18th INTERNATIONAL COMPUTER AND INSTRUCTIONAL TECHNOLOGIES SYMPOSIUM

BOOK OF ABSTRACTS

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Green coding for a sustainable future: A middle school example

Funda Bakırcı[a], Büşra Tavaslı[b], Zehra Lüy[c], Serçin Karataş[d]

Abstract

In the international literature, the concept referred to as “green coding” or “sustainable coding” is used in Turkish as “yeşil kodlama” or “sürdürülebilir kodlama.” Although academic studies on the subject in Türkiye are limited, it is observed that international technology and software companies have defined the concept of green coding in their technical documents and reports and have attempted to integrate it into software development processes. Green coding is defined as “coding techniques that minimize total energy consumption.” Research indicates that software developers have low awareness of green coding and lack adequate training on sustainability. However, awareness of the “green coding” concept should not be limited solely to software developers. In this context, the Information Technologies and Software course, first introduced in the 5th grade of middle school in Türkiye, represents a crucial starting point. At this stage, where students learn how to develop algorithms, it is also essential to integrate learning outcomes related to green coding into the course content. This would allow students to experience, from an early age, not only creating correct and functional algorithms but also producing software solutions that consider energy efficiency and environmental sustainability. Nevertheless, in the context of middle school education, there is no roadmap or sample practice for how sustainability and green coding outcomes can be integrated into the Information Technologies and Software curriculum. The lack of emphasis on the “green coding” concept delays students’ introduction to environmentally friendly computing practices. The purpose of this study is to examine how the learning outcomes in the curriculum of the Information Technologies and Software course, taught at the middle school level in Türkiye, can be related to green coding. The data source for the research is "The Century of Türkiye Education Model Information Technologies and Software Course 5th and 6th Grade Curriculum," which was implemented in the 2025-2026 academic year. The research was designed as a case study, a qualitative research approach. Document analysis was used as the data collection technique. During the data collection process, the learning outcomes in the curriculum were listed and analyzed using content analysis. As a result of the coding performed by the researchers, themes and categories were identified to link the learning outcomes with the principles of green coding. These themes were defined as sustainability, societal impact, and efficiency, with sub-categories created associated with each thematic construct. The findings from the analysis indicate that the concept of green coding is not directly incorporated into the Information Technologies and Software course curriculum. However, codings such as "Efficiency," "File and Folder Management," and "Software Development Process" were found to be related to categories like energy efficiency, resource awareness, data minimization, and code optimization. Furthermore, the learning outcomes of all themes in the curriculum, except for the "Information Ethics and Cyber Security" theme, could be indirectly associated with green coding principles. Nevertheless, from a green coding perspective, it is thought that the topic of information ethics can also be related to green coding principles through the dimensions of ethical awareness, social responsibility, and sustainable digital behavior. Consequently, the existing learning outcomes of the curriculum necessitate a more holistic interpretation, encompassing both environmental and ethical dimensions. Future studies are recommended to address the ethical dimension in more detail within the context of green coding. It is proposed that the curriculum be restructured in line with green coding principles to instill environmental and responsibility awareness in students, particularly during the software development process.

Keywords: *Green coding, sustainable coding, information technologies, sustainability*

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LAMS for team-based learning: A sustainable educational technology for future teaching and learning models

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Abstract

Sustainable educational technologies must not only digitise teaching practices but also provide reusable designs that reduce staff workload, promote student engagement, and remain adaptable across contexts. Team-Based Learning (TBL) is recognised for fostering collaboration, accountability, and higher-order thinking, yet its consistent implementation can be challenging. The Learning Activity Management System (LAMS) offers a sustainable solution by enabling the design and delivery of reusable digital learning sequences that standardise TBL activities while maintaining flexibility. This study explored the integration of LAMS platform for TBL within an undergraduate module in a school of education, delivered to two cohorts (n=63 and n=37). During the first three weeks, students engaged in traditional lectures, followed by five weeks of LAMS-mediated TBL incorporating individual readiness assurance tests (iRAT), team readiness assurance tests (tRAT), and application exercises. Weekly data were collected using the Self-Assessment Scale on Active Learning and Critical Thinking (SSACT), complemented by semi-structured interviews with students from both cohorts. Preliminary findings showed higher scores on both SSACT subscales, Active Learning and Critical Thinking, during the LAMS-mediated TBL weeks compared with the lecture weeks across both cohorts. These quantitative gains were supported by interview evidence, where students consistently judged LAMS-based TBL to be more effective than lecture-based learning. However, participants also highlighted challenges of unequal team participation and recommended the integration of peer assessment into grading to strengthen accountability. The study demonstrates how LAMS can serve as a sustainable educational technology for implementing TBL in higher education, offering reusable designs that reduce instructional overheads and support consistent quality across cohorts. Implications are discussed for scaling active learning through future-oriented, sustainable technology-enhanced pedagogies.

Keywords: *LAMS, Team-Based Learning, sustainable educational technology, active learning, critical thinking*

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Artificial intelligence applications in teaching and learning processes for sustainable educational technologies: A systematic literature review

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Abstract

Artificial intelligence applications are used in many fields, including education. This study aims to provide benefits for future research by examining trends in the use of artificial intelligence applications in learning and teaching processes within the scope of sustainability in educational technologies. In this study, 20 articles obtained from a systematic literature review using keywords identified in the Web of Science database were examined using content analysis. In the study, the use of artificial intelligence applications in the teaching process, their contribution to the teaching process, learning outcomes and sustainability, keywords, methods, sample, sample types, and artificial intelligence tools used were analyzed. The use of artificial intelligence applications in teaching processes in learning and teaching processes was analyzed in terms of individualized learning, lesson plan preparation, and feedback processes. The use of artificial intelligence applications in learning and teaching processes was analyzed in terms of sustainability in the environmental sustainability category in terms of energy use, in the social sustainability category in terms of technology literacy, and in the economic sustainability category in terms of learning management systems.

Keywords: *Artificial intelligence, artificial intelligence in education, sustainability, educational technologies*

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Comparison of artificial intelligence-assisted tools used in block-based programming instruction in terms of suitability for activity design and teacher usability

Mehmet Benzer[a], Figen Demirel Uzun[b]

Abstract

The integration of artificial intelligence-based applications into educational technologies is transforming the pedagogical responsibilities of teachers, especially in the teaching of programming to young students. This transformation is not limited to the technical usability of technological tools, but is also directly related to the extent to which these tools are compatible with teaching processes and how accessible and applicable they are to teachers. However, a review of the existing literature reveals that there are very few studies that systematically compare AI-supported block-based programming tools in terms of their suitability for activity design and teacher usability. This situation may lead educators to disregard qualitative criteria such as pedagogical integrity and user-friendly interfaces when choosing tools.This study aims to address this gap and compares seven different AI-supported block-based programming tools commonly used in programming education: PictoBlox, mBlock, Scratch, ML for Kids, Teachable Machine, Cognimates, and ChatScratch. A qualitative method was adopted in the research, and the document review technique was used. The official documentation, online teaching materials, and user interfaces of each tool were analyzed, and the data obtained were categorized under two main themes. Curriculum alignment, activity variety, step-by-step learning, ready-made activity support, measurement and evaluation, adaptability, feedback, student-centeredness, collaboration and sharing, integration with artificial intelligence, pedagogical alignment, ethics, development potential, and finally, overall suitability for activity design were examined under the following headings. In terms of teacher usability, the following topics were examined: ease of use, time management, contribution to professional development, technical requirements, accessibility, support mechanisms, applicability in class, support for creativity, language support, ease of development with artificial intelligence, privacy, data security, and usability in teachers' lessons. When the findings are examined, it is seen that the tools contribute at different levels in terms of student-centered learning and artificial intelligence integration. mBlock and PictoBlox offer powerful artificial intelligence modules in interdisciplinary and problem-solving activities, while ML for Kids and Teachable Machine are more focused on raising awareness of artificial intelligence. Scratch is easy to implement for basic programming instruction, but its direct AI support is limited; Cognimates and ChatScratch, on the other hand, are advantageous for younger age groups and AI-guided production processes.In terms of teachers, Scratch stands out for its accessibility and intuitive interface, while mBlock and PictoBlox increase preparation time due to their technical requirements. ML for Kids, Teachable Machine, and ChatScratch, which provide AI-based guidance, facilitate teachers' use but have limitations in terms of data security and language support. In conclusion, the effective use of AI-supported block-based tools in education is directly related to pedagogical alignment, technical infrastructure, teacher competence, and data security. As a result, the study evaluates AI-supported block-based tools not only in terms of technical innovations but also in terms of instructional design and teacher accessibility. The study is intended to guide teachers in tool selection and contribute to the design of user-friendly, pedagogically integrated solutions for educational technology developers.

Keywords: *Programming education, AI-powered tools, block-based programming, activity design, teacher usability*

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Bibliometric analysis of artificial intelligence research in game design

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Abstract

The topic of game design is always relevant due to its generally positive effects on individuals' emotional gains, and it is an area where research is conducted in many fields, such as health, education, and marketing. Artificial intelligence technologies, on the other hand, accelerate and simplify many processes in game design, both in the design of in-game assets and in the coding stages. Based on this, in the current study, 1391 publications published between 1992 and 2024, which address both game design/development and artificial intelligence, were examined through bibliometric analysis of publications scanned in the Web of Science database. The search query used was ("AI" or "artificial intelligence") (Topic) and ("Game Design" or "Game Development" or "Gaming") (Topic) and Game AI (OR – Search within topic) and Automated Game Design (OR – Search within topic) and AI-based Game Design (OR – Search within topic) and AI-assisted Game Design (OR – Search within topic) and Automatic Game Design (OR – Search within topic) and Gaming AI (OR – Search within topic) and Adaptive Game AI (OR – Search within topic) and Fighting Game AI (OR – Search within topic) and Editorial Material or Data Paper or News Item or Book Review or Letter or Retracted Publication (Exclude – Document Types). Using the RStudio and Bibliometrix software packages, publication and citation trends, the most frequently used keywords, the most influential countries, authors, and journals, and research focuses were examined. The findings show a general upward trend in the research since 2016. Accordingly, the annual growth rate was calculated as "18.96%." In this field, 4020 authors have published their work in 1347 different sources. Interest in the concepts of game design and artificial intelligence has significantly increased, especially since the end of 2018. According to Bradford's Law, there are 80 sources in Zone 1 (the most effective, one-third). The most effective resource has emerged as "IEEE Transactions on Games." arXiv is the most cited source. The most cited and influential researcher in the field has been Togelius J. The "Computer Science Artificial Intelligence" subject area most frequently publishes studies related to game design and artificial intelligence topics. The most frequently used keywords were found to be "game, artificial intelligence, Go, virtual reality, design, performance, framework, level, and neural networks." The most effective country has been the USA. Ritsumeikan University is the most influential university in this field. Mintz and Brodie (2019) has been the most cited publication. As a result of the clustering analysis, five distinct clusters were formed, and the concepts of game theory, Go, artificial intelligence (AI), design, virtual reality, and neural networks emerged as the main themes. England, China, and America have collaborated the most.

Keywords: *AI-Based Game, Artificial Intelligence, Game Design, Game Development*

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Examination of graduate theses on educational digital games

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Abstract

This study aims to examine the status of graduate theses on educational digital games in Türkiye through a descriptive analysis method. Within the scope of the research, a total of 55 theses registered and publicly accessible in the National Thesis Center of the Council of Higher Education (YÖK) covering the period 2014–2025 were analyzed. The analysis examined the gender distribution of thesis authors, the years of publication, the types of theses, their distribution across universities and departments, the academic titles of advisors, the characteristics of sample groups, and the methodological preferences employed. The findings revealed that gender distribution was balanced in doctoral theses (7.27% male, 7.27% female), whereas female authors (58.18%) were more represented than male authors (27.27%) in master's theses. The distribution of theses by years showed a notable increase especially between 2022 and 2024, with the year 2024 representing the highest level of production with 18 theses (32.73%). Master's theses (85.45%) were considerably more frequent than doctoral theses (14.55%), suggesting that the field is still in its developmental stage. In terms of universities, Ondokuz Mayıs University, Atatürk University, and Anadolu University were found to be leading, while other universities produced a limited number of theses. Regarding departments, Mathematics and Science Education and Primary Education stood out, while Computer and Instructional Technology Education, as well as social sciences and arts-related fields, were less represented. In terms of advisors' titles, professors and associate professors supervised more theses compared to assistant professors. Concerning the distribution of samples, the theses predominantly focused on primary and secondary school students (80%), with fewer studies involving university students, teachers, experts, and adults. In methodological preferences, mixed methods (47.27%) and quantitative approaches (40%) were dominant, whereas qualitative methods (12.73%) were less frequently employed. The findings indicate that academic production in the field of educational digital games is steadily increasing; however, there remains a need for interdisciplinary approaches and research diversified with different sample groups.

Keywords: *Educational digital games, Graduate theses, Descriptive analysis.*

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Designing an online professional learning community: Identifying design dimensions

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Abstract

The continuous professional development of educators plays a critical role in enhancing the quality of education. Online Professional Learning Communities (OPLCs) stand out as flexible, accessible, and interactive platforms that respond to this need. However, designing an effective and sustainable OPLC requires a holistic consideration of pedagogical, social, and technical elements. The aim of this study is to develop a comprehensive OPLC design framework for educators based on the literature and to establish the validity of this framework through formative expert feedback, ultimately presenting the finalized design framework. The study follows the "analysis–design–formative evaluation" stages of the Educational Design Research (EDR) approach, which bridges theory and practice. As a result of a comprehensive literature review conducted using the descriptive survey method, 18 design dimensions were identified, ranging from user-friendly interface (dimension-1) to impact evaluation (dimension-18). Each dimension is structured under the subheadings: "Description, Implementation Suggestions, Gamification Integration, and Artificial Intelligence Integration." The initial design framework was presented to four academic experts in the field of educational technologies through semi-structured interviews to evaluate its structural and content appropriateness. Qualitative data collected from the experts were analyzed using thematic analysis. Based on expert feedback, necessary revisions were made to strengthen the literature foundation of the design framework, and the framework table was updated. The updated framework table and explanatory texts were then presented in the second round to a group of 36 experts, including the initial four, who conduct studies in the fields of professional learning communities, educational technologies, distance education, and teacher professional development, using an expert opinion form. Experts were asked to evaluate the necessity of each dimension, the clarity of descriptions, the appropriateness of implementation suggestions, and the overall framework. Fifteen experts provided feedback via the form (response rate: 42%). The Content Validity Ratio (CVR) was calculated for each dimension based on the expert opinion form. According to the results, all dimensions with CVR ≥ .49 were retained. The average CVR (CVI) was found to be .95, and CVI ≥ .8 indicated high overall content validity. Consequently, all 18 dimensions were accepted as valid and consistent, and the design framework table was finalized. The main finding of the study is a finalized, 18-dimensional OPLC design framework grounded in robust literature and expert opinions, offering a roadmap for the design, development, and evaluation processes of OPLCs for educators. Additionally, by addressing gamification and artificial intelligence components together, the study proposes a unique model aimed at enhancing the effectiveness of OPLCs. The results are expected to serve as a guide for both instructional designers and policymakers in sustainably structuring online professional development environments.

Keywords: *online professional learning community, learning community design dimensions, gamification, artificial intelligence*

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Satisfaction related to online education during post-disaster

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Abstract

Global COVID-19 restrictions and the earthquakes that occurred in Türkiye in 2023 have clearly highlighted the importance of online instructional design and technologies for ensuring the continuity and sustainability of education systems ranging from primary education to higher education. In this process, student satisfaction emerges as a key variable in the effective use of sustainable educational technologies and the improvement of online instructional designs, as data based on student experiences contribute to the development of high-quality and effective instructional designs. Fundamental factors affecting student satisfaction include academic, social, and technical supports provided in online learning environments (Walia et al., 2025). For example, Moore's (1993) Theory of Transactional Distance suggests that the psychological and communicative distance caused by the physical separation between student and instructor reduces interaction, which can negatively affect students' academic achievement and satisfaction. Therefore, increasing opportunities for interaction and collaboration in online instructional designs can both enhance students' satisfaction levels and support active participation in courses (Ünal et al., 2024). Additionally, student satisfaction in online education is an important predictor of course attendance and academic success (Atabay, 2022). In this context, student satisfaction is a critical indicator for evaluating the quality of online instructional designs and technologies, as well as for ensuring the sustainability of education systems. The aim of this study is to evaluate the contribution of educational technologies to the sustainability and continuity of education during crisis periods by examining the satisfaction levels of pre-service teachers based on their experiences with online education conducted after the 2023 earthquakes, as well as their views on the role of this process in their academic and professional development. In this context, the online education process implemented at Dicle University Ziya Gökalp Faculty of Education following the earthquake was examined; pre-service teachers' satisfaction levels, their experiences related to academic and professional development, and the reasons behind these experiences were analyzed. The study was designed using a phenomenological approach, one of the qualitative research designs. Data were collected over three weeks through a structured interview form created online via Google Forms, 137 pre-service teachers participated in the study voluntarily, but when the data set was examined, the data of 47 participants who were found to have given non-explanatory answers to open-ended questions such as "yes, no, no idea, undecided, I don't remember, etc." were discarded, and the data of a total of 90 participants were included in the analysis. The obtained data were analyzed using content analysis; the data were coded twice by the same researcher with a three-week interval. The findings indicate that online education is an effective tool for ensuring the continuity of education during crisis conditions, and that student satisfaction is an important factor for both academic and professional development. Additionally, the data provide insights for enhancing the effectiveness of online education and increasing student engagement, contributing to the development of sustainable learning models during crisis periods. The results offer recommendations for policymakers and practitioners regarding the design of sustainable educational technologies and the effective planning of distance education in times of crisis.

