; Ünal, C. & Demir, İ. (2024). The relationship between high school students' social media usage and Metaverse knowledge levels. *Digital Security & Media,* 1(1), 45-59.

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INTRODUCTION

The emergence of the Internet has brought new phenomenon. The interest in social media, which is one of these phenomenon's, is increasing. When the statistics in Türkiye are examined, there are 66 million Internet users. Social media, which constitutes the first place of internet usage purposes with 82% (Türkiye Statistical Institute, 2016); refers to computer-based technology that allows ideas, information, and personal content to be shared within virtual communities. Social media includes social networking sites such as Facebook and Google+, micro blogging sites such as Twitter, photo and video sharing sites such as Instagram, Snapchat and YouTube (Smith, Leonis and Anandavalli, 2021). Today students, who make up a large part of society, also spend most of their time on social media. As a result of the research conducted by Otrar and Argın (2014), it has been revealed that 94% of students have at least one social media account. One of the phenomena that emerged with the development of technology after the invention of the computer, mobile phone, Internet and then social media, is the Metaverse. The Metaverse refers to an immersive digital environment in which one can interact with virtual identities i.e. avatars in the virtual universe (Suh and Ahn, 2022). The Metaverse is a virtual world that allows socioeconomic activities similar to those in the real world (Lee, Woo and Yu, 2022). This concept was first used 30 years ago in the dystopian science fiction novel "SnowCrash" written by science fiction writer Neal Stephenson in 1992 (Köse, 2021). The Metaverse became popular through the Facebook's change of name to Meta and Mark Zuckerberg's statements. For this reason, there has been an interest in the Metaverse in the community and social media users (Sönmezer and Büyükbaykal, 2022). In a survey of 628 people conducted by Twentify (2022), it was observed that 63% of the participants had some ideas about the Metaverse, although they were not very sure, but only 21% were confident in explaining the concept of the Metaverse. As can be seen from this data, most people's knowledge of the Metaverse remains limited. Since social media is more widely used than the Metaverse, individuals are more interested in social media. Because of the fact that the Metaverse will greatly influence future social media usage, it is important to examine the relationship between these two concepts. In this context, the aim of the study is to reveal the relationship between high school students' social media use and Metaverse knowledge levels. In line with this general purpose, the following questions were sought to be answered: 1. High school students' social media usage and Metaverse knowledge levels; Does it differ according to their gender, grade level, school types, smartphone use status, social media account status? 2. Is there a relationship between high school students' social media usage and Metaverse knowledge levels?

BACKGROUND

In 2023, nearly half of the world population have social media and spend lots of their time with it. For instance; in Türkiye, people spend 3 hours a day with social media. Additionally, females' social media addiction levels are higher than males and "Generation Z" uses social media more competently than "BabyBoomers". With the evolution of technology, after smart phones and social media, there is a new digital environment: Metaverse. Many searchers mentioned and defined the Metaverse phenomena through years. They grouped experiences obtained from the Metaverse and conducted surveys about it. However, there aren't many studies about Metaverse compared with social media.

The Global Review Report showed that 4 billion people in the world use the Internet and more than 3 billion people use social media every month. 90% of these users access the Internet via mobile devices. In Türkiye, an average of 7 hours of the Internet is used in a day and approximately 3 hours of these 7 hours are spent on social media channels (WeAreSocial, 2018).

As a result of another research, the level of social media usage by the participants was determined as 98%. The most commonly used social networks among the participants are

Facebook and Twitter. Depending on the results of the participants using social networks almost every day, it is seen that they spend an average of 1-3 hours a day on these social networks.

Another result of the study was that they were affected by social media at a rate of 55% (Solmaz, Tekin, Herzem and Demir, 2013). Moreover, Güney ve Taştepe (2020) concluded that the dispersion of social media addiction levels of adolescents participating in the study was predominantly moderate (56%).

Furthermore, according to the genders, it was determined that females' social media addiction levels were higher than males, and that grade level was not a significant variable in determining the level of addiction according to Kuss and Griffiths (2011).

Despite this, in Üstündağ's (2021a) research, the analysis of extracurricular screen usage time showed that girls had 3-4 hours of screen use and boys had screen time between 7-8 hours. On the other hand, according to the generations, a series of scale development studies have been carried out in order to reveal the behaviours and values of different generations in terms of social media usage, working life and acceptance of differences. In the scales where it is revealed that the high score is competent in terms of the person's social media use, the differences are accepted at a greater rate and a job where discipline is dominant is not preferred, the high score is Generation Z; it was determined that the low score showed the characteristics of "BabyBoomers" (Deniz, Tutgun and Ünal, 2019).

Additionally, according to the research conducted by Koçyiğit and Koç (2021), the top three most used social media applications among young people were determined as Instagram, WhatsApp and Twitter. Recently, for the social media users, Metaverse is a new and different environment to join. Social media users have many definitions and ideas about the new phenomenon: Metaverse. With regard to Bozkurt and Gümüş (2022), the Metaverse is a concept that refers to three- dimensional virtual environments and interacting with digital twins in these environments. They mentioned their positive and critical view of the Metaverse and compared it to Meta entrepreneurship. Yüksel (2022) touched upon the definition of the Metaverse, its relationship with games, its place in Internet technology and predictions about the Metaverse.

The analyses made as a result of the interviews conducted in a study indicated that the experiences obtained from Metaverse event participation can be grouped under eight themes (illusion being, not to be ignorant based on FOMO, escape, flow, instant pleasure, horizon line, spirit realm and virtual symptomatic) (Argan, Argan and Dinç, 2022). Also, it was determined that the countries that invest in the dimensions of the Metaverse and the schools that combine teaching and technology effectively will make the greatest contribution to the well-equipped education of new generations, and that the Metaverse studies focused on educational sciences and teaching are generally low (Göçen, 2022).

METHOD

Research Design

A correlational survey model was used in the research. Survey models are models that aim to depict a situation that existed or existed in the past in its current form. The event, individual or object that is the subject of the research is tried to be defined within its own conditions and as it is. Correlational survey models are considered appropriate for such research since they are used for research models aiming to determine the presence or degree of co-change between two or more variables (Karasar, 2006). In the study, high school students' social media use and Metaverse knowledge levels were determined and examined in terms of various variables.

Participants

The population of the study consists of students studying in public and private schools affiliated to the Ministry of National Education in Balıkesir in the 2022-2023 academic year. In the study, convenience sampling method was used from the purposeful sampling methods. According to Yıldırım and Şimşek (2013), the aim of creating a maximum diversity-based sample is to try to find the existence of common or divergent aspects among the various situations and to describe the problem in a broader framework according to this diversity. Accordingly, 568 students from 9th, 10th, 11th and 12th grades from three different high schools selected from different types constitute the sample of the research. Personal information of the participants in the research is given in Table 1.

Table 1. *Personal information of the Participants*

Variable	Category	f	%
Gender	Female	322	57
	Male	246	43
Grade Level	9	192	34
	10	112	20
	11	145	26
	12	119	21
School Type	1	213	38
	2	220	39
	3	135	24
Smartphone	Yes	563	99
	No	5	1
Use of Social Media	Yes	523	92
	No	45	8

According to Table 2, the majority of the students (57%) participating in the study were female students and 9th graders are the majority (34%). Smartphone (99%) and social media (92%) users make up the vast majority. Students from 3 different types of schools located.

Data Collection Techniques

A three-part data collection tool was used to determine the relationship between high school students' social media usage and Metaverse knowledge levels. The necessary permissions were obtained from the Balıkesir Provincial Directorate of National Education and applied online to the students within the scope of the research. In the process of analysing the data, the data of 16 participants were not evaluated because they contained outlier values. The analyses were carried out with 568 data collection tools. With the personal information form in the first section, the gender, grade level, school type, smartphone usage status, and social media account status of high school students were obtained.

In the second part, the Social Media Usage Scale developed by Deniz and Tutgun-Ünal (2019) was used to determine the social media usage situations of the students. This scale consists of 8 items and 2 factors (continuity and competence). The continuity dimension includes the person's intense engagement with social media activities and continuous presence in social media, while the competence dimension includes being sufficient to do various daily life activities that can be performed in the social media environment. Responses to the scale items range from "Strongly agree" (5 points) to "Strongly disagree" (1 point). The high score from the scale reveals that the person is more engaged with social media and is competent in terms of use. In the application made with 516 people during the development phase, the Cronbach Alpha (α) internal consistency coefficient of the scale is .824. The reliability coefficients of the factors are .721 for continuity and .734 for competence.

In the third section, The Metaverse Scale was used developed by Süleymanoğulları, Özdemir, Bayraktar and Vural (2022). This scale consists of 15 items and 4 factors (technology, digitalization, social, and lifestyle). The answers to the items of the scale range from "I agree" (5 points) to "Disagree" (1 point). A maximum of 75 and a minimum of 15 points can be obtained from the scale. As the scores obtained from the scale increase, the level of knowledge, attitude, and awareness of the Metaverse concept also increases. In the application carried out with 593 university students, the Cronbach Alpha (α) internal consistency coefficient of the scale is .813. In this study, Cronbach Alpha (α) internal consistency coefficients were calculated as .858 for the Social Media Use Scale and .931 for the Metaverse Scale in line with the data obtained from the participants. When the obtained internal consistency coefficients are evaluated according to the ranges recommended by Özdamar (2004), it can be said that the measurement results are quite reliable.

Frequency and percentage distributions were used for the total scores obtained from the scales where the personal information of the students and the usage permits were obtained. The total scores obtained from the scales were tested according to independent variables. The obtained data were analysed by quantitative data analysis methods using SPSS 16.0 statistical software.

Data Analysis

Data normality was assessed to determine the suitability of the scores obtained from the scale for the planned test statistics. Histogram graphs of the scales were inspected, revealing symmetrical distributions for both curves. Moreover, central tendency measures for the total scores were considered and presented in Table 2.