Keywords: *Continuity and sustainability in education, distance education, online education, professional development of pre-service teachers, student's satisfaction*

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Analysing the effects of visual designs of educational agents on learning

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Abstract

The use of educational agents in online learning environments is not only a tool that supports content transfer, but also an important design strategy that regulates students' cognitive processes and strengthens their affective gains. In the literature, it is frequently reported that with the inclusion of educational agents in the learning process, students' motivation can increase, they can focus more on learning tasks and their perception of social interaction is strengthened. However, the findings regarding the visual design dimension of educational agents are not consistent. Studies on the effects of the level of humanisation, the use of gestures and facial expressions, and emotional expressions sometimes show positive, sometimes limited or neutral results, and thus a controversial view is displayed in this area. Therefore, the main purpose of this study is to systematically examine how the visual design features of educational agents are reflected in learning processes and to evaluate the existing research findings from a holistic perspective. Document analysis was preferred as the research method. In this context, national and international experimental studies and meta-analytical studies published between 2015 and 2023 were analysed. In the inclusion process, only studies published in refereed journals and directly addressing the visual design dimensions of educational agents were selected. In the analysis process, the data obtained from each article were systematically analysed under the categories of "problem", "purpose", "method", "findings" and "conclusion". In addition, the sample sizes of the studies, types of learning materials used, task complexity and measurement tools were recorded separately and evaluated comparatively. Thus, it was possible to analyse the available findings not only at the outcome level but also in terms of methodological diversity and contextual conditions. The reviewed studies show that the visual design dimensions of educational agents have different effects on learning. Anthropomorphic designs increase attention but have a limited effect on learning outcomes. The use of gestures and facial expressions strengthens students' motivation and perception of social interaction. Highly embodied and animated agents reduce cognitive load, especially in tasks requiring step tracking. Emotional expressions, on the other hand, support learning endeavour when appropriate to the context and have neutral or limited effects when incongruent. In conclusion, the visual design of educational agents is not only an aesthetic choice but also a pedagogical tool that affects social interaction, motivational engagement and cognitive load management in the learning process. The reviewed studies reveal that design decisions should be made in a context-sensitive manner and especially humanisation, gesture-mimic integration and emotional expressions support learning when used in harmony with the content. In this context, future studies should examine in more detail the perception of facial expressions by different age groups and the relationship between design elements and learning outcomes.

Keywords: *Educational agent, educational agent visual design, facial expressions, systematic review.*

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Teachers' voices on technology integration in special education: Needs, challenges, and opportunities

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Abstract

The integration of technology into special education has increasingly gained attention in recent years. However, despite the growing body of research highlighting the potential of emerging technologies like artificial intelligence (AI) and virtual reality (VR), there remains a lack of in-depth understanding regarding how special education teachers perceive and utilize these technologies. This study addresses the gap by exploring teachers' perspectives on current practices, limitations, and the possible contributions of emerging technologies to cognitive, social, and daily life skills of special education students. Precisely, this study aims to investigate special education teachers' experiences with technology use, identify difficulties they encounter, and evaluate their views on the potential of AI and VR to enhance student learning. Furthermore, it seeks to reveal how these technologies can support students' cognitive, social, and daily life skills, while also highlighting the perceived risks and challenges teachers perceive. A qualitative research design was employed in the study, and data were collected through semi-structured interviews with six special education teachers. A thematic analysis was conducted to analyze the data, and codes were grouped under key categories such as student challenges and needs, use of existing materials and resources, technology use, awareness of new technologies such as virtual reality and artificial intelligence, and pedagogical practices of technology integration. Findings indicated that students face varying levels of difficulties in communication and daily life skills depending on their special needs. Teachers highlighted the inadequacy of existing teaching materials and difficulties in accessing resources. While technology was acknowledged as beneficial, concerns about screen addiction limited the frequent use of tablets and computers. Teachers expressed strong interest in VR and AI-based applications, noting VR's potential to foster active participation, motivation, and social interaction, while AI tools were valued for personalized support and adaptive feedback. Teachers recognize both the benefits and risks of technology in special education, but there is a need for more effective, student-centered, and accessible digital tools. The study emphasizes the importance of designing technologies that align with students' cognitive and social development needs while supporting teachers in instructional practices. It has been highlighted that policymakers and institutions should invest in VR and artificial intelligence applications specifically designed for special education. It has been determined that teacher education programs can be designed within a framework that integrates hands-on experience with new technologies. In this context, collaboration among educators, researchers, and developers is crucial to ensure that digital tools are pedagogically sound and applicable. Future studies with larger samples are recommended to validate these themes and propose instructional models for technology integration in special education.

Keywords: *Special education, technology integration, virtual reality, artificial intelligence*

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Evaluation of a digital learning environment for gifted students from the perspective of message design and connectionist theory

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Abstract

Digital learning environments, particularly those of gifted students, have the potential to increase the pace, breadth, and depth of learning by supporting the individual differences of students with special needs. However, the effectiveness of these environments is not only related to the content but also to how it is presented. Message design theory focuses on the effective planning, organization, visualization, and design of language and interaction elements of the message to achieve learning objectives (Bishop, 2013). Connectivist theory, on the other hand, emphasizes individuals' access to information networks, interaction, and continuous learning processes (Siemens, 2005). The integration of message design and connectivist theories provides an important framework for evaluating digital learning environments for gifted students. It supports their cognitive needs and learning pace by encompassing both the effective presentation of the message and the opportunities students have for accessing and interacting with information networks. Therefore, it is considered necessary to examine the extent to which digital environments developed based on these theories meet students' expectations and experiences. The purpose of this study is to examine the extent to which digital learning environments developed within the framework of message design and connectivist theories meet the needs and expectations of gifted students. In this context, students' perceptions of the content, visual design, interaction, and feedback dimensions were compared with their pre-implementation expectations and post-implementation experiences. This study is believed to contribute to the field of educational technology by revealing the relationship between the way the message is presented in the design of digital learning environments and their network-based learning experiences. The study employed a case study design, a qualitative research method. The study group consisted of 15 middle school students with special needs attending the Çorum Science and Art Center. Data were collected using a semi-structured "Digital Learning Environment Needs and Expectations Form" and a "Digital Learning Environment Evaluation Form." The data were analyzed through content analysis within the framework of the five dimensions of message design theory: content organization, visual design, language and narrative, interaction, feedback, and the core elements of connectivist theory: access to the information network, community interaction, personal learning paths, and access to up-to-date information. The data indicate that students' expectations for the digital learning environment were largely met. In terms of content, students requested clear, organized, and easily understandable materials, and stated that their experiences found the content descriptive, sufficient, and understandable. In terms of visual design, students expected a simple and easy-to-see layout, and the images and colors used in the application were found to facilitate learning. In terms of language and expression, students expected a simple and understandable style of expression, and the language used in their experiences was described as clear, fluent, and motivating. In terms of interaction, students expected to communicate with both the teacher and their peers. Regarding feedback, students expected immediate and motivating feedback, and receiving rapid and supportive feedback in the application was considered a motivational factor. The findings reveal that digital learning environments designed by integrating message design and connectivist theories have high potential to meet the learning needs and expectations of students with special needs. They also suggest that digital environments should be developed to support not only individual learning but also community-based learning. Increasing peer interaction, providing flexible learning paths that support individual differences, and diversifying quality feedback mechanisms are considered particularly important. The research results suggest that digital learning environments should be adaptable to students' individual pace and preferences, supported by tools that encourage peer collaboration, and feedback mechanisms should be diversified. It is also recommended that future research be conducted with different age groups.

Keywords: *connectivist learning, message design, gifted students*

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Fostering daily living skills in students with autism: Expert views on the usability of a mobile-assisted smart toy

Ali Anıl Öney[a], Yaren Güley[b], Deniz Atal[c]

Abstract

Individuals with autism spectrum disorder (ASD) often experience challenges in acquiring daily living skills and require safe, repeatable, and motivating instructional materials. Teaching the use of electrical appliances, such as a toaster, is particularly difficult due to safety risks (e.g., burns, electric shocks), which restrict independent practice and increase reliance on constant supervision. Consequently, there is a pressing need for technology-based solutions that eliminate safety risks while simultaneously supporting the acquisition of psychomotor skills. Mobile-assisted smart toys offer such potential by providing interactive, engaging, and secure learning environments. The purpose of this study was to evaluate the usability of a mobile-assisted smart toy designed to support students with ASD in learning the "toaster skill." The toy was developed following the ADDIE instructional design model. To assess its usability, a case study design was adopted, and semi-structured interviews were conducted with six experts (two academics, two special education teachers, and two pre-service special education teacher). The interview protocol included 9 questions on design appeal, clarity of instructions, contribution to skill acquisition, feedback mechanisms, student motivation, and suggestions for improvement. Findings indicate that the toy was evaluated very positively by all experts. Participants emphasized that the design was engaging, captured students' attention, and could serve as an effective material for teaching daily living skills. The toy was also regarded as a novel and unique contribution in the field, offering safe opportunities for active student participation. Alongside these strengths, experts suggested several refinements: increasing the variety of reinforcements, enhancing colors and visual stimuli, and simplifying certain instructions. In conclusion, the mobile-assisted smart toy was found to be highly usable and holds promise as an instructional tool for supporting the acquisition of daily living skills among students with ASD. The study demonstrates that smart toys can provide safe and effective alternatives for teaching psychomotor skills in special education. Future research should refine the design based on expert suggestions and evaluate its effectiveness with diverse student groups.

Keywords: *autism spectrum disorder; daily living skills; mobile-assisted smart toy; usability analysis*

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Examining Primary School Students' Perspectives on Informatics/STEM/Coding Courses

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Abstract

The purpose of this study is to examine students' perceptions of Information Technology and STEM/Robotics Coding courses and to identify instructional methods that will address the misperception that learning is game-focused in these courses. It was observed that students mostly perceived the course as an opportunity to play games, and that their motivation decreased in non-game activities. A descriptive method was adopted in the study to describe this situation in detail. A total of 46 students aged 4-14 participated in the study during the 2023-2024 academic year. Data were collected through surveys, teacher observations, student products, and brief feedback sessions. The survey results indicated that 84.8% of the students preferred interactive activities, but they still largely perceived the courses as game-based. To this end, differentiated content appropriate to age groups was implemented in the courses: story-based robotics activities were used in kindergarten and primary school, while robot competitions and knowledge-building games were used in middle school. The findings reveal increased student engagement, and through group work, improved social interaction and problem-solving skills. Additionally, it was determined that students transitioned from a passive role of simply requesting games to a role of "productive learner," capable of designing their own games and actively participating in the learning process. In conclusion, the findings obtained through the descriptive method suggest that the balanced integration of gamification and structured learning methods in Information Technology and Robotics courses contributes to students developing a more conscious and sustainable attitude toward learning.

Keywords: *Robotic coding, information technologies, stem, vision, technology*

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Test performance and pedagogical alignment in online learning

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Abstract

In online learning environments, multiple-choice tests are widely used in summative assessments to evaluate students' academic achievement. However, the influence of item sequencing on student performance and test reliability remains a matter of debate. This study aims to examine the effects of different item sequencing methods (random, ascending difficulty, and topic-based sequencing) on learners' test performance and test statistics, and to reveal the alignment of these methods with the pedagogical structure of online learning. Previous studies (Taşkın & Kandemir, 2025; Taskin, 2025) define the problem situation that forms the basis of the study presented in this paper. In the previous study conducted within the scope of the Atatürk's Principles and History of Reforms course, four different randomly sequenced forms of the test were administered face-to-face using the paper-and-pencil method to determine the academic achievement of online learners (Taşkın & Kandemir, 2025). The subsequent study was carried out within the Foreign Language course, in which three different forms of the test (random, ascending difficulty, and descending difficulty sequencing) were administered to the students (Taskin, 2025). The results of these two studies provided the rationale for including the topic-based sequencing, which constitutes the original contribution of the present paper. 2308 students taking the Ataturk Principles and Revolution History course in the fall semester of the 2024-2025 academic year participated in this study. Unlike the previous studies, three test forms (randomly, ascending difficulty, and topic-based sequencing) were administered to the students. In this study, a 20-item multiple-choice test was used. The questions were developed at the "remembering" and "understanding" levels of Bloom's taxonomy, taking into account the item difficulty and discrimination indices obtained from previous administrations. The data were analyzed using one-way ANOVA, and the test parameters and reliability coefficients were examined within the framework of Classical Test Theory. In the previous study, no significant differences in achievement were found among students who took different test forms; however, the low reliability coefficients raised concerns about the measurement quality of the random sequencing. Therefore, another study was conducted to re-examine the sequencing types (random, ascending difficulty, and descending difficulty). Although the quantitative findings did not indicate significant differences in achievement, the qualitative results revealed that presenting difficult items at the beginning of the test increased anxiety and reduced motivation. Students stated that sequencing aligned with the topic flow was fairer and more functional. Conducted within the scope of the Foreign Language course, this research also highlighted the contextual effects related to the subject area. Consequently, the topic-based form of the test was included in the new study carried out in the Ataturk's Principles and History of Reforms course. The findings of this study showed that random sequencing lowered achievement, while tests sequenced by ascending difficulty and topic flow improved both students performance and test reliability. In conclusion, although random sequencing offers an advantage in terms of equality, the unique findings of this study reveal that topic-based sequencing aligns more closely with the structured nature of online learning. Tests sequenced by topic flow or ascending difficulty support students' performance and enhance the reliability of the measurement process. Therefore, instead of using random sequencing merely as a preventive measure against undesirable situations such as cheating, it is recommended to prefer topic-based sequencing when appropriate security measures are ensured.

Keywords: *Online learning, multiple-choice tests, item sequencing methods, academic achievement, test statistics*

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Artificial intelligence in education: A bibliometric analysis

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Abstract

Artificial intelligence (AI), which substantially enhances human capabilities and exerts a profound influence on contemporary society, is no longer confined to futuristic speculation but has become a practical reality across diverse disciplines (Pham & Sampson, 2022). Within educational contexts, AI has emerged as a transformative force, fundamentally reshaping pedagogical practices. The rapid development of AI technologies has had significant implications for instructional design, teaching processes, and learning experiences. Rather than supplanting teachers, AI assumes a complementary and empowering role by facilitating opportunities for personalized learning, advancing assessment practices, and supporting educational management (Dhanasekaran, 2025; Muthukrishna et al., 2025). Given that the cognitively demanding tasks inherent in teaching and learning can be effectively augmented by AI applications, education constitutes one of the most suitable domains for the integration of AI technologies (Wang et al., 2024). The expanding body of literature on AI in education underscores the need for systematic interpretation by researchers, educators, and policymakers. For the effective and responsible integration of AI into educational practice, it is crucial to identify prevailing research trends, leading scholars, influential publications, and thematic developments. Examining existing research is, therefore, essential to mapping current trajectories and identifying thematic foci in the field. Accordingly, the present study undertakes a bibliometric analysis of the literature on AI in education, with the aim of identifying prominent authors, key publications, and dominant research themes. Data for this study were retrieved from the Web of Science (WoS) database through a keyword-based search, yielding a total of 10,033 publications published between 2020 and 2025. The dataset was analyzed using bibliometric mapping via the VOSviewer software. The majority of these publications comprised journal articles and conference proceedings, predominantly categorized under “Education Educational Research”, “Computer Science Interdisciplinary Applications”, and “Computer Science Artificial Intelligence”. The most prolific authors were identified as Rwitajit Majumdar and Mutlu Cukurova, while leading institutions included Monash University, the State University System of Florida, and Carnegie Mellon University. The United States, China, and Germany emerged as the countries contributing most significantly to the field. AI is widely utilized by stakeholders across educational systems and plays a pivotal role in transforming teaching and learning practices. To advance the effective use of AI in education, it is imperative that researchers and educators systematically monitor the literature, critically evaluate applications within pedagogical contexts, and inform policy development through evidence-based decision-making. Furthermore, fostering interdisciplinary collaboration and undertaking international comparative studies will provide critical opportunities for enhancing and optimizing AI-driven educational approaches.

Keywords: *Artificial Intelligence in Education, AIED, Trends in Artificial Intelligence, Bibliometric Analysis*.

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Examining the artificial intelligence usage experiences of faculty of education faculty members

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Abstract

With the impact of developing technology, every sector is undergoing a digital transformation. Today, the use of artificial intelligence applications has become a part of this transformation and has become a part of many areas of life. The experiences and opinions of faculty members working in education faculties are crucial in its use in education, one of these areas. The purpose of this research is to examine the opinions of faculty members working in education faculties regarding the use of artificial intelligence applications. The research was conducted as a case study using qualitative research methods. A total of 14 faculty members, six female and eight male, working in different departments of the faculty of education at a state university in the Central Anatolia region participated in the study. A semi-structured interview form developed by the researcher was used to collect data. Expert opinions were obtained during the preparation of the semi-structured interview form and then it was piloted with one faculty member. After necessary revisions were made, the final six-question form was administered to the participants. The data were analyzed using content analysis. The analysis revealed themes such as areas of daily use, educational purposes, use in lesson processes, impact on the faculty member role, impact on the student role, and expectations and recommendations. Codes and their frequencies were reported under the themes. This research is expected to contribute to the innovations and changes brought about by artificial intelligence in educational environments and to the shaping of educational policies.

Keywords: *Teacher training, Artificial intelligence, Faculty members, Qualitative research*

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Exploring faculty members' experiences of generative artificial ıntelligence in their professional lives: A phenomenological study

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Abstract

Generative artificial intelligence (GenAI) technologies have recently gained increasing visibility in higher education, reshaping faculty members' professional practices across multiple domains. These technologies are not only transforming instructional design, research processes, and administrative tasks but also introducing ethical, pedagogical, and emotional considerations. The present study aims to explore in depth how faculty members experience the use of GenAI tools in their professional lives, thereby providing insights into the ways these technologies are perceived and integrated into academic contexts. Employing a qualitative phenomenological design, the study was conducted with three faculty members selected through maximum variation sampling. Semi-structured interviews were carried out, and the data were analyzed thematically. The analysis revealed five major themes: (1) domains of GenAI use in academic life, (2) benefits and opportunities, (3) limitations and risks, (4) strategies and pedagogical adaptations, and (5) attitudes and emotional responses. Findings indicated that faculty members perceive GenAI as a supportive tool, particularly in lesson planning, content development, research activities, and routine administrative tasks. The most frequently emphasized benefits were time efficiency, improvement in output quality, and opportunities for personalized learning. However, participants also raised concerns regarding reliability issues, risks of plagiarism, data privacy, and potential overdependence. To address these challenges, faculty members adopted strategies such as verifying AI outputs, adhering to ethical principles, and redesigning assignments and assessments to ensure authentic student engagement. Overall, the study demonstrates that the integration of GenAI in higher education is not merely a technical innovation but a multidimensional transformation that encompasses ethical, pedagogical, and emotional dimensions. The results suggest that while faculty members generally hold positive attitudes toward GenAI, they emphasize the necessity of responsible and critical use. The study concludes with recommendations for higher education institutions, including the development of clear ethical guidelines, policies supporting critical awareness, and professional training programs to ensure the sustainable integration of GenAI into academic practices.