Table 2. *Central Tendency Measures*

	$\bar{X}$	Median	Mode	Skewness	Kurtosis
Social Media Usage	22.88	23	16	.143	-.301
Metaverse	47.76	49	45	-.616	.296

When Table 2 is examined, for the Social Media Usage scale, x̄=22.88, median is 23, mode is 16, skewness is .143, and kurtosis is -.301. For the Metaverse scale, x̄=47.76, median is 49, mode is 45, skewness is -.616, and kurtosis is .296. According to Büyüköztürk (2011), if the mean, median and mode values are close to each other and the skewness and kurtosis values are between -1 and +1, it can be said that the data follows a normal distribution, and parametric tests can be used. Therefore, it was observed that the data collected from the scales followed a normal distribution, and parametric statistical methods were used in the analysis. The relationship between high school students' social media usage and Metaverse knowledge levels was determined based on the scores obtained from the scales and compared according to various variables. Independent sample t-tests were conducted to investigate differences in variables with two subgroups, and one-way analysis of variance (ANOVA) was used for variables with more than two subgroups. The homogeneity of variances was determined based on Levene Statistic values. LSD post hoc follow-up tests were used to determine the groups causing the differences. The Pearson correlation coefficient was calculated to determine the relationship between the two measurements. In correlation analyses, the intervals specified by Büyüköztürk (2011) were used to assess the strength of the relationships: 1.00-.70 as high, .69-.30 as moderate, and .29-.00 as low. The significance level for all analyses was set at .05.

FINDINGS

In this section, it was examined how the total scores obtained from the scales used in the research change according to demographic variables. Then, the relationship between the participants' social media usage and their Metaverse knowledge levels was analysed.

Findings on Social Media Use

In this section, participants were asked to complete a "Social Media Use Scale." Mean and standard deviations of the total scores both obtained from this scale. Then the differences according to demographic variables were examined.

Table 3. *Social Media Use*

	$\bar{X}$	sd
Continuity	10.88	3.85
Competency	12.00	3.91
Scale Wide	22.88	6.97

In Table 3, students' continuity of social media use ($\bar{X}$=10.88), competencies ($\bar{X}$=12.00) and scale wide ($\bar{X}$=22.88) average scores are shown. It can be said that participants' amount of time they spend engaging with social media, being proficient in terms of usage and also scale wide are moderate level. A maximum of 40 and a minimum of 8 points can be obtained from the Social Media Use scale. Because of that 22.88 score is moderate. Students' use of social media t-test results on whether there is a significant difference according to gender. It is given in Table 4.

Table 4. *Social Media Use by Gender*

	Gender	N	$\bar{X}$	sd	t	df	p
Continuity	Female	322	11.42	3.92	3.901	566	.000*
	Male	246	10.16	3.64			
Competency	Female	322	11.89	3.91	-.736	566	.462
	Male	246	12.14	3.91			
Social Media	Female	322	23.31	7.15	1.719	566	.086
	Male	246	22.30	6.70			

* p<.05

In Table 4, when students' social media use is examined according to gender; t-test result in continuity sub-dimension [t(566)=3.901, p=.000] was statistically significant. There is a difference (p<.05). Accordingly, it can be said that female students are more engaged with social media. There was no statistically significant difference between the mean scores of females and males in the competency sub-dimension and the overall scale (p>.05). In other words, students' level of competent use of social media depends on gender but does not change accordingly. Student's social media usage is significant according to grade level ANOVA results on whether they differ or not are given in Table 5.

Table 5. *Social Media Use by Grade Level*

	Source of variance	Sum of squares	df	Average of squares	F	p	Significant difference
Competency	Between groups	197.963	3	65.988	4.532	.004*	11>9
	Within groups	8212.162	564	14.561			12>9
	Total	8410.125	567				
Continuity	Between groups	121.532	3	40.511	2.676	.046*	10>9
	Within groups	8538.468	564	15.139			11>9
	Total	8660.000	567				
Social Media	Between groups	593.478	3	197.826	4.139	.006*	11>9
	Within groups	26958.647	564	47.799			
	Total	27552.125	567				

*p<.05

When the social media usage of the students was examined according to the grade level, a statistically significant difference was seen in the sub-dimensions of continuity [F(3-564)=4.532, p=.004], competence [F(3-564)=2.676, p=.046] according to the ANOVA result and [F(3-564)=4.139, p=.006] in the overall scale (p<.05). According to the results of the LSD test to reveal the source of the difference between the groups; 11th and 12th graders use social media for longer than 9th graders. 10th and 11th graders are more proficient in social media than 9th graders. 11th graders use social media more than 9th graders, both in terms of duration and competence. When the social media usage of the students was examined according to the type of school, there was no statistically significant difference in the ANOVA result. The t-test results on whether the students' social media use differed significantly according to their smartphone use situations are given in Table 6.

Table 6. *Social Media Use According to Smartphone Use*

	Smart Phone	N	$\bar{X}$	sd	t	df	p
Competency	Yes	563	10.91	3.84	2.505	566	.013*
	No	5	6.60	2.19			
Continuity	Yes	563	12.03	3.90	2.191	566	.029*
	No	5	8.20	2.86			
Social Media	Yes	563	22.95	6.95	2.615	566	.009*
	No	5	14.80	4.32			

* p<.05

When the social media usage of the students participating in the research was examined according to their smartphone usage situations; As a result of the t-test, a statistically significant difference was observed in the sub-dimensions of continuity [t(566)=2.505, p=.013], competence [t(566)=2.191, p=.029] and in the overall scale [t(566)=2.615, p=.009] (p<.05). Accordingly, it can be said that students who use smartphones use social media for longer periods of time and more competently. The t-test results on whether the students' social media use showed a significant difference according to their social media account status are given in Table 7.

Table 7. *Social Media Use According to Social Media Account Status*

	Account	N	$\bar{X}$	sd	t	df	p
Competency	Yes	523	11.08	3.86	5.723	58.85	.000*
	No	45	8.47	2.85			
Continuity	Yes	523	12.20	3.88	4.277	566	.000*
	No	45	9.64	3.51			
Social Media	Yes	523	23.28	6.94	5.995	57.20	.000*
	No	45	18.11	5.42			

* p<.05

In Table 7, when the social media usage of the students is examined according to their social media account; As a result of the t-test, a statistically significant difference was observed in the sub-dimensions of continuity [t(58.85)=5.723, p=.000], competence [t(566)=4.277, p=.000] and in the overall scale [t(57.20)=5.995, p=.000] (p<.05). Accordingly, it is observed that students with social media accounts use social media for longer periods of time and more competently.

Findings on the Metaverse Knowledge Levels

In this section, the mean and standard deviations of the total scores obtained from the Metaverse Scale, in the overall and sub-dimensions of the scale were given, and then the differences according to demographic variables were examined.

Table 8. *Metaverse Knowledge Levels of High School Students*

	$\bar{X}$	sd
Technology	22.41	6.39
Digitalization	9.72	2.84
Social	5.73	2.08
Lifestyle	9.89	2.96
Scale Wide	47.76	12.16

Table 8 shows the average scores of the students on technology ($\bar{X}$=22.41), digitalization ($\bar{X}$=9.72), social ($\bar{X}$=5.73), lifestyle ($\bar{X}$=9.89) sub-dimensions and scale overall ($\bar{X}$=47.76). Accordingly, it can be said that the Metaverse knowledge levels of the participants were above the moderate level in terms of 4 sub-dimensions and also scale wide. A maximum of 75 and a minimum of 15 points can be obtained from the Metaverse scale. Because of that scores are moderate. The t-test results of whether the Metaverse knowledge levels of the students showed significant differences according to gender are given in Table 9.

Table 9. *Metaverse Knowledge Levels by Gender*

	Gender	N	$\bar{X}$	sd	t	df	p
Technology	Female	322	22.02	6.09	-1.689	566	.092
	Male	246	22.93	6.74			
Digitalization	Female	322	9.48	2.82	-2.328	566	.020*
	Male	246	10.04	2.85			
Social	Female	322	5.81	1.99	1.050	566	.294
	Male	246	5.63	2.19			
Lifestyle	Female	322	9.66	2.95	-2.191	566	.029*
	Male	246	10.20	2.96			
Metaverse	Female	322	46.96	12.07	-1.784	566	.075
	Male	246	48.80	12.24			

* p<.05

When the Metaverse knowledge levels of the students were examined according to gender; as a result of the t-test, a statistically significant difference was observed in the sub-dimensions of digitalization [t(566)=-2.328, p=.020] and lifestyle [t(566)=-2.191, p=.029] (p<.05). Accordingly, it can be said that boy students have higher Metaverse knowledge levels within the scope of digitalization and lifestyle. There was no statistically significant difference between the average scores of females and males in the technology and social sub-dimensions and in the overall scale (p>.05). ANOVA results on whether the Metaverse knowledge levels of the students showed significant differences according to the grade level are given in Table 10.

Table 10. *Metaverse Knowledge Levels by Grade Level*

	Source variance	Sum of squares	df	Average squares	F	p	Significant difference
Technology	Between groups	192.898	3	64.299	1.580	.193	
	Within groups	22952.875	564	40.697			
	Total	23145.773	567				
Digitalization	Between groups	57.527	3	19.176	2.389	.068	
	Within groups	4526.964	564	8.027			
	Total	4584.491	567				
Social	Between groups	15.836	3	5.279	1.226	.299	
	Within groups	2427.951	564	4.305			
	Total	2443.787	567				
Lifestyle	Between groups	122.004	3	40.668	4.723	.003*	11>9
	Within groups	4856.445	564	8.611			12>9
	Total	4978.449	567				11>10
Metaverse	Between groups	1088.869	3	362.956	2.472	.061	
	Within groups	82805.603	564	146.818			
	Total	83894.472	567				

*p<.05

When the Metaverse knowledge levels of the students were examined according to grade level, a statistically significant difference was seen in the solitary lifestyle sub-dimension [F(3-564)=4.723, p=.003] according to the ANOVA result (p<.05). According to the results of the LSD test to reveal the source of the difference between the groups; It can be said that 11th and 12th grades have a higher level of knowledge in terms of lifestyle than 9th grade, 11th grade 10th grade. ANOVA results on whether the Metaverse knowledge levels of the students showed significant differences according to the type of school are given in Table 11.