Keywords: *Generative Artificial Intelligence, Higher Education, Faculty Experiences, Phenomenology*

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Examination of students' awareness of digital data security

Gülsade Kale[a], Mehmet Marangoz[b]

Abstract

In recent years, a significant portion of both personal and organizational data has been transferred to digital environments. This development has accelerated data processing and facilitated easier access to information. However, protection of data in digital environments has increasingly become a critical and complex issue. Malicious individuals attempt unauthorized access to web servers containing personal data by detecting security vulnerabilities in digital platforms and try to illegally obtain this data. In order to eliminate these threats, security firms continuously update their systems and work to close potential security gaps. Digital data security is an issue for which not only security providers and server administrators, but also the individuals who own the data must take responsibility. In this context, considering that students receiving education in computer and information technologies generally possess high levels of basic computer knowledge, this study examined the digital data security awareness levels of computer programming students. The study was conducted using a survey design from quantitative research methods. The sample of the study consisted of 95 students selected by convenience sampling method. The data were collected with the digital data security awareness scale consisting of 32 items and analyzed with the SPSS package program. The findings show that students' digital data security awareness is generally at a high level. When the data obtained were analyzed according to the variables, it was found that digital data security awareness showed a statistically significant difference in favor of male students with respect to gender, while no significant differences were observed concerning grade level, type of high school graduated, or the amount of daily internet usage. In conclusion, as digital data continues to grow in importance, ensuring its security is progressing in parallel. It is crucial for individuals to receive education and develop awareness about digital data security from an early age.

Keywords: *Digital data, security, data security, awareness.*

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Investigating the relationship between technology interaction and programming self-efficacy

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Abstract

Digital technologies are used effectively in a wide range of areas from daily life practices to professional activities and make significant contributions to problem-solving processes. However, the rapid development and diversification of technological tools lead to differences in individuals' capacity to adapt to these innovations. In particular, individuals' level of interaction with technology plays a decisive role in the adoption and effective use of new technologies. Self-efficacy refers to an individual's belief in their competence to successfully perform a specific task. Individuals with high self-efficacy tend to exhibit greater resilience when facing challenges and hold higher expectations of success. Programming skills are considered a fundamental competency, especially in associate and undergraduate programs related to computer science, yet are often perceived as a challenging course. This perception is typically associated with students' low self-efficacy perceptions towards programming, and low self-efficacy perception leads to failure in programming courses. In this study, the relationship between computer programming students' level of affinity for technology interaction and their programming self-efficacy was examined. The research was conducted with relational survey design, one of the quantitative research methods. The sample of the study consisted of 95 students selected by convenience sampling method. The data were collected with the help of the affinity for technology interaction scale and programming self-efficacy scale and analyzed with the SPSS package program. The findings show that the students' level of affinity for technology interaction and programming self-efficacy levels are generally at a high level. When the data obtained were analyzed according to the variables, it was found that both technology interaction levels and programming self-efficacy levels showed statistically significant differences in favor of male students in terms of gender, while no significant differences were observed in relation to grade level, type of high school graduated, or daily internet usage. As a result of Pearson correlation analysis, it is seen that there is a moderate, positive and significant relationship between the level of students' affinity for technology interaction and programming self-efficacy level. In other words, as students' affinity for technology interaction increases, their programming self-efficacy tends to increase correspondingly.

Keywords: *Technology, technology interaction, programming, self-efficac*

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Comparison of artificial intelligence-assisted tools used in block-based programming instruction in terms of suitability for activity design and teacher usability

Mehmet Benzer[a], Figen Demirel Uzun[b]

Abstract

The integration of artificial intelligence-based applications into educational technologies is transforming the pedagogical responsibilities of teachers, especially in the teaching of programming to young students. This transformation is not limited to the technical usability of technological tools, but is also directly related to the extent to which these tools are compatible with teaching processes and how accessible and applicable they are to teachers. However, a review of the existing literature reveals that there are very few studies that systematically compare AI-supported block-based programming tools in terms of their suitability for activity design and teacher usability. This situation may lead educators to disregard qualitative criteria such as pedagogical integrity and user-friendly interfaces when choosing tools.This study aims to address this gap and compares seven different AI-supported block-based programming tools commonly used in programming education: PictoBlox, mBlock, Scratch, ML for Kids, Teachable Machine, Cognimates, and ChatScratch. A qualitative method was adopted in the research, and the document review technique was used. The official documentation, online teaching materials, and user interfaces of each tool were analyzed, and the data obtained were categorized under two main themes. Curriculum alignment, activity variety, step-by-step learning, ready-made activity support, measurement and evaluation, adaptability, feedback, student-centeredness, collaboration and sharing, integration with artificial intelligence, pedagogical alignment, ethics, development potential, and finally, overall suitability for activity design were examined under the following headings. In terms of teacher usability, the following topics were examined: ease of use, time management, contribution to professional development, technical requirements, accessibility, support mechanisms, applicability in class, support for creativity, language support, ease of development with artificial intelligence, privacy, data security, and usability in teachers' lessons. When the findings are examined, it is seen that the tools contribute at different levels in terms of student-centered learning and artificial intelligence integration. mBlock and PictoBlox offer powerful artificial intelligence modules in interdisciplinary and problem-solving activities, while ML for Kids and Teachable Machine are more focused on raising awareness of artificial intelligence. Scratch is easy to implement for basic programming instruction, but its direct AI support is limited; Cognimates and ChatScratch, on the other hand, are advantageous for younger age groups and AI-guided production processes.In terms of teachers, Scratch stands out for its accessibility and intuitive interface, while mBlock and PictoBlox increase preparation time due to their technical requirements. ML for Kids, Teachable Machine, and ChatScratch, which provide AI-based guidance, facilitate teachers' use but have limitations in terms of data security and language support. In conclusion, the effective use of AI-supported block-based tools in education is directly related to pedagogical alignment, technical infrastructure, teacher competence, and data security. As a result, the study evaluates AI-supported block-based tools not only in terms of technical innovations but also in terms of instructional design and teacher accessibility. The study is intended to guide teachers in tool selection and contribute to the design of user-friendly, pedagogically integrated solutions for educational technology developers.

Keywords: *Programming education, AI-powered tools, block-based programming, activity design, teacher usability.*

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Curriculum development process with student participation in higher education: Findings of a workshop

Buket Akkoyunlu[a], Demet Özmat[b]

Abstract

The rapidly changing social, environmental and technological dynamics of the 21st century necessitate transforming higher education institutions from being structures that merely transmit information into learning communities in which students actively contribute. This transformation has made it necessary to redesign educational programs in a flexible and participatory manner in line with students' needs, expectations and future visions, especially in vocational and design-oriented disciplines. At this point, student participation serves not only as a feedback but also as a source of dynamism and assurance of sustainability of quality processes. Therefore, this study examines the program renewal process based on student contribution and participation in higher education through a workshop titled "Your Program, Your Future" conducted with the participation of students of the faculty of architecture. In this process based on the participatory design approach, senior university students evaluated the current program through individual and group activities, developed suggestions and shared the outputs through presentations. Qualitative data collection techniques were used in the research, and the findings were analyzed with thematic analysis. The findings revealed that the students thought that the program was open to improvement in the dimensions of flexibility, timeliness, digital skills and sustainability. Additionally, students' definitions of the ideal graduate profile are directly related to program outcomes and quality indicators. Therefore, workshops with student participation, such as “Your Program, Your Future”, can be considered among good practice examples that allow the quality assurance approach to be implemented in a student-centered and innovative way. As a result, the integration of student-centered curriculum design practices into quality processes in higher education contributes to both the pedagogical and managerial sustainability of institutions. The adaptability of this model to different disciplines and institutions may support student participation becoming an institutional standard in future curriculum updates.

Keywords: *Curriculum development, student participation, quality assurance system, sustainability in education.*

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Integrating artificial intelligence tools into academic research in higher education: Graduate students' epistemic, pedagogical, and ethical experiences

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Abstract

The rapid integration of artificial intelligence (AI) tools into higher education is transforming how knowledge is accessed, synthesized, and problematized (Clark & Grunspan, 2024; Hossain, 2024). While such tools create new opportunities for conceptual expansion, methodological efficiency, and reflective learning, they also introduce epistemic risks and ethical constraints (Bender et al., 2021; Chen & Xiao, 2025). This study examines how graduate students in chemistry education engaged with both traditional databases (Web of Science, Scopus, ERIC) and AI-based research systems (Semantic Scholar, ResearchRabbit, ChatGPT, NotebookLM, Elicit) in order to develop academic inquiry skills. Specifically, the study addressed seven research questions: (1) How do students' individually generated keywords differ from ChatGPT-suggested concepts in terms of diversity and coherence? (2) How do traditional databases versus AI tools influence inquiry strategies and information verification? (3) How do ResearchRabbit and NotebookLM support conceptual clustering and gap identification? (4) To what extent do ChatGPT and NotebookLM aid students in recognizing methodological limitations through summarization tasks? (5) How are research questions generated via ChatGPT and Elicit evaluated against SMART criteria? (6) How does NotebookLM verification reflect students' ethical awareness and recognition of fabricated citations? (7) What insights emerge from reflective comparisons of pedagogical contributions and strategic uses of AI tools? The research employed a qualitative design using document analysis (Schreier, 2012). Participants were four master's students in a graduate course entitled Integration of AI Tools in Academic Research, selected through purposive sampling for their prior exposure to research methods and digital literacy (Patton, 2014). Data were collected during the 2024–2025 fall semester through a structured eight-section evaluation form, covering keyword generation, traditional database use, Semantic Scholar retrieval, ResearchRabbit mapping, ChatGPT summarization, NotebookLM verification, Elicit-assisted question formulation, and comparative reflection. Thematic content analysis was applied, with codes organized around seven pre-defined themes. Inter-coder agreement between two experts was 93%, ensuring reliability. Findings reveal that students' individually generated keywords provided originality and problem-centered focus, while AI-supported suggestions enriched these with methodological and pedagogical depth. Traditional databases were valued for reliability and critical literacy, whereas AI tools offered efficiency, accessibility, and conceptual variety. ResearchRabbit's citation mapping enhanced visibility of underexplored areas (Park, 2025), while ChatGPT provided contextual clarity in summaries but increased the need for verification (Van Dis et al., 2023). NotebookLM ensured citation fidelity and transparency through document comparison, whereas Elicit partially supported SMART alignment, particularly in precision and measurability (Whitfield & Hofmann, 2023). Across reflections, students reported heightened ethical sensitivity regarding fabricated references and Anglo-centric knowledge biases (Birhane, 2021). In conclusion, AI tools emerge as cognitive partners that can scaffold inquiry, accelerate synthesis, and enrich reflective practice. Yet their educational value depends on students' critical mediation, epistemic autonomy, and ethical responsibility. The study demonstrates that AI can complement but not replace methodological rigor and scholarly transparency. This underscores the need to integrate AI literacy into graduate research training as both a pedagogical priority and an ethical safeguard.

Keywords: *Artificial intelligence tools, academic research, literature inquiry, epistemic autonomy, ethical awareness, SMART criteria*

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A needs analysis for digital content development training in the context of digital competencies

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Abstract

The integration of technology into education has made certain skills valuable and essential and has revealed the production of information within the scope of digital competencies rather than obtaining it directly from the source. The pandemic experienced as of 2019 has highlighted the need for educators to be equipped with digital competencies in teaching environments. Accelerating digital transformation in educational institutions, integrating the latest technologies into teaching environments, and developing effective digital tools for effective learning experiences are considered necessary for educators to be equipped and guided. The purpose of this study is to determine the content of a training program for educators to develop digital content within the scope of digital competencies. The case study model, one of the qualitative research methods, was preferred in this study. A literature review was conducted to determine the educational content. The review was carried out by searching for articles with the keywords "digital content development" and "digital content development" in the "Web of Science" and "Google Scholar" databases between 2020 and 2025. As a result of the search, a total of 333 articles were identified. 159 articles were accessed from the Web of Science database and 174 articles from the Google Scholar database. Since both Turkish and English articles were included in the study, 10 articles were excluded from the search because they did not meet the language criteria, 35 articles were excluded because their content could not be accessed, and 196 articles were excluded because their content was outside the scope of the search topic. Ninety-two articles were included in the study and examined in terms of content. As a result of the review, educational content consisting of 7 different dimensions and 102 items was obtained: "Technopedagogical Dimension (25 items), Design Dimension (9 items), Professional Development Dimension (8 items), Ethics, Privacy, Security, and Copyright Dimension (11 items), Basic Information and Communication Technologies Dimension (12 items), Technology and Development Dimension (22 items), and Measurement and Evaluation Dimension (15 items), consisting of 7 different dimensions and 102 items. The opinions of field experts were sought for the data obtained. In this context, the opinions of 17 academics, including 7 professors, 5 associate professors, and 5 doctors, were obtained via an online opinion form. Following the expert opinion, the educational content was determined to consist of 6 dimensions and 69 items: Technopedagogical Dimension (17 items), Personal and Professional Development Dimension (6 items), Ethics, Privacy, and Copyright Dimension (11 items), Basic Information and Communication Technologies Dimension (11 items), Design and Content Development Dimension (16 items), and Measurement and Evaluation Dimension (10 items), comprising 6 dimensions and 69 items. Due to the frequent use of innovative technologies in teaching environments, it is considered necessary for educators to receive up-to-date training on content development processes for both face-to-face and distance learning environments, and that these trainings should be updated in the context of technological developments and digital competencies.

Keywords: *Technology integration, digital competence, digital content development.*

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A systematic review of the Education 5.0 literature

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Abstract

Education has evolved beyond being merely a process based on the transfer of knowledge due to the effects of globalization and digitalization. In today's education, there is a growing emphasis on developing new paradigms that focus on fostering higher-order learning skills such as critical thinking, collaboration, and problem-solving. The concept of Education 5.0, developed in line with Japan's "Society 5.0" vision, represents an education philosophy that is human-centered, inclusive, and effectively utilizes technology. Education 5.0 aims to provide flexible and participatory learning environments that are sensitive to individual differences by integrating advanced technologies such as artificial intelligence, augmented reality, the Internet of Things, and the metaverse with pedagogical processes. The purpose of this study is to systematically classify the academic literature on Education 5.0 and to reveal the content and methodological trends of the studies in question. Within the scope of the study, articles and papers published in English between 2020 and 2025 were examined using qualitative research methods such as document analysis and descriptive content analysis. The literature review was conducted in the EBSCO, Scopus, Web of Science, and DergiPark databases; as a result of the screening process carried out in accordance with the PRISMA diagram, a total of 41 studies (29 articles, 12 conference papers) were included in the analysis. The findings reveal that academic production on Education 5.0 has shown a significant increase, particularly in 2023 and 2024. The studies were most intensively produced in Zimbabwe and India, while a more limited number of publications were found in countries such as Türkiye, Malaysia, Indonesia, and the Philippines. Methodologically, it was determined that the majority of the studies were conducted using a qualitative approach, with document analysis being the most frequently used design. In addition, document analysis forms and interviews were the most prominent data collection tools, while surveys and achievement tests were used to a more limited extent. In terms of sampling type, purposive and convenience sampling were mostly preferred. When data analysis techniques were examined, it was found that descriptive statistics, reliability tests, and correlation analyses were prominent, while advanced statistical methods were limited. In conclusion, this research comprehensively reveals the conceptual and methodological diversity in the literature on Education 5.0 and provides a guiding framework for new studies that could contribute to the field, particularly in the Turkish context. The study emphasizes the need to approach Education 5.0 from a disciplined perspective that will shed light on future research.

Keywords: *Society 5.0, Education 5.0, digital transformation, systematic review*

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An investigation of information technology teachers' artificial intelligence literacy levels

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Abstract

The main purpose of this study is to examine the artificial intelligence (AI) literacy levels of Information Technology (IT) teachers working across Türkiye and to evaluate these levels in terms of various demographic variables. Today, AI technologies are becoming increasingly widespread not only in industry and business but also in the field of education, transforming teaching and learning processes. With the acceleration of digital transformation in education, teachers' knowledge, awareness, evaluation, and practical skills regarding these technologies have gained critical importance. In particular, since teachers play a guiding role in shaping students' interaction with technology and the development of their digital literacy skills, determining their AI literacy proficiency is considered an indispensable requirement for the sustainability of contemporary education systems. The research was conducted within the framework of a relational survey model, employing quantitative research methods. The sample of the study consisted of 158 IT teachers working at different educational levels and in various regions of Türkiye. During the data collection process, the "Artificial Intelligence Literacy Scale," developed in 2023 by Polatgil and Güler, which consists of four sub-dimensions (awareness, use, evaluation, and ethics), was utilized. The data obtained were analyzed using descriptive statistics and parametric tests. The findings of the study indicate that teachers' AI literacy levels are generally above the medium level. No significant differences were observed in terms of gender and age variables. However, a significant difference was found with respect to the type of institution in which teachers work. According to the findings, teachers working at the high school level demonstrated lower AI literacy levels compared to their colleagues working at other educational levels. Additionally, teachers who use information technologies at an advanced level were found to have higher AI literacy levels. In light of these results, it is revealed that in-service training programs should be planned and implemented to enhance teachers' AI literacy levels. Furthermore, the inclusion of AI-based competencies within the framework of teacher qualifications is recommended as an important component of educational policies. The adoption of institutional and national policies that support the ethical, conscious, and effective use of AI technologies in educational settings will contribute to the healthy progress of the digital transformation process in education. In conclusion, this study systematically reveals the AI literacy levels of IT teachers in Türkiye, providing a scientific basis for new research in teacher education and for the development of educational policies. The findings not only support the individual professional development of teachers but also strengthen the digital transformation vision of the education system, offering a guiding framework for large-scale studies to be conducted in the future.

Keywords: *Artificial Intelligence, Artificial Intelligence Literacy, Information Technology Teachers, Educational Technologies*

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Rethinking introductory programming education with artificial intelligence: A systematic review

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Abstract

In recent years, the rapid proliferation of artificial intelligence (AI) technologies has created significant opportunities to reshape programming education. Introductory-level students often experience substantial difficulties with syntax errors, debugging processes, and algorithmic thinking. These challenges frequently lead to loss of motivation, disengagement, and high failure rates. AI tools, with their ability to provide personalized feedback, adaptive guidance, and real-time support, hold promising potential to address these issues. However, the literature reveals a lack of comprehensive and systematic studies that examine how AI is integrated into introductory programming education and what outcomes are reported. This study aims to fill that gap. The research was designed as a systematic review following the PRISMA methodology. Studies published between 2015 and 2025 were retrieved from the Web of Science and Scopus databases. The inclusion criteria were as follows: (1) an educational focus and (2) relevance to introductory programming education. As a result, 20 studies were identified and analyzed through a structured coding framework. The coding scheme covered descriptive study information, participant characteristics, employed AI technologies, pedagogical approaches, learning outcomes, and reported limitations. The reviewed studies were classified in terms of the AI technologies employed (e.g., intelligent tutoring systems, automated assessment tools, generative AI), the pedagogical methods adopted (e.g., problem-based learning, flipped classroom, scaffolding), the learning outcomes targeted (cognitive, affective, behavioral), and the limitations reported. The trends and emerging themes identified through this review will be elaborated in detail during the conference presentation. Moreover, existing gaps related to ethical issues such as data privacy and responsible use of generative AI will also be addressed. This systematic review aims to map the current state of AI integration in introductory programming education, while identifying trends, opportunities, and limitations in the literature. The study is expected to provide educators with a comprehensive framework for how AI can be utilized in programming instruction and to guide researchers toward new methodological and pedagogical directions for future studies. By synthesizing the existing evidence, this work not only sheds light on current practices but also proposes a research agenda for scalable, ethical, and pedagogically sound applications of AI in programming education.

Keywords: *Artificial Intelligence, Introductory Programming, Programming Education*

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An examination of artificial intelligence literacy among university students

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Abstract

In today's rapidly advancing technological era, artificial intelligence (AI) technologies are increasingly being used across many fields and have gained significant popularity. Since AI technologies have only just begun to transform technology, it is crucial for individuals to possess a high level of AI literacy in order to make the best use of these technologies while minimizing potential risks. Determining the AI literacy levels of university students may serve as a starting point for steps to be taken toward developing AI literacy and evaluating its effects. In this study, the AI literacy levels of university students were examined along with certain demographic variables in order to reveal their current status. Students' AI literacy levels were examined using descriptive statistics and relational analyses to identify their levels. Employing a quantitative research approach, the relational survey model was used. The participants consisted of 257 students from various faculties of a state university located in the Eastern Anatolia Region. Data were collected using a questionnaire. The questionnaire consisted of two sections: the first addressed students' demographic characteristics, while the second included the "Artificial Intelligence Literacy Scale," developed by Laupichler et al. (2023) and later adapted into Turkish by Karaoğlan Yılmaz and Yılmaz (2023). The scale comprises 31 items and 3 sub-dimensions, with an overall reliability coefficient of .99. The Shapiro-Wilk test was used to determine whether the data followed a normal distribution, and it was observed that the data did not show normal distribution. Descriptive statistics and non-parametric tests were applied to analyze the results. The analyses revealed that students' levels of AI literacy were low. Among the sub-dimensions, technical understanding was found to be low, while critical evaluation and practical application were observed at a moderate level. Furthermore, the analyses indicated that the duration of daily technology use had no effect on AI literacy. The study concluded that university students' AI literacy levels are generally low. It was also observed that students' AI literacy levels may vary not only based on their technical background knowledge but also according to their academic fields and expectations. In light of these findings, the importance of interdisciplinary AI education in universities is emphasized. Considering that future technologies will be shaped around AI, it is recommended that academics and education administrators increase AI-related training by introducing new courses and departments in schools and universities.

Keywords: *Education, technology, artificial intelligence, artificial intelligence literacy*

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An examination of prospective teachers' views on the use of AI-assisted content development tools in the digital story development process within the framework of the Technology Acceptance Model

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Abstract

International The study aims to examine teacher candidates' views on the use of artificial intelligence-assisted content development tools in the digital story development process within the framework of the Technology Acceptance Model. This research is a case study, a qualitative research method. The participant group consisted of 59 teacher candidates taking the Open and Distance Learning course at the Faculty of Education of a state university during the fall semester of the 2024-2025 academic year. During the study, the teacher candidates received a total of 4 hours of training over two weeks on instructional design, material design principles, the digital story process, and its components. Over the next three weeks, they were introduced to AI-based image, sound/music, and video production tools for a total of 6 hours. During the following three weeks, they developed digital stories. For these stories, they were first asked to write a scenario teaching an outcome from their field's curriculum. During the process, they consulted with field experts to evaluate the instructional suitability of their scenarios and digital stories. Each of them individually created a digital story. They developed their digital stories according to the ADDIE instructional design model. The digital story development process consists of writing, scripting, storyboarding, using multimedia tools, creating the digital story, and sharing it. Teacher candidates utilized AI-assisted tools throughout the writing, using multimedia tools and creating the digital story. A semi-structured interview form, developed by the researcher and finalized with the opinions of three experts, was used as the data collection tool. The interview questions were based on the Technology Acceptance Model. The collected data was evaluated using content analysis, a qualitative research method. Teacher candidates stated that this application helped them understand the workings of AI and recognize its various application areas. The study highlighted the negative aspects of AI-assisted tools, such as limited free use rights and an English interface, as well as their positive aspects, such as saving time, reducing workload, and being economical. The majority of teacher candidates stated that they would use these tools in the future and recommend them to their colleagues.

Keywords: *Digital story, technology acceptance, teacher candidates, AI-assisted tools.*

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An evaluation of students' use of generative artificial intelligence from the perspective of prompt engineering

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Abstract

Generative artificial intelligence (GenAI), with its human-like capabilities, is transforming and personalizing learning experiences in education. While students are provided with suitable content through learning analytics, educators are offered the opportunity to reshape the instructional process. However, the effective management of this process depends on establishing proper communication with AI. Regarding this, prompt engineering plays a crucial role. Prompt engineering is the skill of guiding GenAI systems effectively and establishing accurate communication with them. This skill enables access to the desired information from GenAI systems and can directly influence success in education. Word choice in formulating prompts may significantly affect the responses generated by the system. Therefore, the correct use of GenAI is directly related to being AI literate. Previous studies have introduced various steps for effective prompt writing, one of which is the CLEAR path. CLEAR emphasizes that prompts should be Concise, Logical, Explicit, Adaptive, and Reflective. These steps are employed to achieve more effective results from GenAI applications. This study evaluated students' use of GenAI in the context of prompt engineering while receiving instruction through MS Word, one of the word processing programs. The primary aim of the study was to examine students' evaluations of how the CLEAR steps influenced the feedback they received from their written prompts. The CLEAR path was introduced to guide students in the correct use of GenAI tools. The students used ChatGPT in the study. The research followed a two-phase process. In the first phase, students attempted to learn how to use the MS Word application by generating questions with GenAI. In the next step, after being introduced to the CLEAR path, students used GenAI again to learn how to use MS Word through different questions. At both stages, a survey prepared in accordance with the CLEAR path was administered, enabling students to evaluate the process based on the responses they received from the GenAI application (before and after using the CLEAR steps). The findings revealed a positive difference between students' evaluations before and after using the CLEAR path. The mean score for the statement "The questions I asked were clear and understandable, and the answers I received were directly related to the topic and did not include unnecessary details" increased from 3.73 before the application to 4.20 afterward. Similarly, the statement "The answers I received were presented in a consistent and logical order" increased from 3.88 to 4.16; and "The answers I received were sufficiently explained" rose from 3.73 to 4.20. In addition, the statement "When necessary, I reached the answer through trial and error by using different words" increased from 3.84 to 4.04, while "The answers I received guided me in writing more accurate prompts next time" rose from 4.00 to 4.20. These results demonstrate that the CLEAR framework has a positive effect on improving prompt writing and enhancing the output students obtain from GenAI.

Keywords: *Prompt engineering, CLEAR, generative artificial intelligence, GenAI*

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Artificial intelligence ethics in research

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Abstract

With technological developments, artificial intelligence (AI) technologies have become quite widespread in social environments due to their increased accuracy, speed, and ease of use. However, the high level of trust in artificial intelligence, dependence on it, privacy violations, and the responsibilities arising from its use bring with them ethical issues. Ethics is a discipline that focuses on how to apply action principles, recommendations, rules, and prohibitions based on various moral concepts that distinguish right from wrong. Artificial intelligence ethics, on the other hand, refers to the fundamental ethical values, principles, and legal regulations that arise during the development and use of artificial intelligence technologies in relevant environments. The OECD, UNESCO, and the Council of Europe have various ethical guidelines regarding ethical issues in artificial intelligence. However, Stahl has outlined the most detailed principles in his work titled "Ethical Issues in Artificial Intelligence" in the form of 39 articles. In this study, a literature review was conducted by addressing the ethical challenges related to artificial intelligence mentioned in studies conducted between 2019 and 2025, based on the 39 articles mentioned by Stahl. To this end, studies were identified in the WoS and Scholar databases between 2019 and 2025 using the keywords "artificial intelligence and ethics," "artificial intelligence ethics," "ethical issues in artificial intelligence," "ethical concerns in artificial intelligence," , "ethical issues in artificial intelligence," and "ethics in artificial intelligence" were used to access studies. The findings obtained from the research were tabulated, and the most frequently highlighted ethical issues were noted.

Keywords: *Ethics in artificial intelligence, ethical issues in artificial intelligence*

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Ethical dimensions of artificial intelligence in education: A systematic literature review

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Abstract

In recent years, artificial intelligence (AI) technologies have been increasingly utilized in the field of education for various purposes, including learning, teaching, assessment, and evaluation. The rapid expansion of AI applications has also brought forth a range of ethical debates. This study aims to reveal current trends regarding the ethical dimensions of AI in education by systematically reviewing empirical research published between 2021 and 2025. The PRISMA framework was employed in the research process. The review included only peer-reviewed empirical studies published in Turkish or English, with full-text access available through the Scopus and ULAKBİM databases. Studies such as reviews, theoretical discussions, book chapters, and opinion papers were excluded. The initial search, conducted using the keywords artificial intelligence, education, and ethics, yielded 1,048 studies. After applying inclusion criteria and re-evaluating the studies, 270 were selected for final analysis. Methodologically, the reviewed studies predominantly employed quantitative and mixed research designs. Among quantitative studies, survey research was most common, followed by scale development and quasi-experimental studies. In qualitative research, in-depth interviews and case studies were prevalent, while phenomenological approaches remained relatively limited. The high proportion of mixed-method studies indicates a growing tendency to integrate multiple data sources. These findings suggest that research on AI and ethics in education primarily focuses on collecting data from large samples, whereas experimental and phenomenological investigations are still in developmental stages. Regarding participant types, most studies focused on higher education students, particularly undergraduates, followed by instructors and teachers. The limited number of studies involving primary and secondary school students highlights a lack of research on the relationship between AI and ethics in early age groups. Conversely, the substantial number of studies involving teachers and academic staff suggests that ethical concerns in professional contexts have gained prominence in academic research. The findings also indicate that ethical issues related to the use of AI in education are mainly concentrated on academic integrity, data security and privacy, and algorithmic bias and fairness. While these areas are of critical importance, comparatively less attention has been paid to other dimensions such as transparency, pedagogical and cognitive impacts, and broader socio-cultural implications. Overall, this study identifies the ethical dimensions of AI in education as reflected in empirical research published between 2021 and 2025. It aims to raise awareness of the ethical use of AI in educational contexts and to present the current state of the field. The findings are expected to inform policy development processes and teacher education, as well as to guide future research on ethics in educational applications of artificial intelligence.

Keywords: *Artificial intelligence, AI, ethics, education*

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Virtual reality editors used in K-12 learning environments: A comparison study*

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Abstract

This article presents a comparison of the editors used in K-12 virtual reality (VR) content creation and environment design in terms of technical capacity, ease of use, content creation features, and accessibility. The review covers 11 applications, ranging from browser- and desktop-based tools to platforms that allow content creation directly on VR headsets. The studies reviewed based on "practical aspects such as prominence in literature and industry sources (at least 10 citations), accessibility, and K-12 references and recognizability". The findings highlight the ease of access and rapid prototyping of editors, the separation of pre-built content folders and programs, and the ability to create executable productions. However, the limitations of pedagogical guidance, the lack of assessment and evaluation, the rudimentary nature of teacher training, and the device/band privacy policies of some platforms are highlighted. From a technical perspective, increasing the freedom of web-based/no-code registration may lead to performance and customization limitations; multi-user social features support learning but require robust infrastructure.

Keywords: *Virtual reality, K-12, virtual reality editors, pedagogical aspects, technical aspects*

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The use of simulation technologies in education and application examples: Literature review

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Abstract

The purpose of this research is to reveal the effects of simulation technologies, which are now fundamental elements of educational programs in fields such as science, health services, disaster management, and engineering education, on learning and teaching processes. In this context, the research method is a systematic literature review, one of the qualitative research methods. Systematic literature review is considered an effective research method that helps synthesize the results and findings of existing studies in a systematic manner, thereby guiding new research and instructional designers. Although systematic literature review was initially used in the field of health sciences, it has been applied in many fields in recent years. In this study, examples of studies conducted in disciplines such as science, health services, disaster, and engineering education were examined in line with the purpose of the research. The results of the studies examined revealed that simulation-based training used in the learning and teaching processes in these fields has various positive effects on students; success, motivation, and skill levels. The results of the studies conducted show that simulation-based training has been effective in eliminating misconceptions among middle school students, developing the clinical skills of healthcare students, and increasing the preparedness of students in disaster education. Simulation-based training has also supported the development of students; higher- level skills, such as problem solving, critical thinking, self-directed learning, and collaborative work. In the concept teaching process in physics classes, it has made learning more meaningful by facilitating students; understanding of these concepts, increasing student motivation, and accelerating learning. In conclusion, simulation technologies are an effective tool for improving students; academic achievement and professional skills compared to raditional teaching methods. In light of these results, it is recommended that simulation technologies be integrated into education programs, that schools; IT infrastructure be adapted to these technologies, and that teachers be supported through in-service training.

Keywords: *Simulation technologies, simulation in education, learning processes, motivation*

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The use of artificial intelligence-supported holograms in education

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Abstract

Holograms, a new technological approach today, are supported by artificial intelligence tools. Artificial intelligence-supported holographic content brings a new perspective to the field of education. With this integration, educational methods are technologically advancing, making the learning process more experiential and interactive for students, while also providing educators with ease in creating materials. The main objectives of this study are to increase the usability of holograms in education, identify low-cost alternatives to make them accessible, and offer virtual environment ideas for application areas. It is possible to produce holographic images obtained by generating images from text using various artificial intelligence tools, and to ensure the usability of these images in different educational fields. Findings such as the concretisation of abstract concepts, a lasting learning process, and increased student motivation can be cited as contributions of AI-supported holographic content to education. Virtual holographic simulators designed for pilot training students and virtual reality, which offer a more interactive learning environment, can be cited as examples. Additionally, holographic content can be used to enhance learning quality in both classroom settings and online education interfaces, thereby providing an education environment independent of time and location. Holograms can be used to provide higher quality education in fields that require practical application, such as medicine, law, and architecture, as well as in areas such as social life and traffic. Furthermore, relevant content can be developed using holographic virtual environments designed with artificial intelligence tools and presented to students. Hologram technology offers safe alternatives in risky scenarios, such as chemistry lessons, and costly scenarios, such as flight training. The problem with this study is that holographic content cannot become widespread in education due to high costs and infrastructure constraints, which prevent it from reaching a wide user base. In addition, the fact that existing educational institutions are not ready for holographic experiences, educators are experiencing adaptation problems with these new technologies, and technologies such as wearable smart devices that support holograms are economically challenging, also hinder widespread adoption. To make this technology more widely available in education and accessible to students in a two-dimensional format, it is possible to use artificial intelligence tools and make them accessible to both students and educators. Therefore, with the adoption of artificial intelligence-supported holograms by users and the widespread adoption of low-cost solutions, this new technology can be made more effective in the education and training process.

Keywords: *Hologram, education, technology, artificial intelligence, virtual reality*

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Bibliometric analysis of artificial intelligence research in the framework of augmented reality and virtual reality

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Abstract

The topic of game design is always relevant due to its generally positive effects on individuals' emotional gains, and it is an area where research is conducted in many fields, such as health, education, and marketing. Artificial intelligence technologies, on the other hand, accelerate and simplify many processes in game design, both in the design of in-game assets and in the coding stages. Based on this, in the current study, 1391 publications published between 1992 and 2024, which address both game design/development and artificial intelligence, were examined through bibliometric analysis of publications scanned in the Web of Science database. The search query used was ("AI" or "artificial intelligence") (Topic) and ("Game Design" or "Game Development" or "Gaming") (Topic) and Game AI (OR – Search within topic) and Automated Game Design (OR – Search within topic) and AI-based Game Design (OR – Search within topic) and AI-assisted Game Design (OR – Search within topic) and Automatic Game Design (OR – Search within topic) and Gaming AI (OR – Search within topic) and Adaptive Game AI (OR – Search within topic) and Fighting Game AI (OR – Search within topic) and Editorial Material or Data Paper or News Item or Book Review or Letter or Retracted Publication (Exclude – Document Types). Using the RStudio and Bibliometrix software packages, publication and citation trends, the most frequently used keywords, the most influential countries, authors, and journals, and research focuses were examined. The findings show a general upward trend in the research since 2016. Accordingly, the annual growth rate was calculated as "18.96%." In this field, 4020 authors have published their work in 1347 different sources. Interest in the concepts of game design and artificial intelligence has significantly increased, especially since the end of 2018. According to Bradford's Law, there are 80 sources in Zone 1 (the most effective, one-third). The most effective resource has emerged as "IEEE Transactions on Games." arXiv is the most cited source. The most cited and influential researcher in the field has been Togelius J. The "Computer Science Artificial Intelligence" subject area most frequently publishes studies related to game design and artificial intelligence topics. The most frequently used keywords were found to be "game, artificial intelligence, Go, virtual reality, design, performance, framework, level, and neural networks." The most effective country has been the USA. Ritsumeikan University is the most influential university in this field. Mintz and Brodie (2019) has been the most cited publication. As a result of the clustering analysis, five distinct clusters were formed, and the concepts of game theory, Go, artificial intelligence (AI), design, virtual reality, and neural networks emerged as the main themes. England, China, and America have collaborated the most.