Table 11. *Metaverse Knowledge Levels by School Type*

	Source variance	Sum of squares	df	Average squares	F	p	Significant difference
Technology	Between groups	393.939	2	196.969	4.891	.008*	1>3
	Within group	22751.834	565	40.269			2>3
	Total	23145.773	567				
Digitalization	Between groups	111.872	2	55.936	7.066	.001*	1>3
	Within group	4472.619	565	7.916			2>3
	Total	4584.491	567				
Social	Between groups	8.605	2	4.303	.998	.369	
	Within group	2435.182	565	4.310			
	Total	2443.787	567				
Lifestyle	Between groups	169.607	2	84.803	9.964	.000*	1>3
	Within group	4808.842	565	8.511			2>3
	Total	4978.449	567				
Metaverse	Between groups	1952.494	2	976.247	6.731	.001*	1>3
	Within group	81941.978	565	145.030			2>3
	Total	83894.472	567				

*p<.05

When the Metaverse knowledge levels of the students were examined according to the school type, a statistically significant difference was seen according to the ANOVA result (F(2-565)=4.891, p=.008], digitalization [F(2-565)=7.066, p=.001], lifestyle [F(2-565)=9.964, p=.000] and [F(2-565)=6.731, p=.001] in the overall scale (p<.05). According to the results of the LSD test to reveal the source of the difference between the groups; it is seen that the students of schools 1 and 2 have higher levels of knowledge in these 4 sub-dimensions than the students of school number 3. Accordingly, considering that school 1 and 2 receive students with higher base scores, it can be said that academic achievement is effective at the Metaverse knowledge level. The t-test results of whether the Metaverse knowledge levels of the students

showed significant differences according to their smartphone use situations are given in Table 12.

Table 12. *Metaverse Knowledge Levels by Smartphone Use*

	Smart phone	N	$\bar{X}$	sd	t	df	p
Technology	Yes	563	22.46	6.36	1.908	566	.057
	No	5	17.00	8.03			
Digitalization	Yes	563	9.74	2.84	1.360	566	.174
	No	5	8.00	3.39			
Social	Yes	563	5.74	2.07	1.658	566	.098
	No	5	4.20	2.17			
Lifestyle	Yes	563	9.90	2.95	.525	566	.600
	No	5	9.20	4.92			
Metaverse	Yes	563	47.84	12.09	1.731	566	.084
	No	5	38.40	17.64			

When the Metaverse knowledge levels of the students participating in the research were examined according to their smartphone usage situations; as a result of the t-test, there was no statistically significant difference in both the sub-dimensions and the overall scale (p>.05). Accordingly, it can be said that the use of smartphones has no effect on the Metaverse knowledge levels of the students. The t-test results of whether the Metaverse knowledge levels of the students showed significant differences according to their social media account status are given in Table 13.

Table 13. *Metaverse Knowledge Levels According to Social Media Account Status*

	Account	N	$\bar{X}$	sd	t	df	p
Technology	Yes	523	22.55	6.42	1.745	566	.082
	No	45	20.82	5.90			
Digitalization	Yes	523	9.75	2.84	.841	566	.401
	No	45	9.38	2.85			
Social	Yes	523	5.79	2.09	2.244	566	.025*
	No	45	5.07	1.86			
Lifestyle	Yes	523	9.88	2.96	-.306	566	.760
	No	45	10.02	3.09			
Metaverse	Yes	523	47.97	12.18	1.420	566	.156
	No	45	45.29	11.88			

* p<.05

When the Metaverse knowledge levels of the students are examined according to their social media account status; as a result of the t-test, a statistically significant difference was observed in the social sub-dimension [t(566)=2.244, p=.025] (p<.05). Accordingly, it can be concluded that students with social media accounts possess a higher level of knowledge in the social domain. A correlation analysis was performed to reveal whether there is a significant relationship between high school students' social media use and Metaverse knowledge levels. According to Büyüköztürk (2011), the correlation coefficient ranges between 1.00 and -1.00. The correlation coefficient between .70-1.00 is high; between .69-.30 is medium; and the correlation coefficient between .29-.00 is an indication of a low level of relationship. 0 indicates there is no relationship. Since the data have a normal distribution and both variables are continuous, the Pearson correlation coefficient was calculated. The analysis results are presented in Table 14.

Table 14. *The Relationship between Social Media Use and Metaverse Knowledge Levels*

		Technology	Digitalization	Social	Lifestyle	Metaverse
Continuity	r	.383**	.352**	.331**	.214**	.392**
	p	.000	.000	.000	.000	.000
Competency	r	.504**	.462**	.414**	.277**	.511**
	p	.000	.000	.000	.000	.000
Social media	r	.494**	.453**	.415**	.273**	.503**
	p	.000	.000	.000	.000	.000

*p<.05

When examining the correlation analyses in Table 14, it was found that both consistent and proficient use of social media had a positive relationship with all sub-dimensions of Metaverse knowledge levels. With continuous social media usage, there was a moderate-level relationship between technology, digitalization, social sub-dimensions, and the overall Metaverse knowledge level. However, a low-level relationship was observed with the lifestyle dimension. With proficient social media usage, there was a moderate-level relationship between technology, digitalization, social sub-dimensions, and the overall Metaverse knowledge level. However, a low-level relationship was identified with the lifestyle dimension. With general social media use, there was a moderate-level relationship between technology, digitalization, social sub-dimensions, and the overall Metaverse knowledge level. However, a low-level relationship was noted with the lifestyle dimension. Therefore, it can be said that high school students' prolonged and competent use of social media leads to a significant change in their Metaverse knowledge levels.

CONCLUSION AND DISCUSSION

In this research, the total scores obtained from the scales were analysed and the relationship between high school students social media use and Metaverse knowledge levels was examined according to different variables. It was revealed that the duration of the students participating in the research and their competence in terms of social media were moderate and female students were more engaged with social media. Similarly, some researchers found that females social media addictions are higher than males (Güney and Taştepe, 2020; Demircan, Işık and Gürhan, 2022; Bozkurt and Bozkurt, 2021). However, Çalapkulu and Sarı (2022) emphasized that individuals' social media addiction does not show a significant difference according to gender, but only differentiation in the sub-dimension of busyness. In addition, according to Güney and Taştepe (2020), there is no difference in the sub-dimension of competence and general social media use according to gender.

When students' social media usage was examined according to grade level; grades 11 and 12 use social media longer than 9th graders. 10th and 11th grades use social media more proficiently than 9th graders. 11th graders use social media more than 9th graders, both in terms of duration and competence. In support of these findings, Hazar (2011) and Çetinkaya (2013) stated that internet-based addictions differ according to grade level; by contrast with Güney and Taştepe (2020), who reached a different conclusion, concluded that adolescent's social media addictions do not change according to grade level.

In this research, there is no statistically significant difference according to school type. Also Akyürek (2020) stated that high school students perceptions of their attitudes towards social media did not change significantly depending on the school type variable.

It has been revealed that students who use smartphones and have social media accounts use social media for longer periods of time and more competently. As a result of his research,

again similarly, Üstündağ (2022b) concluded that there is a significant and positive relationship between smartphone use and both social media and game addiction.

As a result of the research, the level of knowledge of the participants in Metaverse was above the average level in all 4 sub-dimensions. Avcu, Tilki, Dereli and Aksoy (2023) also revealed that students' levels of Metaverse knowledge, skills, and awareness are at a high level.

In terms of gender, male students have higher levels of knowledge of Metaverse within the scope of digitalization and lifestyle. Supporting this conclusion; Aburbeian, Owda and Owda (2022) found that males are more interested in the Metaverse than females. In the research conducted by Karababa, Turan and Savaş (2022) with pre-service teachers, it was determined that the Metaverse knowledge levels of male pre-service teachers were significantly higher than females. There is no difference between male and female students in the sub-dimensions of technology and social and in the scale in general.

In the examination made by grade level, 11th and 12th grades have a higher level of Metaverse knowledge than 9th grades, and 11th grades have a higher level of Metaverse knowledge within the scope of lifestyle than 10th grades. Karababa et al. (2022) stated that in their research, students' Metaverse knowledge levels regarding classroom situations did not have any statistically significant difference in all sub-dimensions and total scores.

Considering the school type of the students participating in the research, the Metaverse knowledge levels of the students of the two schools that accept students with higher base scores are higher. Similarly, Aksak (2017) and Çap (2017) found that there was a significant variable according to the type of school. However, unlike these findings, no significant difference was found in the research conducted by Akyürek (2020).
In the research, it was revealed that while the use of smartphones did not have an effect on the Metaverse knowledge levels of the students, the students with social media accounts had a higher level of knowledge in the social context.

According to another result of the research, both continuous and competent use of social media has a positive relationship with all sub-dimensions of Metaverse knowledge levels. With the continuous use of social media; there is a moderate relationship between technology, digitalization, social sub-dimensions and the general Metaverse knowledge level, and a low level of relationship between the lifestyle dimensions. Conversely, in the research conducted by Karababa et al. (2022), no statistically significant difference was found in all sub-dimensions of the Metaverse knowledge levels regarding daily internet usage situations and in the total score.