Keywords: *AI-based game, artificial intelligence, game design, game development.*

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The effects of generative artificial intelligence-supported blended music theory education on students

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Abstract

Rapidly advancing technological innovations today are having significant impacts in the field of education. The use of technological tools in education facilitates the learning process and increases student motivation. Web-based technological tools, in particular, are widely used in educational settings; thus, learning is not limited to the classroom environment but continues outside of school, offering students personalised learning experiences. In recent years, generative artificial intelligence (GAI) applications have been added to these tools. These tools are particularly important in music education, as they make the learning process more interactive and personalisable. The use of GAI-supported Web 2.0 tools is becoming increasingly important. This study examines the effects of AI-supported blended music theory education on students. The case study method was adopted in the study, and the process was approached multidimensionally. The study group consisted of 15 students (5 female, 10 male) studying in the music department of Erzincan Fine Arts High School. During the six-week application period, music theory lessons were conducted using a blended learning approach, and the "Ear Training Exercises" available on the "Music for Everyone" platform were utilised. During the data collection process, the "Teaching Materials Motivation Scale" and the "Generative Artificial Intelligence Attitude Scale" were applied, and weekly teacher diaries were kept by the researcher. Semi-structured interviews with the students were also conducted to examine their experiences and opinions regarding the process in depth. The collected qualitative data were analysed using content analysis in the MaxQDA programme. Quantitative data show that generative artificial intelligence-supported blended music theory education increases students' learning motivation. However, it is understood that some concerns regarding ethical and security issues have also emerged among students. In the interviews, students stated that the generative AI-supported web platform used in the course was accessible and understandable, facilitated learning, and contributed to the development of their creativity. Furthermore, it was determined that students developed a positive attitude towards the use of generative artificial intelligence in music education. The results of the study reveal that it is important to investigate the integration of generative artificial intelligence tools into music education from different perspectives.

Keywords: *Music education, music theory, blended learning, web 2.0 tools, generative artificial intelligence*

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Design and application of an educational chatbot for literary text learning: The example of Kutadgu Bilig

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Abstract

Kutadgu Bilig is a classic 11th-century work by Yusuf Has Hacib, and its archaic language and cultural references make it difficult for today's students to comprehend. These challenges can reduce students' interest and motivation in literature courses. This study aims to design, implement, and evaluate an AI-supported educational chatbot to alleviate the linguistic and conceptual difficulties encountered in learning Kutadgu Bilig and to increase students' engagement and motivation. The research was conducted using a mixed-method approach with an explanatory sequential design. In the quantitative phase, the Behavioral Intention to Use Chatbot in Education and Learning Scale was administered as a pre-test and post-test to 41 students in the Turkish Language Teaching program at Atatürk University. In the qualitative phase, semi-structured focus group interviews were held with 9 students, and log records of all interactions with the chatbot were analyzed. The developed chatbot was integrated with the ChatGPT language model and limited to content from the Kutadgu Bilig text, and it was provided to students via a mobile application for four weeks. Analysis of the post-application data showed that students' behavioral intention scores towards using the chatbot increased significantly. The qualitative findings revealed that students mostly interacted with the chatbot to acquire information about the course content, summarize the text, and generate content. Students reported that the chatbot facilitated their understanding of the challenging literary text, increased their interest and motivation in the course, and provided instant feedback and personalized support. On the other hand, some students noted that the bot's answers were sometimes superficial or insufficient, that it struggled with complex questions in Turkish, and that excessive use of the bot could foster laziness among learners. Overall, the results indicate that educational chatbots can be used as effective supportive tools in learning classical literary works. Based on these findings, it is recommended to integrate such chatbots into literature education as supplementary aids and to provide guidance to students on their effective use. The design and content of the chatbot should be continuously updated according to student feedback for ongoing improvement. Moreover, students should be encouraged to critically evaluate the chatbot's responses and develop self-directed learning skills rather than relying solely on the bot.

Keywords: *Educational chatbot, literary text learning, Kutadgu Bilig.*

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Personalized support in digital game-based learning: A systematic literature review on the effectiveness of adaptive feedback

Hamza Aydemir[a],Hakan Tüzün[b]

Abstract

Digital educational games are recognized in the literature as tools with the potential to enhance student motivation and engagement. To increase the effectiveness of these games for different learner profiles, a trend is observed towards integrating adaptive feedback mechanisms that provide personalized and immediate support. However, empirical findings regarding the design, implementation, and effectiveness of such feedback have not yet been holistically addressed in the literature. This study aims to systematically review, synthesize, and evaluate experimental and comparative studies on adaptive feedback in digital educational games. The objective is to provide an overview of the underlying mechanisms of this feedback, its prevalent implementations, and its overall impact on student engagement and learning. Following the PRISMA guidelines, a systematic search was conducted in the Web of Science (WoS) database using keywords related to educational games, feedback, and adaptation. The initial query yielded 62 studies. These studies were screened according to pre-defined inclusion criteria, and 22 articles were selected for the final analysis. Studies were included only if they had an experimental or comparative intervention design that tested an implemented adaptive feedback system. Conceptual papers, reviews, and studies where the feedback was not adaptive, were limited to simple correct/incorrect responses, or where adaptability was a future recommendation rather than a tested component, were excluded. The synthesis reveals a diverse range of adaptive feedback mechanisms, including intelligent tutoring systems (ITS), AI-powered chatbots, fuzzy logic models, open learner models (OLM), and learning analytics. These systems most commonly adapt feedback based on detailed student data, such as in-game performance metrics, demonstrated knowledge levels, specific error patterns, and observed behaviors. Compared to control groups, the results indicate that adaptive feedback has a positive and significant effect on cognitive outcomes, including enhanced learning performance, superior problem-solving skills, and better knowledge retention. Furthermore, the benefits extend to affective and non-cognitive domains; adaptive systems frequently led to increased student motivation, deeper engagement, optimized cognitive load, and reduced learning-related anxiety. Despite these trends, effectiveness is highly context-dependent. For example, some studies found that complex explanatory feedback did not offer a significant cognitive advantage over simpler corrective feedback. Other research indicated that adding features like gamification did not universally improve outcomes such as self-regulation. Thus, the design and context of the intervention are critical. The findings support that well-designed adaptive feedback is a powerful strategy for enhancing both the cognitive and affective dimensions of learning in digital educational games. The findings highlight the critical importance of a holistic approach to personalization, tailoring feedback not only to the student's cognitive state but also to their motivational and emotional needs. This systematic review reveals a need for future research to move beyond simple efficacy studies and investigate the nuanced interaction between specific adaptive mechanisms, learner characteristics, and various contexts. Future work should focus on establishing more robust design principles, conducting longitudinal studies to assess long-term effects, and exploring how different feedback types can be optimally combined to create effective personalized learning experiences.

Keywords: *Adaptive feedback, digital educational games, game-based learning, systematic literature review*

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Exploring Esports in STEM education through Minecraft: Opportunities and challenges

Hasan Çakır [a]

Abstract

STEM (Science, Technology, Engineering, and Mathematics) thinking has emerged as a critical skill set for preparing students to meet the demands of the 21st-century workforce and to engage meaningfully with complex societal challenges. This proposal outlines an innovative approach to STEM education through esports activities implemented within the Minecraft platform. By integrating competitive gaming with problem-based learning, this approach fosters not only subject-specific knowledge but also transversal skills such as collaboration, strategic planning, and computational thinking.

Keywords: *Minecraft, esports, STEM education*

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Examining pre-service teachers' utilization of digital games

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Abstract

The use of digital games in educational processes has become increasingly important in recent years, and the attitudes of pre-service teachers towards this issue play a significant role in shaping innovative approaches in education. The problem addressed in this study is to examine the extent to which pre-service teachers benefit from digital games and to evaluate their opinions through qualitative data. The purpose of this research is to investigate pre-service teachers' use of digital games in education, their attitudes towards this issue, the challenges they encounter, and their views on the effects of game-based learning. The study was conducted using the survey model, one of the quantitative research methods. The participants consisted of 253 pre-service teachers studying in different departments. As the data collection tool, the "Utilization of Digital Games Scale" (UDGS), developed by Görmez (2020), was employed, and qualitative data were also gathered through participants' opinions. The data were analyzed with SPSS 23 software using descriptive statistics, t-tests, one-way ANOVA, and multiple comparison tests. According to the findings, the overall mean score of the participants on the UDGS was 58.02 (SD = 7.02). Based on Görmez's (2020) categorization, scores between 52–68 indicate a high level of digital game utilization, suggesting that participants' attitudes toward using digital games were generally high. In terms of departments, Elementary Education students (M = 57.03) scored significantly lower than Mathematics Education students (M = 59.55) ($p < .05$). Turkish Language Education students (M = 57.86) did not differ significantly from either group. When analyzed by grade level, 1st-year (M = 56.70) and 2nd-year students (M = 57.62) had similar scores, while 4th-year students scored higher (M = 59.60). This indicates that as grade level increases, digital game utilization also increases, with a notable difference between 1st- and 4th-year students. No significant differences were found in terms of gender; however, significant differences were observed regarding gaming frequency and daily playing time. Students who played games regularly scored significantly higher than those who never played. Moreover, students who played 2-4 hours a day demonstrated higher levels of digital game utilization compared to those who played less than one hour daily. In conclusion, regular and balanced engagement with digital games appears to enhance pre-service teachers' digital game competencies. Additionally, academic variables such as department and grade level were found to influence these competencies. The findings indicate that when pre-service teachers enter their professional careers, they may be more likely to integrate game-based practices into their lessons. Therefore, it is recommended that teacher education programs include more digital game-based learning activities, expand gamification practices in course content, and provide support for pre-service teachers in digital game analysis and design.

Keywords: *Educational digital games, gamification, attitude, pre-service teacher*

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A comparison of user experience in MOOC environments in terms of users' usage preferences

Elif Polat [a], Yüksel Göktaş[b], Sholpan Zhubanova[c], Meltem Polat[d]

Abstract

With the rise of digital systems, developments such as the necessity of lifelong learning and the recognition of micro-skills continue to position MOOC environments as important learning resources. These self-directed, asynchronous online course package environments should offer structures and components that support learning, not only through the content and organization of the courses, but also by addressing the diverse needs and expectations of different users. In this context, user experience (UX) can be a determining factor for variables such as participation, motivation, and retention in MOOC environments. The aim of this study is to determine whether the UX experienced in MOOC environments causes significant differences in terms of learners' usage habits and preferences. A descriptive approach was adopted within the quantitative research design, and causal-comparative and correlational methods were employed. A total of 264 university students participated in the study. After completing a 30-minute MOOC experience process, they responded to the 10-item UX scale known as AttrakDiff2 along with a set of demographic questions. An independent samples t-test was used to analyze the variable of gender, while one-way ANOVA was employed to analyze other variables such as age categories, frequency of regular MOOC use, average duration spent per session, and intention to use MOOCs in the future. No statistically significant differences were found in UX scores between groups based on gender, age, or duration spent in the MOOC environment (less than 30 minutes, 30 minutes–1 hour, 1–2 hours, more than 2 hours). Increased duration of use did not lead to a marked increase or decrease in UX scores. However, significant differences were observed in UX mean scores based on the intention to use MOOCs in the future ($F(5, 255) = 7.604$; $p < .001$). According to the results of the Post-Hoc Tukey test conducted for this variable, participants who stated “I do not intend to use it at all” had significantly lower UX scores compared to those who intended to use it frequently, continuously, or at the same level. Furthermore, a significant difference was found between those who were ‘Neutral’ and those who intended to use MOOCs more frequently. This finding indicates that individuals who have a more positive user experience in MOOC environments are more likely to continue using these platforms in the future. It suggests that perceived user experience is related not only to current attitudes but also to future behavioral intentions. Additionally, the differences in UX mean scores according to how frequently participants had used MOOCs in the past were also statistically significant ($F(3, 257) = 3.585$, $p = .014$). UX scores of participants who had never used MOOCs were significantly lower than those who used them a few times a month. However, participants who used MOOCs a few times per week did not have significantly higher UX scores than those who used them a few or several times per year. This suggests that more frequent use does not necessarily lead to a more positive perception of user experience. In conclusion, the findings reveal a positive and significant relationship between user experience in MOOCs and the intention to use them in the future. A positive UX may increase the possibility that students will continue to use these systems at the same or higher frequency. This result highlights the potential importance of improving user experience in MOOC design, particularly in terms of influencing user engagement and sustained participation.

Keywords: *MOOC, User Experience, Online Learning, Motivation, Engagement*

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Digital access opportunities in global education: A review of current literature on artificial intelligence, open educational resources, and inclusive policies

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Abstract

Although access to education on a global scale is a priority area among the United Nations' Sustainable Development Goals, according to UNESCO data, more than 250 million children and youth are still deprived of formal education; while pandemics, disasters, and socio-economic inequalities deepen this problem, the digital divide stands out as one of the obstacles to access to education, especially in low- and middle-income countries. The study is conducted through a literature compilation method in light of peer-reviewed articles, international reports (UNESCO, OECD, World Bank, UNICEF), and policy documents published between 2020 and 2024. In this context, current trends focus on three main axes within the scope of Open Educational Resources (OER), artificial intelligence-based learning solutions, and global connection initiatives and inclusive policies. The results of the literature review reveal that OER strengthens equal opportunities by reducing the cost barrier, but its impact is limited due to linguistic diversity and lack of quality assurance. Artificial intelligence-based applications, on the other hand, personalize learning processes by adapting content to individual needs; While emphasizing that it supports equal opportunities, particularly in multilingual environments, issues such as data security, ethical principles, and energy costs stand out as critical areas awaiting solutions. While global connectivity projects such as UNICEF and ITU's Giga initiative contribute to reducing infrastructure problems by connecting schools to the internet, World Bank and OECD reports indicate that technological solutions alone are not sufficient to eliminate persistent inequalities; curricular adaptations, teacher support, and digital literacy investments must also be developed simultaneously. The study emphasizes the need to integrate technology and policy for the sustainability of access opportunities, demonstrating that OER can have a stronger impact by adapting it to the local context, designing artificial intelligence solutions within an ethical framework, and supporting global connectivity initiatives with inclusive policies. The study aims to create a guiding framework for researchers, policymakers, and practitioners by presenting applicable strategies for equal opportunities in global education in light of current literature.

Keywords: *Digital access in education, artificial intelligence, open educational resources*

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Prediction of achievement from weekly digital interaction

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Abstract

This study investigates at which point students' end-of-term grades can be predicted with the highest accuracy based on their weekly interaction data in an online learning environment. The data were obtained from Moodle learning management system (LMS) records of an undergraduate course offered by the Department of Computer Education and Instructional Technology at a public university in Türkiye. Weekly variables representing students' online learning behaviors—including assignment submission status, first interaction week, total interaction count, login frequency, quiz and assignment participation, resource access, and session duration—were computed, forming a time-series dataset. The data were cleaned during preprocessing by removing non-meaningful transitions and short sessions, and numerical variables were normalized using Z-score and Min-Max scaling methods. The dependent variable was students' end-of-term numerical grade. A Random Forest regression model was applied for prediction on a weekly basis, and model performance was evaluated using metrics such as R^2, mean absolute error (MAE), and mean squared error (MSE). The results revealed that behavioral data collected up to the middle weeks of the term (weeks 6 to 9) provided the most significant contribution to predicting end-of-term grades. The research findings indicate that the total interaction count in the 5th week serves as the most critical predictor for end-of-term grade prediction.

Keywords: *Learning analytics, Moodle, online learning, machine learning, grade prediction, random forest*

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Evaluation of teacher training in the 'Artificial Intelligence BILSEM' project

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Abstract

This study was carried out within the scope of the "Artificial Intelligence BILSEM (BILSEM.AI)" project, which is supported by the TÜBİTAK 4004 Nature and Science Schools Support Programme. The target group of the project consisted of 25 Information Technology teachers working at Science and Art Centers (BILSEM), which provide educational activities for gifted students. The main objectives of the project were to increase teachers' awareness of artificial intelligence, to support their application development skills, and to contribute to the dissemination of artificial intelligence education for students. Within the one-week training program conducted as part of the project, the following topics were addressed: artificial intelligence literacy, block-based and text-based AI applications, machine learning, data mining, data visualization, AI algorithms, AI tools that can be used in lesson planning and assessment, as well as ethical issues related to AI. The purpose of this study is to evaluate the effectiveness of the training. For this purpose, the "Artificial Intelligence Awareness Scale for Teachers" was administered as a pre-test and post-test in order to collect quantitative data, while qualitative data were obtained through semi-structured interview questions. Before the training, interview questions focused on teachers' views regarding the use of AI in education, whereas after the training, teachers were asked questions concerning their experiences in the program and their opinions on the planned AI-related instructional activities. The analysis of the pre-test data indicated that the participants possessed only a basic level of conceptual knowledge regarding artificial intelligence. Among the subfields of AI, machine learning was the area with which participants were most familiar. Notably, all participants reported prior experience with personal assistant applications. However, the findings also revealed a lack of competence in developing artificial intelligence systems. Comparison with the post-test results demonstrated that participants achieved greater conceptual clarity, particularly with respect to terms and notions that are often difficult to distinguish. These outcomes were further substantiated through statistical analyses. According to the qualitative findings on the use of artificial intelligence in education, participants stated that AI would be insufficient for providing personalized learning opportunities, that it would not replace teachers in the future, and that it would not reduce the risk of errors in education. With regard to the training activities, participants reported that they benefited from practice-oriented activities and expressed their willingness to implement AI awareness activities with their own students. They particularly noted that they struggled with natural language processing, while machine learning and image processing applications were of greater interest. They emphasized that the development of comprehensive and advanced systems requires extensive coding knowledge. All participants highlighted that the most important issues, both for their personal use and for the educational activities they planned for their students, are originality and ethical considerations. As a result, the training activities conducted within the scope of the project were evaluated as having successfully achieved their objectives.

Keywords: *Artificial intelligence, teacher education, artificial intelligence awareness*

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Eco-friendly digital platforms and applications in Türkiye

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Abstract

The digitalization process plays a crucial role in generating new environmentally friendly solutions aligned with the Sustainable Development Goals (SDGs). In recent years, eco-friendly digital applications in Türkiye have expanded significantly across various fields, including energy and resource management, waste management, sustainable transportation and sharing economy, food waste prevention, and environmental education and awareness. This study examines the functions and societal contributions of eco-friendly digital platforms in Türkiye. Mobile applications developed by the Energy Market Regulatory Authority (EPDK) and the Ministry of Energy enable citizens to monitor their electricity and natural gas consumption, thereby fostering transparency and savings in individual energy use. Applications launched by the ÇEVKO Foundation support waste management by mapping recycling points and disseminating knowledge. In the transportation sector, electric scooter and car-sharing applications contribute to reducing carbon emissions by decreasing private vehicle use. In the field of food waste prevention, the Fazla Gıda platform redistributes surplus products from hotels, restaurants, and supermarkets to those in need, representing a notable example of both environmental and social sustainability. Within education and awareness, the digital tools of the TEMA Foundation and WWF Türkiye enhance environmental consciousness and encourage voluntary participation. In the media ecosystem, programs broadcast on TRT Belgesel, Habertürk, and NTV; digital platforms such as Yeşil Gazete, Ekoiq e-magazine, and Sürdürülebilir Yaşam TV (YouTube); as well as documentaries from the Sustainable Living Film Festival, BluTV, and Gain reinforce the cultural dimension of eco-friendly digital transformation. Additionally, social media campaigns by TEMA, WWF Türkiye, and Greenpeace Mediterranean provide strong examples of digital activism. In conclusion, eco-friendly digital applications in Türkiye make significant contributions to individual behavioral change, corporate responsibility, and environmental awareness. However, the expansion of these practices and their integration into public policies are critical requirements for reducing environmental impacts and ensuring sustainable development.

Keywords: *Eco-friendly digital applications, sustainable development, media*

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Professional digital competency profiles: A literature review on conceptual approaches and application areas

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Abstract

Digital transformation has increased the importance of digital knowledge, skills, and attitudes in professions and has made these areas more visible within professional competencies. In today's business world, digital competencies are not limited to technical skills but also encompass a multidimensional structure that includes problem-solving, communication, collaboration, innovation, and ethical behavior in the digital environment. This situation has necessitated the systematic definition, measurement, and continuous development of professional digital competencies. In this context, the concept of "professional digital competency profile" is discussed in detail in this study. These profiles aim to identify the digital competencies required by professions, develop appropriate measurement tools for their assessment, and support individuals' professional development processes. Internationally conducted studies provide important reference points in this field. In particular, the DigComp frameworks developed by the European Commission and the ESCO database stand out as key resources for creating digital competency profiles in occupations. Furthermore, the Spain-based Ikanos Project has made important contributions to modeling digital competencies in the context of occupations. The study used a literature review method, and DigComp reports, European Commission documents, project outputs, and relevant databases were examined in detail. Furthermore, approximately 20 articles were evaluated in detail as a result of searches conducted in Google Scholar and various academic databases using keywords such as "professional digital competency profile," "professional digital competency," and "professional digital competency profile." The findings show that professional digital competence profiles play a critical role in the design of education programs, professional development processes, and national policy-making. However, it was observed that most of the existing studies focused on a limited number of occupational groups. Future studies should develop profiles covering a wider range of occupational groups and effectively integrate these profiles into national policy processes.

Keywords: *Professional digital competency profile, professional digital competencies, digital competencies, digital competency profile, professional profile*

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.From innovation to accountability: Comparative insights into quality assurance of micro-credentials

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Abstract

Micro-credentials have emerged globally as tools to support flexible, lifelong learning and agile workforce development. As micro-credentials gain traction globally, quality assurance (QA) systems face the dual challenge of supporting innovation while maintaining educational standards. This paper explores how four countries—Malaysia, United States, Ireland, and Germany—have responded to this challenge. Drawing on policy analysis, QA reports, and cross-country comparisons, it identifies four distinct models of QA engagement with micro-credentials: institutional-led (U.S., Germany), national-framework-led (Malaysia, Ireland) QA approaches. The paper argues that effective QA for micro-credentials requires contextual adaptability, transparent outcome standards, and interoperability across educational systems. It further explores how international frameworks (e.g., UNESCO's micro-credential guidelines, Bologna Process instruments) are influencing national approaches, especially in the European contexts. This comparative perspective offers insights for policymakers seeking to align micro-credentials with both labor market relevance and academic quality arguing that robust QA for micro-credentials must balance flexibility, learner autonomy, and cross-border recognition, and concludes with recommendations for aligning micro-credentials with national qualifications frameworks and labor market forecasting tools.

Keywords: *QA, Microcredentials, higher education*

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Teachers' perceptions of the use of artificial intelligence tools in education: An examination across various variables

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Abstract

The rapid development of artificial intelligence (AI) technologies in recent years has led to profound transformations in education. AI tools are now widely employed in diverse areas such as content development, diversification of teaching methods, student assessment, adaptation of instructional materials, and strengthening communication among educational stakeholders. The effective integration of these technologies into educational settings is closely tied to teachers' perceptions and attitudes. Teachers' adoption of AI should not be seen merely as the use of a technical tool; rather, it represents a functional and transformative process involving the restructuring of teaching methods, teacher roles, and instructional designs. Therefore, understanding teachers' perceptions of AI technologies is of critical importance. The aim of this study is to examine teachers' perceptions of the use of AI tools in education and to determine whether these perceptions differ according to demographic variables. The study group consists of 207 teachers from different subject areas, including 100 females and 107 males. This research was conducted using a quantitative approach within the framework of a correlational survey model. The data were collected through the Perception Scale on the Use of Artificial Intelligence Tools in Education, which includes 37 items across three factors (competence, anxiety, and usefulness) on a five-point Likert scale. The findings revealed no significant differences in teachers' perceptions based on gender or professional experience. However, teachers who reported more frequent use of AI tools demonstrated more positive perceptions compared to those who used them less frequently. These results suggest that increased exposure and experience with AI may foster more favorable attitudes toward its educational applications. In conclusion, the study recommends expanding in-service training programs, incorporating AI literacy into teacher education curricula, and raising awareness of pedagogical and ethical dimensions to enable teachers to integrate AI technologies effectively into classroom practice. Future research could focus on longitudinal studies that explore how teachers' perceptions of AI evolve over time, providing deeper insights into the long-term impact of professional experience and AI use.

Keywords: *Artificial intelligence, educational technologies, teacher perceptions*

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Vocational school students' views on digital citizenship awareness: A case study

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Abstract

In this age, with the rapid change and development of technology, the vast majority of individuals' lives have shifted to digital environments. From education and communication to shopping and entertainment and public services, many activities are conducted through digital tools; this necessitates digital literacy and the need to be conscious and responsible digital citizens. The integration of digital processes into all areas of life necessitates that individuals act with awareness of their digital rights and responsibilities, develop awareness of digital security, and comply with digital ethical principles. From this perspective, the concept of digital citizenship, which refers to individuals becoming active, conscious, and responsible participants in the digital world, is gaining value today. The increasing interaction of individuals in digital environments, especially among young people, constitutes a critical factor in terms of their awareness, ethical use, and social and individual security. In this context, young people's awareness of digital citizenship is crucial for both ensuring their own digital security and creating healthy digital interaction environments at the societal level. Awareness of young people's digital citizenship is crucial not only for protecting their own digital security but also for contributing to the development of healthy, respectful, and responsible interaction cultures in the digital environment. In light of all this information, this study aimed to in-depth examine the views of Vocational School students regarding digital citizenship awareness. The study group consisted of 60 first- and second-year students at the Computer Technologies Department of Kazım Karabekir Technical Sciences Vocational School of Kafkas University. The research, conducted using a case study design, a qualitative research method, used a semi-structured interview form developed by the researcher as the data collection tool. The findings revealed that students have some awareness of the concept of digital citizenship, but they experience various knowledge gaps, particularly regarding digital ethics, digital security, and digital rights. This study, which systematically addresses digital citizenship education at the higher education level, is expected to guide new educational programs, policy development processes, and future academic research in this area by revealing student opinions on areas such as digital literacy, ethical use, security awareness, and online responsibilities.

Keywords: *Digital citizenship awareness, vocational school students, opinion, case study.*

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The prevention of cyberbullying in middle schools through the use of gamification

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Abstract

The widespread adoption of digital communication tools has significantly facilitated interpersonal interaction; however, it has also contributed to the emergence of various social issues. One such issue is cyberbullying, which involves individuals using technological platforms—such as social media or other digital communication tools—to send messages or images intended to threaten, humiliate, or insult others. Perpetrators may engage in such behavior to inflict harm, seek revenge, or for entertainment purposes. Research underscores the severity of cyberbullying, indicating that it can lead to serious psychological consequences, including suicide (Aksaray, 2011). According to a 2023 survey conducted in the United States, 27% of respondents reported experiencing cyberbullying within the past 30 days (Patchin & Hinduja, 2024). In Türkiye, a 2011 study revealed that 14% of participants had been victims of cyberbullying, while 10% had engaged in such behavior. The study also found that Facebook was the most common platform for cyberbullying, whereas Twitter (X) was the least (Özdemir & Akar, 2011). These findings highlight the critical need for proactive, awareness-raising initiatives to prevent cyberbullying before it occurs. This study, conducted under the TÜBİTAK 2209-A University Students Research Projects Support Program, aims to raise awareness and implement preventive strategies against cyberbullying. The primary objective is to design a gamified, school-based intervention that enables middle school students to recognize cyberbullying behaviors, adopt protective and preventive measures, and contribute to cultivating a positive school climate. The intervention also seeks to reduce not only cyberbullying and victimization but also passive bystanding behaviors in digital contexts. A qualitative research design was employed, grounded in the intervention research model. The study group consisted of 33 sixth-grade students and one teacher of Information Technologies and Software. Data collection tools included the fishbone (Ishikawa) technique and semi-structured interviews. Students created fishbone diagrams to identify causes and consequences of cyberbullying, and the entire school participated in the gamified activities. The intervention incorporated various gamification elements—such as code-breaking, problem-solving, and storytelling—alongside awareness-raising posters. These activities were designed to enhance students' understanding of cyberbullying, foster collaboration and communication skills, encourage interclass interaction, and promote a supportive school environment. At the conclusion of the intervention, a semi-structured interview was conducted with the Information Technologies and Software teacher to gather further insights. Data were analyzed using content analysis. The findings indicate that the gamified intervention effectively increased students' awareness of cyberbullying. Participants demonstrated a clearer understanding of the roles of cyberbully, cybervictim, and cyberbystander, and responded to these roles with greater consciousness and responsibility. Moreover, the intervention was found to strengthen peer cooperation and have a positive impact on the overall school climate. In conclusion, the study demonstrates that gamification can serve as an effective, sustainable, and awareness-raising educational strategy. This approach holds promise as a model for other schools seeking to combat cyberbullying and promote the development of responsible digital citizenship among students.

Keywords: *Cyberbullying, gamification, positive school climate, intervention, awareness.*

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Investigation of the teaching and learning conceptions of teachers who actively participate in the project development process

Sümeyya Gürses Badar[a], İlker Yakın[b]

Abstract

Epistemology is a field of philosophy that concerns the nature and justification of human knowledge. It is related to and influences conceptions of teaching and learning (Chan & Elliot, 2004). In other words, teachers' conceptions of teaching and learning, the meanings they attribute to educational conceptions, their thoughts, and their practices, shape their teaching methods and perspectives on teaching and learning (Biçer et al., 2013; Chan & Elliot, 2004). In the literature, conceptions of teaching and learning are seen to consist primarily of two approaches: traditional and constructivist (Yıldırım, 2019). The traditional approach is teacher-centered and is based on the argument that the subjects to be taught are more important to the teacher than the interests and needs of the students (Aytaç, 2020). The teacher is the transmitter of knowledge; the student is the passive recipient, and collaborative work is generally absent. In contrast, the constructivist approach is student-centered. In this approach, students are active, discover or construct knowledge, work collaboratively with their peers, and possess a critical perspective (Aypay, 2011; Bağcı, 2019). Rapidly and constantly evolving technology and the innovation economy require the development of critically thinking, solution-oriented, innovative, and competitive individuals. Teachers' conceptions of teaching and learning emerges as one of the factors that play a significant role in acquiring these modern skills (Fındıkoğlu, 2019). It is essential to integrate constantly changing and evolving information and communication technologies into the field of education, utilize them in accordance with the understanding of quality education, and expand their use (Timur & Taşar, 2011). Teachers are among the primary individuals who will fulfill this requirement. An active learner is an individual who is motivated to learn, learns to learn, is aware of what and how to learn, can manage their learning with the necessary control strategies, and thanks to their self-management skills, achieves learning by performing certain activities (Özer, 2004). One of these activities that active learners will engage in is projects carried out in schools. The question of whether teachers who develop projects, which are of great importance in educational environments, hold a constructivist or traditional teaching-learning approach requires examination of the level determined by various variables. In light of these assessments, the aim of this study is to determine the teaching-learning approach of teachers who actively participate in the project process and to determine whether there are significant differences between these approaches and various variables. A survey model, a descriptive research method, was used in the study. This study was conducted with 480 teachers working in Mersin province, selected through purposive sampling, who had been actively involved in project development processes within the last three years. The data collection tool for the study consisted of demographic information of the participants and the "Teaching-Learning Conceptions Scale," developed by Chan and Elliot (2004) and adapted into Turkish by Aypay (2011). Descriptive statistics, independent samples t-tests, and one-way ANOVA were used to analyze the data. The main findings of the study indicated that the teachers had a high level of adoption of the constructivist approach and a low level of adoption of the traditional approach. Furthermore, it was concluded that the female teachers participating in the study embraced the constructivist dimension more than the male teachers. Conversely, the traditional dimension was found to be more accepted by male teachers than female teachers. The teaching-learning approaches adopted by teachers who actively participated in the project development process did not differ according to their educational background, but differences were found among participants with a traditional approach based on their years of service and educational background. Finally, the number of projects participated in the study also varied among the participating teachers. The results of the study are intended to offer implications for future studies.

Keywords: *Teaching-learning conception, project, constructivist, traditional*

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An analysis of vocational school students' online interaction data

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Abstract

This study aims to examine the interaction data of vocational school students in online learning environments and to identify similar learning behaviors. The research was conducted with 553 first-year students enrolled in the Fundamentals of Cybersecurity course at a state university's vocational school. The course was delivered entirely through the Moodle learning management system (LMS) in a fully online format. The sample consisted of students from different departments and programs. During the data collection process, two different tools, Moodle and Big Blue Button (BBB), were utilized. Through BBB, students' participation rates in live classes were obtained. From Moodle, approximately 174,000 rows of data were collected, including assignments, quizzes, H5P activities, access to course materials, and the number of unique login days. The study followed an educational data mining process. In the analysis phase, the K-means clustering algorithm was applied, and the optimal number of clusters was evaluated using the Silhouette score criterion. The analyses were carried out with the Orange Data Mining software. The findings revealed that students were grouped into three clusters according to their interaction levels: low, medium, and high. In terms of academic performance, students in the high-interaction cluster achieved the best results, while those in the low-interaction cluster performed the worst. Students in the medium-interaction cluster were positioned between the two groups. The results indicate a meaningful relationship between interaction and achievement in online learning environments and highlight the need for data-driven interventions to identify at-risk students at an early stage. The findings emphasize the importance of data-informed decision-making processes. Future studies may benefit from classifying students based on these clusters, implementing early interventions for those with low or high interaction, adapting instructional design to different learner profiles, and enabling both instructors and students to monitor the learning process more effectively.

Keywords: *learning analytics, online learning, interaction data, clustering analysis*

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Developing a study agenda through rapid application development tools

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Abstract

Considering the time and cost constraints associated with coding from scratch, the use of AI-based or rapid application development (RAD) tools offers a more practical and functional alternative. This study aims to provide a timely solution to an educational problem using RAD tools and to evaluate its impact on the target audience. Interviews with parents of exam-preparing students revealed difficulties in helping students develop study habits and challenges in tracking paper-based study schedules provided by teachers. In response, a user-friendly mobile/web application was developed to help students monitor their daily study routines, record assignments, track solved questions, and log books read. The app visualizes students' academic progress to boost intrinsic motivation and promote disciplined study habits. Various RAD tools were reviewed during development, and Mendix was selected for its AI support and ease of use. The application is designed for mobile use, allowing all stakeholders easy access to data. It will be piloted with student groups in two different cities over a two-month interactive period, after which surveys will be conducted with students, parents, and teachers. The project aims to raise awareness among educators and parents, serving as a model for the use of RAD tools in education.