With the competent use of social media; there is a moderate relationship between technology, digitalization, social sub-dimensions and the general Metaverse knowledge level, and a low level of relationship between the lifestyle dimensions. With general use of social media; there is a moderate relationship between technology, digitalization, social sub-dimensions and the general Metaverse knowledge level, and a low level of relationship between the lifestyle dimensions. Accordingly, it is thought that high school students' use of social media for a long time and competently causes a change in their Metaverse knowledge levels.

Suggestions

Support can be obtained from school counseling services for female students who spend more time on social media. Especially considering that students who have reached the 11th and 12th grades and will take the higher education transition exam use social media more competently; this situation can be turned into an advantage. Practice exams, sample question solutions, etc. can be given via social media. Group features in social media environments can be used in group work and activities. At the same time, trainings for teachers can be organized and information can be given about how to use social media more effectively in their lessons

and in-school work. Projects can be prepared to raise awareness about the problematic use of social media.

Seminars for students and parents can be planned in order to correctly perceive the concept of Metaverse, which is one of the newest technologies of today and will be encountered in every field in the near future. Content for the concept of the Metaverse can be added to the curriculum of the Computer Science course taught in high schools. Virtual educational environments can be designed where each student has an avatar. In order not to fall behind the Industry 4.0 industrial revolution, a new generation of classrooms can be created that will shape the future and where high school students will use technology effectively. Future research may reach different conclusions using different variables that may influence social media usage and Metaverse knowledge levels at different grade levels and school types. Qualitative research can be carried out in which more in-depth data can be collected.

Statement of Researchers

Researchers contribution rate statement:

Study conception and design: Eray Yılmaz; data collection: Ceren Ünal and İremnur Demir; analysis and interpretation of results: Eray Yılmaz; draft manuscript preparation: Ceren Ünal and İremnur Demir. All authors reviewed the results and approved the final version of the manuscript.

Conflict statement:

First Author declares that he/she has no conflict of interest.
Second Author declares that he/she has no conflict of interest.
Third Author declares that he/she has no conflict of interest.

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Research Article

Digital Security & Media, *1*(1), 60-77

The analysis of postgraduate studies on AI in education in Türkiye

Received: 11/05/2024
Revised: 21/11/2024
Accepted: 23/11/2024

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Abstract

Research to answer the question "How can artificial intelligence be utilized in educational applications?" has been gaining serious momentum over the years. Thanks to thinking machines, teachers can offer his expertise with more meaningful and economic opportunities, while learner become an autonomous learner. On the other hand, artificial intelligence (AI), which increases the quality of distance education that offers equal opportunities in education, enables students to become individuals who research and develop in the classroom environment. Therefore, the current situation regarding the application areas of AI in education, which is a subject of global curiosity, has become the focus of research in many countries. In this study, it is aimed to examine the studies published by universities in Türkiye between the year 2000 and 2024 on AI in education through criteria of publication year, research method, universities, study type (master's or doctoral) and focus group/ AI applications. As a result of content analysis, it is concluded that there is an increasing interest for AI in education faculties especially after the year of 2021. After result and conclusion, there are some suggestions for academicians, researchers and prospectives teachers.

Keywords: Artificial intelligence, education, thesis, dissertations, postgraduate.

Cite: Dağdemir, V. (2024). The analysis of postgraduate studies on ai in education in Türkiye. *Digital Security & Media, 1*(1), 60-77

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INTRODUCTION

While technological developments show its impact on many sectors, the field of education is looking for new ways to meet the needs of era. In addition to devices like interactive boards and tablets, digital learning platforms provide the opportunity to change students' role from passive to autonomous learners. One of the remarkable methods to recover academic and social demands of new generation and teachers is teachnology of artificial intelligence (AI). From its first studies in 1960s, AI has been an object of interest. Many countries around the world try to catch the developments as it grows up quicker than anything. It can be stated that advancements in education mostly mean to place AI in education. That's why it would be very useful to analyse scientific studies to describe the framework and outputs of AI in education (AIED).

AEID studies can been categorised into three groups as learner-centred, instructor-centred and institution-centred. Firstly, learner-centred practices represents the digital platforms in which students are users and the main point is to active students self-learning skills. Secondly, although the aim of teacher-centred practises is to provide students more qualified experience, the teacher is user. Preparing and picking up educational materials, assessment and evaluation processes are common use of this practises group. Lastly, institution-centred is essentially related to administrative stuffs like admission, scheduling or detecting risks and problems. Classification of these studies in a table is shown below (Chassignol, et al., 2018; Holmes and Tuomi, 2022; Labadze, et al., 2023; Ouyang and Jiao, 2021):

Table 1. *Classification of AI Practises in Education*

Learner-centred	Instructor-centred	Institution-centred
• Intelligent Tutoring Systems	• Plagiarism	• Admission
• AI-Supported Apps	• Smart Curation of Learning Materials	• Course Plans, Scheduling
• AI-supported Simulations	• Classroom Monitoring	• e-Proctoring
• AI for Special Needs Learners	• Automatic Summative Assessment	• Identifying Risky Learners
• Chatbots	• Classroom Management	
• Automatic Formative Assessment		
• Learning Network Orchestrator		
• Dialogue-based Tutoring Systems		

As it is shown in the table, learner-centred practises have 8 titles: AI-supported Apps, AI for Special Needs Learners, Intelligent Tutoring Systems, AI-supported Simulations, Chatbots, Automatic Formative Assessment, Learning Network Orchestrion, Dialogue-based Tutoring Systems. On another hand, Plagiarism, Intelligent Materials, Classroom Monitoring, Automatic Summative Assessment and Classroom Management are topics on which instructors need help by AI. Lastly, under institution-centred title there are 4 main topics: Admission, Course Planning and Scheduling, Identifying Risky Students and E-Proctoring. Under the next titles, each topic is defined.

1) Learner-centred AI

a) Intelligent Tutoring Systems (ITS)

It's the most funded and common area in AIED studies. The main purpose of these systems is to collect data from students' answers and provide an individualized and linear teaching order. Based on their answers, difficulty level of materials and types of content are presented in an AI-supported estimated manner. In addition, instant feed is one of the key points for this kind of practises. Students are active receiver in the systems based on the philosophy of behaviourism (Ouyang and Jiao, 2021). Spark, from a French company, is an example of ITS.

It provides individualised pathways for learners and a dashboard with analytics for teachers. Another example is Gooru Navigator in which the application routes ways for user's strengths, weakness and goals. If it needs, it can reroutes the pathways.

b) AI Supported Apps

In recent years, AI-based educational apps have been offered to the market in many disciplines such as English language, maths, history and geography. It can be stated that they are more specific than ITS. These tools analyse and present data in an "intelligent" way to engage learners in deep thinking. Thanks to AI support, the computer instantly collects learners' data and encourages them to develop higher thinking skills by providing activities based on their background and interests. However, the contribution level of such applications is controversial among researchers. For example, Chinese government has banned AI-based homework apps for students as it blocks learners creative thinking skills (Dan, 2021).

c) AI-Supported Simulations (Virtual Reality, Augmented Reality)

By adding interactive and intelligent functions to serious games designed for educational purposes, an environment can be prepared especially for collaborative and creative activities (Terzidou and Tsiatsos, 2016). Students are allowed to feel more meaningful and qualified experiences when Augmented Reality and Virtual Reality technologies are incorporated to disciplines such as health sciences and engineering. Google Arts and Culture is one of the example of this practises.

d) AI for Special Needs Learners

AI-supported applications are available to compensate for learning difficulties such as dyslexia, Attention Deficit/Hyperactivity Disorders (ADHD), dysgraphia, autism or physical disabilities. For example, the StorySign application developed by Huawei for children with hearing difficulties can be given as an example (Huawei, 2022).

e) Chatbots

Chatbots provide instant support by answering questions, providing explanations, and additional resources with various guidance. Chat agents, Chatbots can also act as virtual teaching assistants that provide support to instructors before, during or after teaching. Such applications are very useful for institutions where the student capacity is high and it is difficult for real people to answer all questions. Ada (named after the computer pioneer Ada Lovelace), virtual teaching assistant (TA), ChatGbt, Claude, Microsoft Bing AI, Meta AI can be cited as examples of chat robots used in the field

f) Automatic Formative Assessment (AFA)

Automated formative assessment applications use natural and semantic language processing together, in addition to other AI techniques. They are applications that provide quick and effective feedback on students' writings or other outputs. There are few studies and examples of this title as it is difficult to offer correct and helpful feedback. Open Essayist is an example of AFA practises. It provides feedbacj on essays.

g) Learning Network Orchestrator (LNO)

In the learning network orchestrator, for instance, if a student does not understand the subject in class, he/she logs into the mobile application and selects the topic. One of the online instructors explains the subject in the form of a private lesson, only by making voice calls and sharing the screen. Instructors are constantly rated by previous learners. Therefore, a learner can choose the instructor he wants to listen according to the ratings and instructors are supported by AI functions during teaching process. Since real teachers are used in these applications, it can be said that it costs high. OpenTutor application can be given as an example. Lessons are for 20 minutes and with human tutors. AI has a supporter role while the student decides what he wants to learn by himself.

h) Dialogue-based Tutoring Systems (DTS)

Dialogue-Based Tutoring Systems, where natural language processing is used, are applications offered within the framework of cognitive and social cognitive philosophy as it brings real teachers and students together by talking or texting. The most important part of the system is that it is based on different Socratic principles. Instead of classical lectures, teaching is provided through questions. AutoTutor which is the research of Memphis University, is one of the best-known examples.