Keywords: *Rapid application development, assignment tracking, study monitoring application*

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Integrating artificial intelligence into arduino-based educational activities

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Abstract

Artificial Intelligence (AI) refers to computer systems and software capable of imitating human intelligence and performing similar tasks. It encompasses cognitive processes such as learning, reasoning, problem-solving, and language comprehension. First introduced at the 1956 Dartmouth Conference, AI has since advanced significantly, particularly in the field of emotion recognition. Systematic reviews highlight the increasing role of such technologies in health, education, and human-computer interaction. In education, sentiment analysis provides adaptive and empathic feedback, thereby enhancing student engagement (Guo et al., 2023; Happy et al., 2021). Methods range from lexicon-based approaches to deep learning architectures such as LSTM, CNN, and Transformer/BERT models (Anilsagar & Syed, 2022). Arduino, as an open-source microcontroller platform, has gained popularity in STEM education, supporting the development of engineering and algorithmic thinking skills (Prabowo & Irwanto, 2022). Integrating AI models with Arduino offers learners both tangible hardware experience and intelligent software outcomes. Building upon this trend, this study developed a system that performs sentiment analysis of spoken expressions and visualizes the results as emojis on an 8×8 LED Matrix in real time. The system was designed using an Arduino Uno, an 8×8 LED Matrix (MAX7219), and a Junior+ shield. The matrix pins were connected to Arduino's digital inputs, and power connections were established according to the standard wiring scheme. For AI processing, a Turkish BERT-based sentiment analysis model from Hugging Face was employed. User speech was recorded via a microphone, converted into text with the Google Speech-to-Text API, and then classified as positive or negative. The classification result was transmitted from Python to Arduino using the pyserial library, prompting the LED Matrix to display either a smiling or a sad emoji. Python libraries (transformers, speech_recognition, pyserial) and the Arduino IDE were used in development. The system operates in four steps: 1-Recording speech and converting it to text. 2-Performing sentiment analysis using the BERT model. 3-Transmitting the result to Arduino via serial port. 4-Displaying the corresponding emoji on the LED Matrix. Tests indicated an accuracy rate of 90–92%. Despite a 0.2–0.5 second delay, the system provided real-time feedback. In uncertain cases, a positive emoji was displayed by default. Educationally, the system enables students to experience AI through hardware interaction, combining coding, electronics, and empathic awareness. This study introduced a low-cost prototype that visualizes sentiment analysis of spoken expressions in real time. The system has potential as an interactive tool to attract student interest. While the BERT model performed well on short texts, it struggled to classify neutral emotions. Environmental noise and accent variations were also observed to impact performance. Inclusion of a neutral sentiment class, Use of noise-resistant hybrid models, Integration into AI literacy and STEM courses at the secondary school level, Expansion to multimodal analysis incorporating tone of voice, facial expressions, and body language. Thus, the project is not only a technical application but also a powerful educational tool that fosters AI literacy, empathic awareness, and interdisciplinary learning.

Keywords: *Artificial intelligence (AI), Arduino, artificial intelligence in education, sentiment analysis*

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Blending rme and ar in early childhood: Insights from teachers, children, and observational data

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Abstract

This qualitative study explores teacher and child perceptions of MAGIC, an Augmented Reality (AR)–based application grounded in Realistic Mathematics Education (RME), designed to support preschool children's mathematical skills. Data were collected through teacher social validity forms, child social validity forms, and researcher diaries during the implementation of MAGIC in three preschool classrooms. Thematic analysis revealed that teachers perceived the application as effective in enhancing children's mathematical understanding, classroom engagement, and instructional efficiency, while also noting technical challenges and the importance of student readiness. Children expressed overwhelmingly positive emotions while using MAGIC, frequently describing the experience as fun and expressing a desire to engage with it again. Most highlighted the appeal of interacting with the tablet, while others appreciated the opportunity to collaborate with peers. Researcher diary entries supported these findings, identifying themes such as increased emotional engagement, rapid technological adaptation, and active mathematical reasoning among children. However, challenges related to group dynamics, unequal participation, and occasional teacher passivity in scaffolding were also noted. Overall, the qualitative data suggest that AR-supported RME activities like MAGIC can foster enthusiasm, collaboration, and conceptual understanding in early childhood mathematics, while also underscoring the need for thoughtful implementation and teacher support.

Keywords: ***E****arly childhood; augmented reality; mathematics; realistic mathematics education*

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Students' perspectives on the educational use of Minecraft

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Abstract

The purpose of this study is to reveal the skills acquired by high school students through their gaming experiences with Minecraft and to examine the relationship of these skills with educational processes. The research was conducted using the phenomenology design, one of the qualitative research methods, through semi-structured interviews with eight high school students determined by convenience sampling. The data were analyzed using content analysis. The findings show that playing Minecraft fosters cognitive and social skills such as creativity, imagination, problem-solving, teamwork, attention, and strategic thinking. The game was particularly associated with mathematics, physics, chemistry, and English lessons. Some students noted that the game does not directly contribute to academic achievement or may even have negative effects. The study demonstrates that when structured for educational purposes, Minecraft can be an effective learning tool and contribute to the development of 21st-century skills.

Keywords: *Minecraft, game-based learning, digital games*

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Designing an adaptable learning analytics dashboard beyond one-size-fits-all

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Abstract

Learning analytics has gained traction as online and blended learning grow more complex, and its most common application is the student-facing dashboard that aggregates indicators into visualisations to provide feedback. Yet the literature shows that most existing dashboards remain largely descriptive (what happened) and static, offering limited diagnostic (why did it happen), predictive (what will happen) or prescriptive (what should i do) guidance and little control for learners to personalise what they see. This study presents a learner-centred design for an adaptable learning analytics dashboard that treats the interface as a flexible workspace students can customize their dashboard. Adaptability is made possible through drag-and-drop layout control and simple show/hide toggles applied across the 18 elements available in the interface, allowing learners to bring forward what matters and hide the rest. These elements span feedback types—from descriptive to diagnostic, predictive and prescriptive —delivered through complementary visualisations and concise textual representations. As an illustrative case, we outline a prototype used in an introductory statistics course on a MOOC platform and discuss how students engaged with the dashboard and which features they tended to prioritise. Taken together, the design moves dashboards beyond one-size-fits-all by enabling course-aligned views that support planning, monitoring and timely adjustment.

Keywords: *Learning analytics, adaptable learning analytics dashboard, educational data mining, massive open online course*

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An analysis of students' asynchronous video viewing behavior in distance education

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Abstract

With the acceleration of digital transformation, distance learning has become a permanent and widespread learning model in higher education. Video-based course content, which is at the heart of these systems, offers students the opportunity to learn independently of time and place, allowing them to adapt to their own learning pace. However, in order for these contents to be designed effectively, it is necessary to reveal in detail how students interact with videos. In the current literature, research directly observing the impact of asynchronous video content on students' learning processes is limited; comprehensive data-driven findings, particularly regarding the intensity, time periods, and interaction patterns with which students use videos, appear to be lacking. This situation necessitates an in-depth examination of student behavior in order to improve the quality of content used in distance education.This study will examine the behavioral patterns of students regarding the use of video content in online courses offered by the Adnan Menderes University Distance Education Center (ADÜZEM). Within the scope of the research, students' viewing frequencies, preferred viewing times, and micro-level interactions such as fast-forwarding, pausing, or replaying videos will be examined through system log data. In the study, large-scale log records will be analyzed using quantitative methods to reveal students' interaction patterns, and inferences about learning processes will be made based on these patterns.Given the limited studies on data analytics approaches based on system log records in the Turkish context, this research aims to make significant contributions to both practice and theoretical discussions. In particular, examining students' interactions with online course content through video analytics will help fill gaps in the literature and add a new dimension to learning analytics-based studies. In this respect, the study aims to contribute to the development of distance education designs and to enrich the literature on understanding digital learning processes in higher education.

Keywords: *Video analytics, distance learning, log data analysis, educational videos*

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Contributions of computer and instructional technology education graduates to emergency remote teaching

Açelya Özer[a], Ebru Kılıç Çakmak[b]

Abstract

With the sudden transformation of education systems during the global pandemic, the concept of "emergency remote teaching" frequently discussed in the literature and adding a significant dimension to the literature, has become a focal point of educational research today. While initially addressed in the context of Covid-19, this concept is not limited to health crises but also encompasses solutions to ensure continuity of education in extraordinary situations such as earthquakes, floods, fires, and other natural disasters. Therefore, emergency remote teaching is seen as a process that tests the resilience of education systems to crises on both a global and national scale. In this context, it is important to examine the contributions of Computer Education and Instructional Technology (CEIT) graduates who specialize in the management of educational technologies, content design, and process coordination. These graduates, who integrate pedagogical knowledge with technological equipment, directly influence the effectiveness of distance learning practices in emergencies as distance education professionals. As part of the research, interviews were conducted with 32 faculty members (17 administrators and 15 experts) using qualitative research methods during the fall semester of the 2021-2022 academic year. The study was designed with a case study design specifically for the Covid-19 period, and the data obtained through in-depth interviews were subjected to content analysis. The obtained data were coded, similar statements were brought together to form themes, and the contributions of CEIT graduates to the process were systematically revealed. As a result of the analysis, the contributions of CEIT graduates to the distance education process were grouped under three main themes: “Technology and System Management,” “Education-Training Design,” and “Management and Coordination.” Under the Technology and System Management theme, the establishment and effective operation of learning management systems, the integration of virtual classroom tools, the rapid resolution of technical problems, and the sustainability of the infrastructure were highlighted. The theme of "Education and Instructional Design" identified contributions such as adapting course content to the online environment, designing activities that enhance student-faculty interaction, adapting measurement and evaluation processes to digital environments, and preparing videos and guides. The theme of "Management and Coordination" highlighted activities such as rapid decision-making in crisis environments, establishing support teams, and establishing boards and commissions. The findings reveal that rapid transitions during the emergency remote teaching process inevitably necessitated rapid decision-making. Furthermore, it was observed that these rapid decisions led to practical solutions and innovative practices. The rapid response of CEIT graduates to technological and pedagogical challenges faced by educational institutions during times of crisis, in particular, enabled the process to continue uninterrupted. Furthermore, the prepared guidance documents and training videos supported faculty in using digital tools more effectively, thus making the distance learning process more systematic and accessible. In conclusion, the study has detailed the critical and concrete contributions made by CEIT graduates during emergency remote teaching. The study reiterates the importance of qualified human resources during times of crisis and demonstrates that experts, particularly those trained in educational technologies, play a decisive role in the success of distance learning applications. In this context, it is crucial to utilize the experiences of CEIT graduates to ensure that emergency remote teaching processes are more planned, sustainable, and inclusive in the future.

Keywords: *Emergency remote teaching, global epidemic, CEIT*

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A needs analysis study on applied training and workplace training in the emergency distance education period

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Abstract

With the transition to the emergency distance education model in education during extraordinary situations, certain difficulties were experienced in laboratory courses involving applied skills training and workplace training applications. This study aimed to examine the difficulties encountered in laboratory courses involving applied skills training and workplace training applications during the emergency distance education process from the perspective of students, faculty members, and institutions, and to identify the solutions developed by faculty members for these problems. The study was conducted using a qualitative approach with an embedded single-case study design. Data were collected through the Kırklareli University Laboratory Usage Status Survey, Kırklareli University Workplace Training (Internship) Application Status Determination Survey, and semi-structured interviews with faculty members. The findings obtained from the collected data indicate problems such as insufficient technological infrastructure, pedagogical coordination issues, lack of practical experience, and decreased motivation. Despite these challenges, it is suggested that the effectiveness of distance education can be increased through innovative applications such as virtual simulations, 360-degree video-based laboratories, and virtual reality platforms, and the use of interactive online platforms. Additionally, training for instructors should be organized, covering topics such as the integration of artificial intelligence tools into educational environments, effective use of current educational technologies, digital content development, distance education methods, techniques, and theories, and multimedia design principles. This study serves as a needs analysis for action plans expected to be prepared for similar future situations.

Keywords: *Distance education, applied training, needs analysis, laboratory courses, workplace training*

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Usability and eye-tracking findings of the ÖZÇİMO teacher panel

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Abstract

With the increasing prevalence of digital environments in education, teacher management panels have become important tools for monitoring students and effectively managing learning processes. The purpose of this study is to measure the usability level of the ÖZÇİMO teacher panel developed for teachers and to analyze in detail, through the eye-tracking method, teachers' interactions with the interface. The study provides both quantitative indicators of the panel's functionality and an in-depth view with visual focus data reflecting teachers' experiences. The research was conducted with the participation of five teachers. The criteria of effectiveness (successful completion of tasks) and efficiency (completion of tasks on the first attempt and without assistance) were used in the usability evaluation. Task success rates were calculated using Nielsen's (2001) approach. In addition, with the eye-tracking method, the distribution of attention, fixation durations, fixation counts, and time-to-first-fixation on the interface were examined. The experiments were carried out individually in a laboratory setting designed to make teachers feel comfortable. The data obtained were analyzed through both numerical metrics and heat/path maps. As a result of the usability analysis, the teacher panel's effectiveness rate was calculated as 91%, and the efficiency rate as 88%. These values show that the panel can be used successfully by teachers and that the vast majority of essential tasks are carried out smoothly. Eye-tracking findings supported these results. Especially in the start-up and assignment tasks, it was observed that teachers directed their attention directly to the relevant areas and completed the tasks effectively. On the evaluation screen, teachers focused for longer periods, distributing their gaze across different areas of the page, thus conducting a detailed examination. High fixation durations and counts revealed that teachers were heavily engaged in the evaluation process. This study demonstrates that the teacher panel performs strongly in terms of usability and largely meets teachers' needs. The fact that both effectiveness and efficiency values are close to 90% indicates that the panel can be used comfortably in practice by teachers. Eye-tracking findings also show that teachers not only completed the tasks but also engaged in detailed interaction with the content. As a result, the ÖZÇİMO teacher panel can be evaluated as a user-friendly and effective tool with high potential to support educational processes.

Keywords: *Usability, eye-tracking, teacher panel, human-computer interaction*

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Hierarchical clustering analysis: An application with Python

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Abstract

Hierarchical clustering is an unsupervised machine learning method that groups all data into tree of nested clusters. Applying agglomerative and divisive techniques, the method helps find patterns and connection in dataset (Murtagh & Legendre, 2014). Ward's hierarchical clustering method minimises information loss (sum of squared errors) in each grouping during inductive iteration, measuring this loss in an interpretable manner by combining structures with minimum variance values to obtain clusters that are as homogeneous as possible. With this method, the sum of the squared distances between the combined points and the resulting cluster centres is minimised. Ward's method is also less sensitive to outliers in the dataset (Shetty & Singh, 2021). There are various methods for visualising the results of hierarchical clustering analysis. Clusters can be displayed using a dendrogram created with a binary tree data structure. The horizontal axis of the dendrogram shows the values in the data set, while the vertical axis represents the distances between the clusters (URL). In this study, a case study was conducted on the 'mall customer segmentation' dataset using hierarchical clustering analysis. Customers were grouped according to their spending behaviour by clustering the matrix created based on customer data (e.g. age, annual income and spending score) in the dataset. The standardised data was iteratively clustered in each step, with the Euclidean distance of each cluster calculated and the clusters gathered and represented as a dendrogram (Murtagh & Conteras, 2012). To demonstrate the range of values for the variables and facilitate comparisons between the clusters, scatter plot and hierarchical clustered heatmap were also employed. As a result of the analysis, customers were divided into five clusters based on their spending behaviour. These clusters were named and interpreted as 'thrifty', 'luxury consumer', "balanced", 'young and enthusiastic' and 'wealthy and frugal'. Based on the sample analysis conducted in the study, the different areas of application of the method will be discussed, particularly applications that can be carried out using educational data sets.

Keywords: *hierarchical clustering, machine learning, data visualization.*

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Candidates left unplaced in the 2025 YKS preference results and programs with excessive demand

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Abstract

The purpose of this study is to analyze and project future employment and income risks for university graduates in Türkiye by correlating the Higher Education Institutions Exam (YKS) placement results announced in July 2025 with current labour market data and past trends. This research aims to examine the phenomenon of high-demand fields alongside the situation of candidates remaining unplaced, analyzing the impact of professions' expected starting salaries, employment probabilities, and attractiveness factors on preference behaviors. Methodologically, the study will primarily utilize quantitative data, supported by qualitative findings. In the first stage, 2025 YKS placement statistics publicly disclosed by the ÖSYM (Student Selection and Placement Center) — including quotas, fill rates, and minimum/maximum scores — will be compiled. In the second stage, this data will be comparatively evaluated against existing employment and income data, such as TUIK's (Turkish Statistical Institute) Labour Force Statistics, Income and Living Conditions Surveys, and graduate tracking surveys. To understand trends, data from the last 5 years will be compared with the 2025 data to analyze changes in student preferences and quota distributions. News reports and comments in the media and social media regarding the 2025 YKS results will be used as a qualitative data source, analyzed through content analysis to understand public perception. The purpose of this study is to examine the future employment and income risks for university graduates in Türkiye by correlating the Higher Education Institutions Examination (YKS) placement results announced in July 2025 with current labor market data and trends from previous years. This research aims to analyze the impact of expected starting salaries, employment probabilities, and attractiveness factors of occupations on preference behaviors by examining fields with excessive demand and the situation of candidates left without a placement. Quantitative data will form the basis of the study, supported by qualitative findings. In the first phase, the 2025 YKS placement statistics (quotas, occupancy rates, minimum/maximum scores) published by ÖSYM will be compiled. In the second stage, these data will be evaluated comparatively with existing employment and income data, such as the Turkish Statistical Institute's (TÜİK) Labor Force Statistics, Income and Living Conditions Surveys, and graduate tracking surveys. To understand the trend, data from the last 5 years will be compared with 2025 data, and changes in student preferences and quota distributions will be examined. News and commentary in the media and social media regarding the 2025 YKS results will be used as a qualitative data source through content analysis to understand public perception. The policy implications of the findings indicate that quota planning should be calibrated not only based on exam demand but also on the trio of salary expectations, employment potential, and program attractiveness. The most important contribution of the study is that, beyond presenting static data, it serves as an early warning mechanism regarding the possible consequences (unemployment, brain drain, unskilled employment) that current preferences and placement trends will create in the future labor market. The research results emphasize the importance of dynamic quota management, digital career guidance systems for students, and university-industry collaborations. The study also develops concrete policy recommendations in these areas.