2) Teacher-centred AI

a) Plagiarism

This kind of software, which are frequently used by teachers, have both paid and free versions. Examples of plagiarism detection programs that provide the originality rate in written texts can be given as follows: Turnitin, iThenticate, Plagiarism Checker X, Grammarly.

b) Smart Curation of Learning Materials (SCLM)

It becomes a time-consuming problem for the teacher to find correct material, as the internet has more and more data day by day. Educational resources for the purpose are automatically selected with applications such as X5GON (research tool), Teacher Advisor and Clever Owl.

c) Classroom Monitoring

AI-supported video applications can observe students in the classroom in terms of their focus levels (Lieu, 2018). In addition, there are studies that allow students to monitor and record mental activities by wearing EEG (Electroencephalography). For example, US based BrainCo application's headsets software provide instructor to signal to the panel when the learner needs more support during the lesson. It shows blue lights for pupils whose mental activities are slow, yellow is for average and red lights when mental progress is more than average.

d) Classroom Management

Classroom management is a concept that is about how a teacher manages activities for effective teaching within the available schedule, time and space. Although it has just started, there is some research on getting AI support in classroom management. In the FACT application, which is an example of this, while students solve the activity in small groups, the application offers recommendations to the instructor on which groups to visit and what to say (VanLehn, et al., 2019).

e) Automatic Summative Assessment (ASA)

After ITS, one of the most invested applications in the field of AIED is automatic summative assessment applications. These applications (called as autograder as well) are designed to evaluate written assignments and reports and they detect errors, explain how to correct them, and evaluate by providing the correct answer rate (Hsu, et al., 2021). A commercial example of ASA is e-Rater which is used for automated essay scoring since 1999 (Attali and Burstein, 2006).

3) Institution-centred AI

a) Admission

Nowadays, many institutions use AI-based software to recruit personnel (Suen and Hung, 2023; Suen, Chen and Lu, 2019). Software that enables remote interviews with interactive programs evaluates competencies and skills of candidates both academically and intuitively, while providing employers with insight into which position they are suitable for. The ethical view of the practice continues to be discussed in the scientific literature. GRADE, which is developed by the University of Texas, make suggestions on applicants by using data of test scores, academic background and recommendation letters.

b) e-Proctoring

Schools have done mid-term and final exams online after pandemic years. But there are some problems about integrity in academic. The purpose of e-Proctoring practises is to monitor students during online exams by AI-supported cameras microphone. EduSynch is one of the the example of the practises as it uses AI and human invigilators to ensure exam integrity and prevent students from academic dishonesty (EduSynch, 2024).

c) Course Planning and Scheduling

Lecture plans are prepared on students' academic and social background, interest and target of the expanded programme. Today, there are some studies that aims to guess students' achievements in the next term or difficulty level of next exams to be able to edit plans and programmes. This kind of practises enable administration objective views and tracks to manage the school.

d) Identifying Risky Learners

Preventive actions have an important role in education. AI-supported applications let administration team and school consultants to determine students at risk both in academic and social. Data given to the applications provide instructors what students are going to do in the next exam, task or social activities with clarified percentage.

It is very important to follow the developments in the field of education and to reveal the current situation in the country in terms of progress. However, while doing this, the researches should be carried out within the correct classification. Otherwise, a correct evaluation may not be made. The types of AIED reflected above can be seen in the analysis system of many studies in the international literature. In the following chapters, you will read the analyses of studies in Türkiye according to this classification.

In this research, it is aimed to examine the postgraduate studies published by universities in Türkiye on AIED between 2000 and 2024 according to publication year, research method, universities, thesis type, focus group and AI application. The research questions on which the study is based on are as follows:

1) How is the distribution of studies according to the year of publication?
2) How is the distribution of studies according to research method?
3) How is the distribution of studies according to their universities?
4) How is the distribution of studies according to type (Master's or Doctoral)?
5) How is the distribution of studies according to focus group and AI applications?

METHOD

Research Design

This research was conducted within the framework of qualitative research designs. Qualitative research is an interpretative perspective based on the research problem of a social problem of individuals or groups. The researcher interprets the problem with his/her own deep thoughts while exhibiting both deductive and inductive approaches from this perspective (Creswell, 2013).

Data Collection Techniques

For examining artificial intelligence research in education, the document analysis technique, which is used in both qualitative and quantitative designs, was used. Document review can be considered as the examination of all kinds of written documents after the purpose of the research is clarified. It can be handled at different stages of the study. For example, scientific literature can be examined to develop a scale or it can be used directly as a research technique (Sönmez and Alacapınar, 2014). Through the Higher Education Institutions (YÖK) Database (https://tez.yok.gov.tr/UlusalTezMerkezi/), the studies searched with keywords with "artificial intelligence", "intelligent", "chatbots/chat agents" were examined in detailed and 72 studies were determined according to their research purposes.

Data Analysis

In this research content analysis method was used. Content analysis, which is frequently applied especially in social sciences, can be explained as dividing the written text into categories with certain codes and summarizing it with a systematic technique (Büyüköztürk, et al., 2020). The themes and codes to be used in the content analysis of 72 studies were created with the framework given above and accepted in the literature. While the themes for the analysis of the identified studies are "student-centred AI, teacher-centred AI and institution-centred AI", the codes are the AI application types. It means Table 1. Also representes themes and codes of this research.

FINDINGS

In this study, postgraduate research published by universities in Turkey between the year of 2000 and 2024 was analysed. It may be fruitful to see the findings obtained to researchers studying in the related field. The table presenting the 72 postgraduate researches in detailed is attached in the end of the paper.

Distribution of Studies According to the Year of Publication

The graph showing the completion rate of postgraduate thesis studies on artificial intelligence in the field of education by year is as follows:

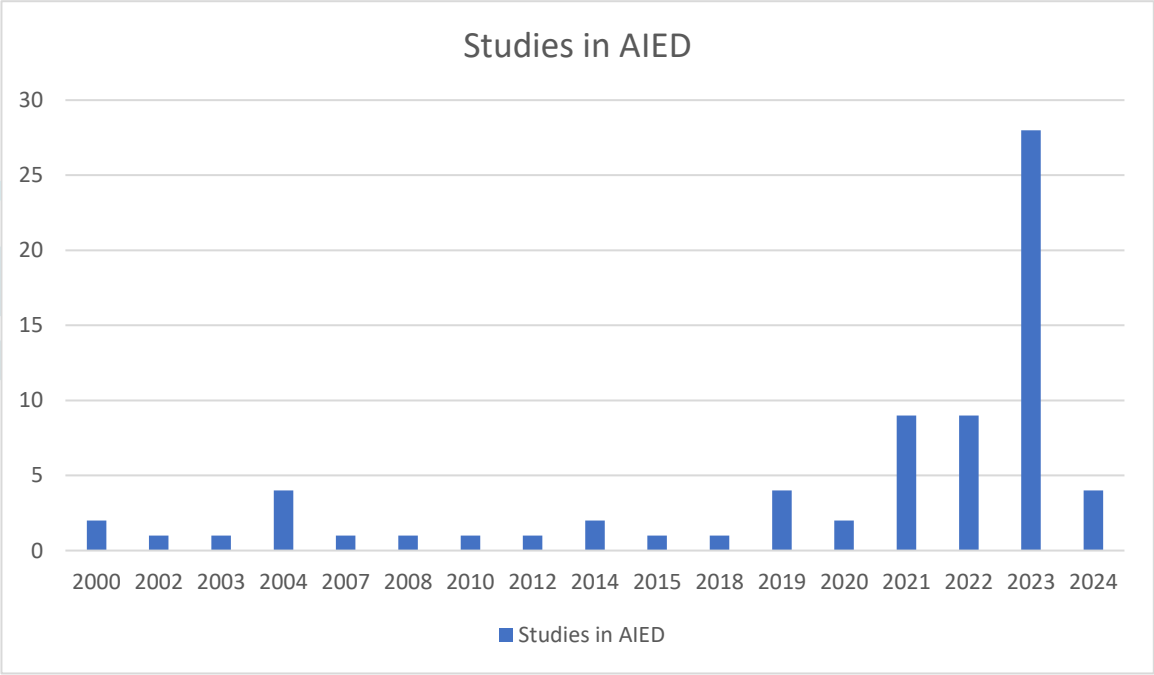

Figure 1. *Studies According to the Year of Publication*

Looking at the graph above, there were 2 in 2000, 1 in 2002, 1 in 2003, 4 in 2004, 1 in 2006, 1 in 2007, 1 in 2008, 1 in 2010, 1 in 2012, 2 in 2014, 1 in 2015, 1 in 2018. While there were 1, 4 studies in 2019, 2 studies in 2020, 9 studies in 2021 and 2022, it is seen that 28 studies were written in 2023, with a fast increase. It has been determined that 4 studies have been written in 2024, although the year have not been completed yet.

Distribution of Studies According to Research Method

The methodological framework of the studies written by postgraduate students on AIED is another research sentence of the research. The graph showing the distribution according to the methods is as follows:

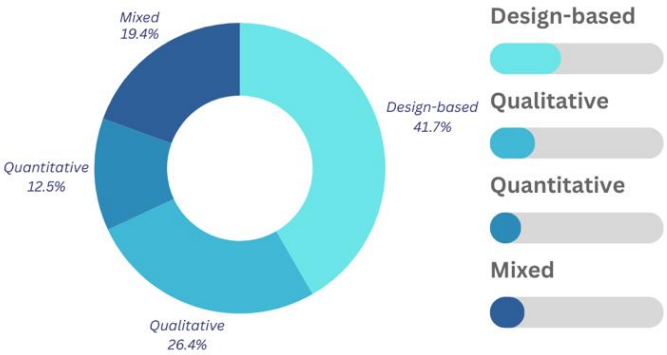

Figure 2. *Studies According to Methodology*

When the graph above is examined, the research methods of the studies are in order of density: 41.7% (30) are design-based, 26.4% (19) are qualitative, 19.4% are mixed (14) and 12.5% are quantitative (9) was determined.

Distribution of Studies According to Their Universities

Studies on AIED vary depending on the universities they are affiliated with. The table showing the number of studies in this field at 33 different universities is shown below.

Table 2. *Studies According to Universities*

University	Number	University	Number	University	Number
Anadolu University	7	Sakarya University	2	Erzincan Binali Yıldırım University	1
Bahçeşehir University	7	Kocaeli University	2	Çankaya University	1
Fırat University	5	İstanbul Aydın University	2	Van Yüzüncü Yıl University	1
METU	4	Karabük University	2	Trabzon University	1
Atatürk University	4	İnönü University	2	Mersin University	1
Marmara University	4	Çanakkale 18 Mart University	1	İstanbul Okan University	1
Gazi University	3	Karadeniz Tech. University	1	19 Mayıs University	1
Ankara University	3	Afyon Kocatepe University	1	Yıldız Teknik University	1
Bursa Uludağ University	3	Harran University	1	Düzce University	1
İstanbul University	3	Süleyman Demirel University	1	Çankırı Karatekin University	1
Çukurova University	2	Tekirdağ Namık Kemal University	1	Muğla Sıtkı Koçman University	1

One of the issues addressed within the framework of the research questions is to reveal the density of studies in terms of universities. It is seen that there 33 universities which have published thesis or dissertations in AIED. On the other hand, it could be said that Anadolu University, Bahçeşehir University and Fırat University are the most published studies in the country. The other universities and number of studies are shown in the table above.

Distribution of Studies According to Type (Master's or Doctoral)

In Türkiye, over a 24-year period (2000-2024), postgraduate stud which deal with the relationship between education and AI have been examined in two different types: master's and doctoral. For this analysis, the graph showing the distribution of 72 studies is as follows:

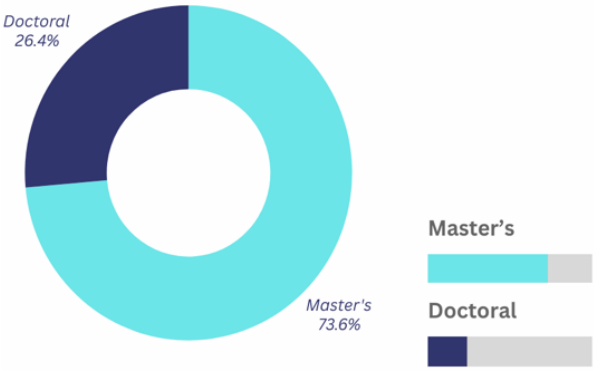

Figure 3. *Studies According to the Types*

Looking at the graph above, while 73.6% (53) of the 72 sample studies were completed as master's degree and 26.4% (19) were submitted to the literature at the end of doctoral programmes.

Distribution of Studies According to Focus Group and AI Practises

Studies in the field of AIED, published by universities in Türkiye, were analysed according to certain themes on literature review. The table showing the classification of them is as follows:

Table 3. *Studies According to Focus Group and AI Practises*

Focus Group	AI Apps	Diss. Code
Learner-centred	AI-supported Applications	T6, T7, T17, T18, T24, T25, T27, T32, T34, T35, T36, T37, T39, T42, T43, T44, T47, T48, T49, T51, T52, T54, T57, T64, T66, T69, T70
	ITS	T1, T2, T3, T4, T5, T9, T12, T13, T26, T29, T56
	Chatbots	T11, T38, T40, T41, T46, T62, T65, T71
	AI for Special Needs	T22, T58
	DBTS	T55
Instructor-centred	ASA	T10, T14, T19, T20, T28, T30, T31, T33, T59, T60, T67
	SCLM	T15, T16, T23, T61, T68
	Classroom Monitoring	T72
Institution-centred	Course Plan. Scheduling	T8, T21, T45, T53
	Identifying Risky Learners	T50, T63

Looking at the table above, studies published between 2000 and 2024 were mostly discussed in the field AI-supported applications from the student-centred group. ITS, chatbots, AI for learners with special needs and dialogue-based tutoring systems are student-centred AI application areas. When the studies where teachers are at the centre are examined, although it has been determined that automatic summative (ASA) assessment is the majority, there are research in the fields of curation of smart learning material, classroom monitoring. Finally, in order to produce administrative solutions, it is seen that researches have been published on course planning and scheduling and identifying risky learners, which are institution-cantered AI practises areas.

RESULTS and DISCUSSION

It can be said that AI, which is seeking practises areas to increase quality in many sectors every year, has become a necessity today. National and international research shows that AI technologies have got around many steps of the education process. This study aims to examine the studies published by universities in Türkiye between 2000 and 2024 on certain themes. It is thought that this research will shed light on educational researchers, especially in the field of technology. As a result of the analysis, some inferences can be made about what the current situation is.

The studies identified within the framework of the first research question were analysed according to years. It is seen that AIED studies have started to increase significantly after the year of 2021. Looking at the findings, it can be said that this rise will continue in the following years. Güzey et al. (2023), who examined AI research in education in the Web of Science database between 2019 and 2021, found that there were 24 studies in 2019, 38 in 2020 and 86 in 2021. Therefore, it can be said in parallel that research in the field of AIED is constantly increasing every year in Türkiye.

When we look at the findings showing the distribution of studies according to research methods, it is seen that design-based research is in the majority. The value of theoretical studies is undeniable. However, it has critical importance for the literature that researchers and universities do not feel limited to scanning and contribute literature with studies in the experiential dimension by making designs. This also encourages those who want to work in the relevant field. Akdeniz and Özdinç (2021) classified the 37 post graduate studies and articles they identified according to qualitative, quantitative, mixed and design-based methods. As a result of their analysis, it is seen that there are 5 qualitative, 7 quantitative, 8 mixed and 17 design-based studies. Güzey et al. (2023) classified the 148 articles they examined as experimental-applied (79), literature review (29), descriptive (16), action (15), method study (7) and professional study (2). When the literature is followed, it is clear that design-based and experimental research are in the majority. On the other hand, Meço and Coştu (2022) present a result in opposite, while emphasizing that the dissertations and articles they examined were mostly in the scanning method.

Limitations & Recommandations

This study is limited to the studies completed between 2000 and 2024 (May). It is researched on the database of YÖK TEZ (Higher Education).

At the end of the research, which aims to analyse the theses completed in the field of AIED between 2000-2024 according to certain themes, some contributions can be made to the literature.

- After the results of the analysis have analysed, it is determined that there are no studies on AI-supported Stimulations, Automatic Formative Assessment, Learning Network Orchestrator, Plagiarism, Classroom Management, Admission and e-Proctoring. It can be said that researchers' orientation towards these missing areas will contribute to the scientific literature.
- It was determined that doctoral studies were at a low rate. It is recommended that academicians encourage doctoral students to conduct research in the field of EYZ.
- Finally, for understanding the educational philosophy that will be provided by the use of artificial intelligence in education, qualitative studies that offer the opportunity for in-depth examination and reveal the needs and demands of teachers, students and decision makers can be applied more intensively.
- It is recommended that the similar study could be conducted on different databases.

Statement of Researchers

Researcher's contribution rate statement: Since the study has a single author, the entire contribution belongs to the author.

Conflict statement: The author declares that he/she has no conflict of interest.

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Attached File: ***Studies about AIED*** **in Türkiye**

	Studies	Type	Method	Focus Group	AI Application
T1	Integration of web based adaptive and intelligent education system into METU-online (Şimşek, 2000)	Master's	Design-based	Learner	ITS
T2	Development of an intelligent agent for distance learning (Özdemir, 2000)	Master's	Design-based	Learner	ITS
T3	A model concerning the usage of artificial intelligence program techniques on computer aided education (Tamer, 2002)	Master's	Design-based	Learner	ITS
T4	Development of an intelligent tutoring system for distance education at master's level (Yeşiltaş, 2003)	Master's	Design-based	Learner	ITS
T5	Developing an artificial intelligence based instructional software (Demir, 2004)	Master's	Design-based	Learner	ITS
T6	Computer aided preschool education and artificial intelligence (Karadayı, 2004)	Master's	Qualitative	Learner	AI Apps
T7	The effects of fuzzy logic and cybernetics on cyber society and artificial intelligence (Işıklı, 2004)	Master's	Qualitative	Learner	AI-supported apps.
T8	Using two artificial intelligence techniques, genetic algorithms and tabu search, in the preparation of weekly timetables in academic institution (Gülcü, 2004)	Master's	Design-based	Institution	Course Plan. Sch.
T9	Artificial intelligence and web based intelligent tutoring system design in learning-teaching process and an application in mathematics teaching (Keleş, 2007)	Doctoral	Design-based	Learner	ITS
T10	Modelling an instructional expert system perspective in artificial intelligence (Erkoç, 2008)	Master's	Design-based	Instructor	AFA
T11	Usability of artificial intelligent conversational agents as student support service in distance education (Kayabaş, 2010)	Master's	Design-based	Learner	Chatbots
T12	Effect on students' academic development of intelligent electronic advisory system (Demirkol, 2012)	Master's	Design-based	Learner	ITS
T13	Investigation of the change in sixth grade students' problem solving abilities, attitude towards problem solving and mathematics instruction based on Polya's problem solving steps (Erümit, 2014)	Doctoral	Design-based	Learner	ITS
T14	Student consultancy service information infrastructure design using artificial intelligence technics (Kaynak, 2014)	Master's	Design-based	Instructor	ASA
T15	The implementation of intelligent question bank using Matlab software on Moodle learning management system (Beyazşekeroğlu, 2015)	Master's	Design-based	Instructor	SCLM
T16	Designing of intelligent question bank by using heuristic methods (Diri, 2018)	Master's	Design-based	Instructor	SCLM
T17	Using artificial intelligence in museum education (Aslan, 2019)	Master's	Qualitative	Learner	AI Apps
T18	Artificial intelligence based smart toys for preschool children: A design based study (Akdeniz, 2019)	Master's	Design-based	Learner	AI Apps
T19	Analysis and evaluation of the exam results of the students attending the university examination with artificial intelligence: 2018 Şanlurfa province (Tankuş, 2019)	Master's	Design-based	Instructor	ASA
T20	Predicting the success of distance education students using artificial intelligence techniques (Altınsoy, 2019)	Master's	Design-based	Instructor	ASA

T21	Building strategy decision model with artificial intelligence technique in open and distance flexible learning environments (Güler, 2020)	Doctoral	Qualitative	Instructor	Course Plan. Sch.
T22	Modelling reasons for reading problems experienced by third graders through artificial intelligence method (Çelik, 2020)	Master's	Mixed	Learner	AI for Special Needs
T23	Determination of difficulty level of Ataturk University Open Education Faculty exam questions with artificial intelligence methods (Canpolat, 2021)	Master's	Qualitative	Instructor	SCLM
T24	An artificial intelligence awareness level scale for teachers: A reliability and validity study (Ferikoğlu, 2021)	Master's	Quantitative	Instructor	AI Apps
T25	Analysis of university preferences for high school students studying in informatics with artificial intelligence methods (Türk, 2021)	Master's	Design-based	Learner	AI Apps
T26	The effect of artificial intelligence system on the academic success of students in the unit of interaction of light with matter (Kesler, 2021)	Master's	Mixed	Learner	ITS
T27	The effect of embedded system applications on intelligent device development performance, metacognitive awareness and academic achievement (Parlak, 2021)	Doctoral	Mixed	Learner	AI Apps
T28	Development of an machine learning-based system for determining the vocational future of students who will transfer to higher education (Sucu, 2021)	Master's	Quantitative	Instructor	ASA
T29	Intelligent tutoring systems on foreign language teachers using artificial intelligence (Şener, 2021)	Doctoral	Design-based	Learner	ITS
T30	Student academic oerformance prediction via artificial intelligence using machine learning algorithms (Bastem, 2021)	Master's	Design-based	Instructor	ASA
T31	Predicting graduation of open education high school students with artificial intelligence technics (Sulak, 2021)	Master's	Design-based	Instructor	ASA
T32	Perception of English language learners and teachers towards the use of artificial intelligence in the language classroom (Gücük, 2022)	Master's	Mixed	Learner	AI Apps
T33	Estimating LGS Revolution History and Kemalism subtests correct numbers using artificial intelligence methods (Başer, 2022)	Doctoral	Quantitative	Instructor	ASA
T34	The effect of course plan and contents developed for artificial intelligence teaching in secondary schools on students' metacognitive behaviours (Çolak, 2022)	Master's	Qualitative	Learner	AI Apps
T35	Analysis of instructional issues affecting the development of artificial intelligence literacy skills (Onat, 2022)	Master's	Qualitative	Learner	AI Apps
T36	Opinions of science teachers on the use of artificial intelligence in education (Bağır, 2022)	Master's	Qualitative	Learner	AI Apps
T37	The analysing of the points of science teachers concerning the usage of artificial intelligence technologies in science teaching (Sanca, 2022)	Master's	Qualitative	Learner	AI Apps
T38	The use of chatbots as an example of artificial intelligence application in social studies teaching (Yetişensoy, 2022)	Doctoral	Mixed	Learner	Chatbots
T39	The effect of use of artificial intelligence technologies in education on student success: Meta-analysis study (Altun, 2022)	Master's	Qualitative	Learner	AI Apps
T40	Interactive teaching of harmony between time and appearance markers and active attachment in teaching Turkish as a foreign language through chatbot (Çamcı, 2022)	Master's	Design-based	Learner	Chatbots

T41	An investigation of physicians' evaluations towards artificial intelligence chatbot's support for health literacy (Yıldız, 2023)	Master's	Qualitative	Learner	Chatbots
T42	The impact of physical programming in artificial intelligence training (Özyanık, 2023)	Master's	Qualitative	Learner	AI Apps
T43	Determination of pre-service teachers' awareness level on the concepts of artificial intelligence and artificial intelligence applications (Dumlupınar Arslan, 2023)	Master's	Quantitative	Learner	AI Apps
T44	Examination of artificial intelligence studies in education with social network analysis (Bayındır, 2023)	Master's	Qualitative	Learner	AI Apps
T45	Investigation of artificial intelligence readiness factors at open and distance education institution (Göçmez, 2023)	Doctoral	Qualitative	Institution	Course Plan. Sch.
T46	Examining attitudes towards chatbots used in open and distance learning support services (Helvacı Aydın, 2023)	Master's	Quantitative	Learner	Chatbots
T47	Examination of teachers' views on artificial intelligence-based language models (Kaya, 2023)	Master's	Qualitative	Learner	AI Apps
T48	An investigation of the effect of artificial intelligence-based education informatics network academic support system to the students' academic success (Aydın, 2023)	Master's	Quantitative	Learner	AI Apps
T49	Innovative effects of artificial intelligence on teacher education (Dengiz, 2023)	Master's	Qualitative	Learner	AI Apps
T50	Detecting the problems in distance education and predicting the academic performance of students by using artificial intelligence methods (Irmak, 2023)	Doctoral	Qualitative	Institution	Identifying Risky Learners
T51	An application example for the use of artificial intelligence in the art education (Erdurmuş, 2022)	Master's	Mixed	Learner	AI Apps
T52	The development of artificial intelligence literacy program for secondary school students (Özmutlu, 2023)	Doctoral	Design-based	Institution	AI Apps
T53	Determining the tendency of vocational high school information technologies teachers towards artificial intelligence and machine learning (Karahan, 2023)	Master's	Quantitative	Institution	Course Plan. Sch.
T54	Meta-analysis study on artificial intelligence applications in education (Yazar, 2023)	Master's	Qualitative	Learner	AI Apps
T55	Conversational artificial intelligence and foreign language: A model in the process of teaching speaking (Yavuz, 2023)	Master's	Design-based	Learner	DTS
T56	Analysis of e-learning settings, which are prepared on the basis of multiple intelligence domains determined by artificial intelligence in science instruction, as per different variables (Alan, 2023)	Doctoral	Mixed	Learner	ITS
T57	Opinions of high school principals and teachers on the use of artificial intelligence in education (Demir Dülger, 2023)	Doctoral	Mixed	Learner	AI Apps
T58	Teachers teaching special talent students AI awareness and innovative perspectives the relationship between (Yüregir, 2023)	Master's	Quantitative	Learner	AI for Special Needs
T59	Predicting of undergraduate students' course motivation using artificial intelligence methods (Yavuzarslan, 2023)	Doctoral	Design-based	Instructor	ASA
T60	Predicting science process skills with artificial intelligence and its effectiveness in students and gifted students (Sarığlu, 2023)	Doctoral	Design-based	Learner	ASA
Y61	Development of AI-powered chatbot for quantitive analysis selection (Ersöz, 2023)	Doctoral	Design-based	Learner	SCLM

T62	The creation of chatbots for a Frecnh forign language class: Contributions and limitations (Dündar, 2023)	Doctoral	Mixed	Learner	Chatbots
T63	The effect of intelligent affective feedback on learner engagement, satisfaction and perceived learning online learning (Kımav, 2023)	Doctoral	Mixed	Learner	Identifying Risky Learners
T64	Methodology and scope of graduate thesis completed between 2012-2022 on the use of intelligent technologies in foreign language education in Türkiye (Behbudova, 2023)	Master's	Qualitative	Learner	AI Apps
T65	Artificial intelligence supported student clubs chatbot application (Altunyurt, 2023)	Master's	Design-based	Learner	Chatbots
T66	Artificial intelligence education for secondary students the effect of its content on artificial intelligence literacy (Soylu, 2023)	Master's	Mixed	Learner	AI Apps
T67	Predicting student academic performance in the field of educational data mining with artificial intelligence supported machine learning algorithms (Bingül, 2023)	Master's	Design-based	Instructor	ASA
T68	Creation of question generation platfrom using artificial intelligence method (Erdoğan, 2023)	Master's	Design-based	Instructor	SCLM
T69	K-12 teachers' awareness and perceptions of artificial intelligence in education (Senger, 2024)	Master's	Mixed	Learner	AI Apps
T70	Higher education instructors' artificial intelligence awareness and its effect on some demographics (Kebapçı, 2024)	Master's	Quantitative	Learner	AI Apps
T71	The development of listening and speaking skills in EFL via an artificially intelligent chatbot application: A quasi-experimental design study (Koç, 2024)	Doctoral	Mixed	Learner	Chatbots
T72	Development of artificial intelligence software that instantly measures students' attention to the lesson (Dikmen, 2024)	Doctoral	Mixed	Instructor	Classroom Monitoring

Book Review

Digital Security & Media, *1*(1), 78-83

Review of the Book "Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning"

Received: 27/11/2024
Revised: 04/12/2024
Accepted: 13/12/2024

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Abstract

This paper provides an in-depth review of the book “Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning”. The review highlights that this book serves as a comprehensive resource, meticulously examining the implications of AI across different educational levels, from early childhood education to higher education. The book explores the practical applications of AI in enhancing teaching methods and learning outcomes and delves into ethical considerations related to its use in educational settings. Additionally, the book presents recommendations for leveraging AI effectively in the future of education. However, the review also identifies certain shortcomings within the book. One notable criticism is that it tends to overemphasize technical details, which may lead to a disconnect for readers who seek practical guidance. Furthermore, the review points out that some chapters lack sufficient real-world examples, making it challenging for educators to fully grasp how to implement the discussed concepts in their classrooms. Notably, the book encompasses a range of perspectives by including insights from both teachers and students, thereby enriching the discussion on the role of AI in education. By presenting diverse viewpoints, the book offers a more holistic understanding of how AI can be integrated into educational practices, highlighting opportunities and challenges ahead. While the book is a valuable resource, it could benefit from a more balanced approach that prioritizes actionable insights alongside technical discussions.

Keywords: Digital Communication, Education, AI, Teaching Practices, Future Learning.

Cite: Yıldırım Şen, İ. (2024). Review of the book "Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning". *Digital Security & Media, 1*(1), 78-83

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INTRODUCTION

"Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning" is a book edited by Queiros, Cruz, and Mascarenhas. It consists of four sections and twelve chapters and was published by IGI Global in 2024. This significant work explores the multifaceted impact of artificial intelligence on education. Within this context, the book offers a wealth of information, from current practices and ethical considerations to practical examples and future projections.

The book's most significant aspect is its authorial team, which comprises educators, researchers, policymakers, and technologists specializing in artificial intelligence and education. This diverse collaboration enables a comprehensive and nuanced exploration of the subject from various perspectives.

Sections and Chapters of the Book

The book covers the foundations, tools, and applications of artificial intelligence in education in four sections:

Section 1: Foundations of AI in Education

This section focuses on the issues underpinning the integration of AI in education.

Chapter 1 discusses the current applications and benefits of AI in education while also addressing the ethical aspects of this technology. The authors suggest steps to overcome ethical concerns.

Chapter 2 explores primary school teachers' attitudes towards AI. A survey of 200 primary school teachers in Ankara revealed that their attitudes differed according to their age, gender, computer skills, and experience using AI. This chapter emphasizes the importance of understanding teachers' perspectives to integrate AI in primary education successfully.

Chapter 3 addresses pre-service preschool teachers' experiences with AI and, based on the literature in this field, examines AI integration, AI literacy, AI in early childhood, and the role of teachers in using AI. Interviews and a literature review provide a detailed analysis of how pre-service teachers use AI tools in their educational process. Furthermore, recommendations are made regarding the ethical use of AI in educational settings and teacher preparation.

Section 2: AI Tools and Applications in Educational Settings

This section provides concrete examples and areas of application of AI in education.

Chapter 4 explores developing and implementing a custom MyGPT called 'PedaBuddy' in higher education as a case study. It discusses the basic principles behind generative AI tools and their potential to improve teaching-learning experiences. By detailing the configuration process and practical applications of PedaBuddy, the advantages and challenges related to the use of AI-driven tools in higher education are presented.

Chapter 5 discusses the transformative potential of Natural Language Processing (NLP) in higher education. It outlines how NLP can support and even automate tasks such as essay evaluation and material creation and enhance personalized learning through intelligent tutoring systems. It also emphasizes that NLP requires attention to ethics, privacy, and equity issues.

Chapter 6 focuses on the learning environment in the 21st century, where artificial intelligence and metadata store technologies are reshaping educational systems. It emphasizes that

education needs to be restructured to consider individual learning characteristics and the potential of AI-powered learning assistants in the form of meta-humans. The importance of selecting appropriate AI algorithms and linking them to individual differences to create personalized learning experiences is discussed.

Section 3: Designing AI-Enhanced Learning Environments

This section offers practical approaches to how AI can make learning environments more effective and efficient.

Chapter 7 discusses the development of an AI-based learning system for teaching biology. It discusses the advantages of AI in education, such as personalized learning programs and reduced teacher workload, and describes the system's design and development process in detail. The knowledge acquisition, representation, and evaluation phases are also described, showing how AI can improve student learning.

Chapter 8 discusses AI's revolutionary shift in educational assessment. It outlines how AI-driven systems can automate tasks such as item creation and feedback provision and enable teachers to focus on individualized instruction. On the other hand, the potential of intelligent curricula to personalize learning experiences is highlighted. Issues such as algorithmic bias and privacy are also highlighted.

Chapter 9 emphasizes the impact of digital learning systems, especially on students aged 6-12, and focuses on students' cognitive and emotional engagement. In the context of technological transformation, the importance of creating a holistic learning environment that considers the psychological and behavioral aspects of learning is addressed. Through a predictive analysis of student behavior, it is argued that educational systems must be carefully designed to integrate technological advances and support young learners' cognitive and emotional development.

Section 4: AI's Role in Teacher Training and Language Learning

This section examines how AI can contribute to teachers' professional development and language learning processes.

Chapter 10 details a pilot study focusing on the use of chatbots in higher education. The authors provide an overview of the history of AI in education and describe the research objectives, questions, and methodology. Through questionnaires and focus group interviews, insights were collected from students and faculty members about their experiences with AI. The chapter emphasizes the importance of informed professional development for faculty and ethics training for students.

Chapters 11 and 12 address the role of AI in second language acquisition, with a particular focus on English language learning among students in Portugal. The study emphasizes the importance of treating learners as active participants in shaping learning environments and allowing their perspectives to influence educational practices. Data was collected through an online survey targeting secondary school students from public schools in Portugal. Although AI is just emerging in Portuguese schools, students generally viewed AI-powered tools positively for learning English and everyday tasks. Importantly, they did not feel that AI jeopardized the role of the teacher and recognized the irreplaceable value of empathy and human connection. The study also recommends further research on students' perceptions of AI in education.

Importance of the Book and Contributions to the Literature

The book can be considered a comprehensive resource that addresses the impact and potential of artificial intelligence in education. The importance and contributions of the book can be listed as follows:

- *Examining Artificial Intelligence Applications in Different Educational Fields:* The book provides examples of how artificial intelligence can be used at different levels of education, from primary to higher education. For example, Chapter 2 examines primary school teachers' attitudes towards AI, while Chapter 4 discusses developing and implementing a unique MyGPT application called "PedaBuddy" in higher education. This diversity makes the book appealing to readers in different educational fields.

- *Providing Practical Information on Artificial Intelligence Tools and Applications:* The book provides practical information on how educators and researchers can use AI tools and applications. For example, Chapter 11 lists AI platforms and tools for language learning and highlights their features, applications, benefits, and limitations. This information is a valuable guide for those interested in using AI in education.

- *Addressing Ethical Issues in AI Integration:* The book does not ignore the ethical dimensions of using AI in education. Chapter 1 addresses the ethical challenges and opportunities of AI in education and suggests steps that can be taken to address these challenges. This perspective emphasizes the importance of using AI ethically and responsibly.

- *Inclusion of Student and Teacher Perspectives:* The book examines the role of AI in education from both student and teacher perspectives. For example, Chapter 10 describes a pilot study on using chatbots in higher education, including students and faculty members' views on their experiences with AI. This approach is essential to understanding the impact of AI integration on all stakeholders.

- *Providing Ideas for Designing Future Learning Environments:* The book offers ideas on how AI and metadata store technologies can shape future learning environments. Chapter 6 discusses the potential to deliver learning experiences tailored to individual learning characteristics and the development of AI-powered learning assistants in the form of meta-humans. These insights are essential for developing future strategies in education.

In this context, the book is an essential resource that explores the impact and potential of AI in education. The book significantly contributes to education by addressing AI applications at different educational levels, providing practical information about AI tools and applications, highlighting ethical issues, and providing ideas for designing future learning environments.

Aspects for Improvement

The book sheds light on an essential topic by addressing the potential of artificial intelligence in education and the challenges it may face. The book's strengths are that it presents different perspectives from many authors and offers rich content. However, some aspects of the book may be open to criticism for improvement:

- *Too much focus on technological details:* The book sometimes focuses too much on technical details when discussing the applications of AI in education. This can make some chapters challenging to understand for readers who are not experts in AI. For example, in Chapter 7, while describing the design and development stages of the AI-

based learning system used in biology teaching, technical details such as MATLAB may confuse readers unfamiliar with the subject.

- *Limited Application Examples in Some Chapters:* While the book discusses different uses of artificial intelligence in education, some chapters may not provide enough practical examples. For example, while Chapter 6 describes how AI and metadata storage technologies can reshape education systems, concrete application examples of these technologies are limited.

- *Giving More Space to the Perspective of Educators:* While the book discusses different aspects of AI's role in education, it could have included more educators' perspectives. For example, the challenges teachers may face when using AI tools, how these tools can be integrated with pedagogical approaches, and the role of AI in teacher education could have been addressed in more detail.

- *Impact of Cultural Differences:* Although the book covers the impact of AI in education in general, it could have focused more on the effect of cultural differences on AI applications. AI integration can take place in different ways in different countries and education systems, and addressing these differences would have broadened the book's scope.

- *Clarifying Future Directions:* The book makes some predictions about AI in education, but it would have been helpful to make these predictions more precise and concrete. For example, the book could have elaborated in more detail on how the role of teachers will change as AI becomes widespread in education systems, how learning environments will be transformed, and what new issues related to AI ethics might arise.

In conclusion, although the book is an essential resource in AI and education, it could be enriched with a more comprehensive and critical perspective, considering the points mentioned in the previous paragraphs.

CONCLUSION

“Integrating Artificial Intelligence in Education: Enhancing Teaching Practices for Future Learning” is a vital resource that explores the impact and potential of artificial intelligence in education. The book makes significant contributions to the field of education by addressing the application of AI at different educational levels, from primary to higher education, providing practical information about AI tools and applications, highlighting ethical issues, and providing ideas for designing future learning environments. However, there are some areas for improvement in the book. For example, the book sometimes focuses too much on technical details when discussing the applications of AI in education. For readers who are not experts in artificial intelligence, this may make some chapters difficult to understand. Another criticism is that some parts of the book do not provide enough practical examples when discussing different uses of AI in education. As a result, the book can be used as an essential resource in artificial intelligence and education. Still, it also has the potential to be further developed and enriched in some points.

Statement of Researchers

Researcher's contribution rate statement: Since the study has a single author, the entire contribution belongs to the author.

Conflict statement: The author declares that he/she has no conflict of interest.

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