Keywords: *Higher education planning, employability, education-labor market alignment, YKS, quota management*

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Examination of educational technology research in 2023: AJET, BJET, C&E, ETRD, AND ETS journals

Batuhan Cicikler[a], Büşra Tavaslı[b], Emre Süzer[c], Hasan Hüseyin Cihangir[d], Ebru Kılıç Çakmak[e]

Abstract

Educational technologies have become one of the essential components of contemporary education and stand out as a field that rapidly transforms instructional processes. With the continuous impact of technological innovations, the importance of research in this field has also been increasing. In this context, trend studies in educational technology play a critical role in identifying and shaping both the conceptual framework and methodological orientations of the field, while also necessitating the systematic examination of its rapid developments. The purpose of this study is to analyze the articles published in 2023 in five international journals indexed in the Social Sciences Citation Index (SSCI)—Australasian Journal of Educational Technology (AJET), British Journal of Educational Technology (BJET), Computers & Education (C&E), Educational Technology Research and Development (ETRD), and Educational Technology and Society (ETS)—through the method of bibliometric analysis, with the aim of drawing attention to the current tendencies of the field. The population of the study consists of all articles on educational technologies published in SSCI-indexed journals in 2023, while the sample includes 385 articles published in the five selected journals during the same year. "Special Edition" issues were excluded from the sample. The articles were accessed through the online archives of the journals, and data were collected using a "Data Review Form" developed via Google Forms. For the analysis process, the "Article Review Form" prepared by Göktaş et al. (2012) was adapted, and the data obtained were analyzed using descriptive methods. The findings demonstrate that the majority of the studies focused on "instructional environments and technologies," while topics such as individual differences, digital learning environments, design and development, and distance education were also prominently addressed. Quantitative research methods were found to be the most frequently employed approach, whereas qualitative methods were relatively limited. Regarding data collection tools, scales (e.g., attitude, perception, personality) were the most commonly used, while observation was the least preferred. More than half of the studies collected data online, with convenience sampling and purposeful sampling identified as the most widely adopted strategies. Undergraduate students constituted the most common sample group, with sample sizes most frequently ranging between 31 and 100; smaller samples were rarely observed. In terms of data analysis techniques, quantitative approaches were significantly dominant, with descriptive and inferential analyses being the most widely applied. These findings reveal that current research in educational technology predominantly relies on quantitative approaches, medium-sized samples, and studies centered on instructional environments.

Keywords: *Educational technologies, content analysis, research trends*

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The relationship between artificial intelligence chatbot addiction levels and emotion regulation in adolescents

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Abstract

The widespread use of new technologies and their expansion into different areas has brought with it many negative consequences. Among these, problematic emerging technology use, such as Problematic Internet Use (PIU), Problematic Social Media Use (PSMU), and Problematic Technology Use (PTU), points to a relationship between addiction and emotion regulation skills. Research shows that adolescents' PIU, PSMU, and PTU can have negative effects in academic, social, and emotional areas. Emotional regulation skills, which encompass adolescents' ability to recognize, manage, and appropriately express their emotions, are seen as an important factor that can either increase or decrease the risk of technology addiction. Adolescence is defined as a challenging period of life, both in terms of biological changes and finding solutions to problems encountered. During this period, adolescents may experience negative emotions such as loneliness, high stress, depression, anxiety, a need for belonging, and a search for emotional support, and may struggle to cope with these emotions in a healthy way, resorting to negative coping methods. Technology usage forms such as PIK, PSMM, and PTK are used as avoidance behaviors in coping with negative emotions. However, there are also studies on the positive effects of related technologies in terms of socialization and bonding in emotion regulation. Therefore, there is a difference of opinion in the literature regarding the relationship between emotion regulation and technology usage. The development and rapid spread of artificial intelligence (AI) technologies have also increased the use of chatbots, which is a cause for concern among adolescents. There has also been an increase in the use of chatbots for emotional support and bonding purposes. As a result, the literature on AI usage patterns and levels is becoming increasingly rich. However, there is still a lack of research on the consequences of adolescents forming emotional bonds with chatbots. Therefore, the main objective of this study is to examine the relationship between adolescents' AI chatbot addiction levels (AI-CAL) and their emotion regulation (ER) skills. The literature emphasizes the correlation between adolescents' loneliness levels and problematic technology use forms such as PIK, PSMM, PTK, and others. There are also findings indicating that adolescents' parental education status explains the support they receive at home. As a result, this study will also investigate whether socioeconomic status (SES) (age, gender, parental education status, reading habits, number of siblings, and being alone at home) plays a mediating role in this relationship. In this study, the AI-CAL Scale, the DD Skills Scale for Children and Adolescents, and questions related to SED will be administered to adolescents aged 13-18 via an online survey form. Data will be collected from middle schools and high schools using the snowball method, with a target sample size of 300. The aim of the study is to contribute to the literature on adolescents' use of AI chatbots for emotion regulation and to contribute to the consensus that will emerge in this regard. Based on the results, recommendations will be made to practitioners, researchers, and policymakers regarding technology use and intervention programs for groups such as adolescents.

Keywords: *artificial intelligence, emotion regulation, adolescent, addiction*

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Creative coding in computer science education

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Abstract

Algorithms, programming languages, and digital applications have become pervasive in nearly every aspect of daily life. Even artistic domains that require psychomotor skills, such as music and painting, are not exempt from this phenomenon. Contrary to the conventional function of coding, creative coding is an artistic method that employs programming languages not to develop functional applications, but to produce aesthetic artworks. Through various codes, artists are able to generate unique artistic outputs. This study introduces creative coding, examines the primary development environments used for this purpose in terms of their code structures, and highlights the opportunities it offers for computer science education. As a method in which technology is used as a brush, with its earliest examples emerging in the 1960s, creative coding has evolved alongside a growing variety of editors, environments, and programming languages. Among these platforms, Processing and p5.js stand out. While both rely on text-based programming languages, p5.js operates directly through the web without requiring additional installations. In addition, a search was conducted in the Web of Science database under the subject heading 'creative coding', and among the 83 studies retrieved, those focusing on the field of computer science education were examined. It was observed that the number of relevant studies has increased since 2020. These studies include efforts toward scale development, the design of new platforms, and the integration of additional features into existing ones. They also emphasize aims such as enhancing computational thinking and problem-solving skills, providing introductory programming education for beginners, and strengthening girls' engagement with STEAM fields. Considering its contribution to fostering creative thinking, creative coding applications are recommended as a supportive method for introductory programming courses at the secondary and tertiary levels.

Keywords: *Computer science, creative coding, programming languages, computational thinking*

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Scenario-based learning in technology-enhanced learning environments: An examination of assessment approaches

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Abstract

Scenario-based learning is an active instructional method that aims to develop students' knowledge and skills by engaging them in solving real-life or near-real-life situations. In the literature, there are several studies that explore the use of scenario-based approaches in technology-enhanced learning environments. In scenario-based learning, students' knowledge, skills, and attitudes are assessed within real-life contexts. It is expected that different measurement-evaluation methods will be preferred than traditional assessments because the nature of scenario-based learning, which supports the constructivist approach, aims to ensure that learning takes place in the process: to measure it while it is taking place, to ensure learning while it is being measured, and to eliminate learning deficiencies during this process on time. Therefore, it is expected that alternative assessment methods—distinct from traditional evaluation practices—are employed. In this approach, process-oriented assessment methods that enable students to actively construct knowledge are recommended. The purpose of this study is to identify which assessment approaches are used in studies that incorporate scenario-based learning within technology-enhanced environments, and to examine the advantages and disadvantages of these assessment approaches. To systematically review the current state of the literature, studies published between 2020 and 2025 focusing on the learning process and using the keyword "scenario-based learning" were searched and analyzed through the Web of Science database. A systematic review method was adopted for the analysis of the identified studies. The analysis criteria included: the title of the publication, the type of learning environment used, the assessment methods employed, and—if available—positive and negative findings related to these assessment methods. The data were analyzed through descriptive content analysis using a data collection form developed by the researchers based on these criteria. Based on the findings, this study aims to outline the general trends in assessment methods used in scenario-based learning and to highlight the advantages and disadvantages of these methods. Additionally, the study offers recommendations to guide future research adopting the scenario-based learning approach.

Keywords: *Technology-enhanced learning, scenario-based learning, assessment methods, process evaluation*

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Examining the measurement invariance of the technostress scale in terms of gender

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Abstract

Measurement invariance refers to the extent to which a scale yields equivalent parameter estimates across different groups or conditions, and it represents a critical step in the scale development process. Ensuring scalar invariance is particularly essential for conducting valid mean comparisons either over time or between groups. Although the Technostress Scale has been widely employed in research investigating teachers' technostress, no prior studies have examined its measurement invariance. The present study therefore aims to evaluate the gender-based measurement invariance of the Technostress Scale. This research employed a descriptive design and included 368 teachers as participants. To assess measurement invariance, the Multi-Group Confirmatory Factor Analysis (MG-CFA) approach was utilized. Prior to conducting the analyses, the dataset was examined for outliers, normality, linearity, homoscedasticity, and multicollinearity. Based on these evaluations, the Weighted Least Squares with Mean and Variance Adjusted (WLSMV) estimator was employed. The analyses proceeded through the following steps: (1) testing the CFA model separately for each group, (2) assessing configural invariance, (3) testing metric invariance (factor loadings), (4) testing scalar invariance (intercepts), and (5) optionally testing residual invariance. Invariance decisions were made based on $\Delta CFI \leq 0.010$ and $\Delta RMSEA \leq 0.015$ criteria. The initial CFA demonstrated acceptable model fit, $\chi 2/df = 1.67$, RMSEA = 0.043, CFI = 0.981, TLI = 0.979, with all item loadings exceeding .50. Configural invariance was supported ($\chi 2= 819.262$, df = 680, RMSEA = 0.033, CFI = 0.989, TLI = 0.987), as were metric invariance ($\chi 2= 923.475$, df = 703, RMSEA = 0.041, CFI = 0.982, TLI = 0.980), scalar invariance ($\chi 2= 951.934$, df = 726, RMSEA = 0.041, CFI = 0.981, TLI = 0.981), and strict invariance ($\chi 2= 1013.776$, df = 754, RMSEA = 0.041, CFI = 0.979, TLI = 0.979). At each stage, the change in model fit indices satisfied the recommended thresholds. Overall, the findings indicate that the Technostress Scale demonstrates measurement invariance across gender. These results provide additional validity evidence for the scale and suggest that it can be reliably employed in gender-based group comparisons.

Keywords: *Technostress, measurement invariance, validity*

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The effect of university students' artificial intelligence readiness on their motivation towards technology use in classes

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Abstract

The purpose of this study is to examine university students' motivation levels and readiness for artificial intelligence and to reveal potential differences based on departmental variables. Quantitative methods were used in the study, and a descriptive survey model was preferred. The study group consisted of 227 undergraduate students enrolled in various faculties during the 2023–2024 academic year. An 18-item motivation scale measuring students' learning motivation and an 18-item scale assessing artificial intelligence readiness were used as data collection tools. Demographic variables (department, gender, age) were also included in the study.Due to the lack of fully fulfilling parametric assumptions (normality and homogeneity of variance) in data analysis, non-parametric tests were preferred. First, descriptive statistics (mean, standard deviation, median, skewness, and kurtosis values) were reported. Then, the Kruskal–Wallis H test was conducted to compare motivation and artificial intelligence scores based on departmental variables. The analysis results indicate statistically significant differences in both motivation and AI readiness scores across departments ($p < .05$). This finding suggests that students differ in both their academic motivation levels and their AI readiness based on their departments.The results indicate that students in engineering and IT-based departments, in particular, have higher AI readiness scores, while motivation scores are more pronounced among social science students. These differences are thought to be related to course content, teaching methods, and students' future professional aspirations. The study also reports pairwise comparisons following the Kruskal–Wallis model, detailing the departments where significant differences exist.Consequently, the research findings reveal that university students differ significantly in both motivation and AI readiness across departments. This suggests that programs and policies aimed at improving AI literacy in higher education should be designed with departmental characteristics in mind. The findings of the research contribute to student-centered artificial intelligence integration and motivation-enhancing applications in universities.

Keywords: *Motivation, Artificial intelligence, Readiness*

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Determining pre-service teachers' generative AI literacy across technical, ethical, and socio-emotional dimensions

Fatma Mukaddes Öcal[a], Deniz Atal[b]

Abstract

Generative artificial intelligence (GAI) tools are transforming education through applications ranging from instructional material production to personalized learning support. This development requires pre-service teachers to develop a comprehensive GAI literacy that encompasses not only technical knowledge but also critical, ethical, and socio-emotional competencies. However, existing studies on AI literacy largely remain at a general level, without sufficiently addressing GAI-specific dimensions. In particular, the socio-emotional dimension has often been neglected, overlooking pre-service teachers' emotional responses to rapidly emerging tools and their implications for pedagogy. This highlights the need for a multidimensional framework tailored to pre-service teachers and for systematically describing their current levels of GAI literacy based on such a framework. The purpose of this study was to explore pre-service teachers' experiences with GAI, their areas of use, emotions, and support needs, and to determine their GAI literacy levels through a survey developed on the basis of a six-dimensional framework. The framework consists of the following dimensions: (1) Understanding–Comprehension, (2) Use–Application, (3) Critical Evaluation, (4) Social–Collaborative, (5) Ethical–Legal Awareness, and (6) Socio-Emotional Awareness. Survey items were adapted from national and international frameworks (e.g., Long & Magerko, 2020; Ng et al., 2021; Wang et al., 2023; Pretorius & Cahusac de Caux, 2024), validated by expert reviews, and piloted prior to implementation. The study employed a descriptive survey design in the fall semester of the 2024–2025 academic year. Participants were 244 pre-service teachers enrolled in education faculties across Turkish universities (71.72% female; 67.21% third-year, 32.79% fourth-year), selected through convenience sampling. Data were collected both online and face-to-face and analyzed using descriptive statistics. Findings revealed that experiences with GAI were highly prevalent: 98.77% of the participants had used at least one tool, with ChatGPT being the most common (95.49%). Text generation (86.07%) was the primary application, while future intentions focused on lesson preparation (85.66%), material development (84.84%), and activity planning (78.28%). Curiosity (82.79%) and excitement (44.26%) were the most salient emotions, whereas anxiety (19.26%) and stress (12.70%) were relatively low. Reported support needs clustered around technical knowledge (41.39%) and content production (39.75%). Overall GAI literacy was at a moderate level ($\bar{X}$ = 3.35). The lowest means were observed in Understanding–Comprehension ($\bar{X}$ = 3.10) and Use–Application ($\bar{X}$ = 2.85), while the highest was Ethical–Legal Awareness ($\bar{X}$ = 3.72). In conclusion, although pre-service teachers are highly familiar with GAI tools, they exhibit clear gaps in conceptual understanding and application skills. This suggests that teacher education programs should address GAI not only as a technical tool but also as an ethical and socio-emotional phenomenon. Accordingly, it is recommended to strengthen foundational concepts and algorithmic thinking; to design scenario- and project-based activities focusing on prompt engineering, data-driven problem-solving, and model customization; and to deepen ethical and socio-emotional awareness through case-based discussions and reflective practices.

Keywords: *Pre-service teachers, generative artificial intelligence, generative AI literac, educational technology*

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Sound-based STEAM integrated education: Science, mathematics, technology and engineering perspective

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Abstract

This study discusses how sound, the fundamental component of music, can be theoretically approached within the context of the STEAM (Science, Technology, Engineering, Arts, Mathematics) approach. Sound acquires musical expression through acoustic properties such as frequency, amplitude, duration, and timbre, as well as through melody, harmony, rhythm, and dynamics. From a science perspective, it is associated with the principles of vibration and waves; from a mathematical perspective, with rhythm, ratio and frequency relationships; and from a technology and engineering perspective, with digital sound processing, acoustic design and instrument development processes. The artistic dimension highlights the aesthetic perspective, creativity and possibilities for emotional expression. Art aims to equip students with an aesthetic perspective, critical thinking skills, high concentration, and effective problem-solving abilities. In this context, the study theoretically links sound, the fundamental component of music, with the disciplines of science, mathematics, technology, and engineering, and discusses potential approaches that could be utilised in STEAM education. The principles of vibration and waves in the context of science; rhythm, frequency and ratio relationships in the context of mathematics; and connections with digital sound processing and instrument design in the context of technology and engineering have been addressed. Furthermore, the artistic dimension of music has been evaluated as an element that increases students' motivation and directs their interest towards learning. Consequently, within the STEAM approach, sound is not merely considered a physical phenomenon; it is also evaluated as a holistic learning domain encompassing technological, engineering, mathematical, and artistic dimensions. This interdisciplinary perspective aims to provide deeper and more creative learning experiences by enabling students to grasp the concept of sound from both scientific and aesthetic angles.

Keywords: *STEAM education, sound, theoretical assessment, science, mathematics, technology, engineering, creativity*

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Comparison of practical and supervised exam performance in programming instruction based on generative AI, peer, and content support

Denizer Yıldırım[a], Sinan Keskin[b]

Abstract

Programming is perceived as a complex and challenging field of learning, particularly by beginners, due to its abstract nature. This often results in a significant portion of students experiencing decreased motivation and failure. Therefore, the support mechanisms offered to students in programming instruction are crucial for sustaining student motivation and success. This study aims to compare students' performance in practical and supervised exams based on gen0erative AI (Gen-AI), peer collaboration, and structured content support. The participants of the study were first-year students enrolled in an Introduction to Programming course. During the two-week study period, students, based on their own preferences, utilized one of four different support combinations: (1) Gen-AI and Peer Support, (2) Gen-AI and Structured Content (w3school), (3) Gen-AI, Structured Content, and Peer Support, and (4) Gen-AI Only. Students participated in an unsupervised applied programming task and a supervised exam. Students were grouped based on the different combinations of support they received, and their performance was compared based on this grouping. Descriptive statistics revealed a difference in average scores between support formats, but this difference was not statistically significant. Students in all four groups performed better on applied tasks than on the supervised exam. Accordingly, students experienced difficulties transferring what they learned independently of AI-supported learning to supervised assessment contexts. In the supervised exam, students were required to demonstrate their own performance; therefore, the influence of support types was observed comparatively limited. When examining distributions related to student performance using box plots, it was found that patterns of variability were more heterogeneous in some support combinations. For instance, in groups supported by Gen-AI with structured content, or with the addition of peer support, both high-achieving students and low-performing ones were observed. Although collaboration and content support provided students with an advantage in applied tasks, their performance was more heterogeneous compared to other groups. In contrast, students who relied solely on Gen-AI support demonstrated relatively more consistent and higher performance. It is recommended that controlled experimental studies be conducted with larger and more diverse student groups to more clearly identify the effects of Gen-AI and other forms of support.

Keywords: *Programming instruction, Gen-AI support, peer collaboration, structured content support*

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Can artificial intelligence applications be used without digital skills? An examination of faculty readiness

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Abstract

As the use of artificial intelligence in academic research and teaching increases, the digital competence of faculty members continues to be questioned. This issue is not limited to Türkiye. For example, at Northeastern University in the United States, a student realized that course materials had been prepared with AI, reported the instructor, and requested a tuition refund. Although the university rejected this request, the case sparked debates on the transparency of AI use in academia, as well as on teaching quality and ethical issues. These discussions highlight how crucial basic technology skills and digital literacy are for using AI technologies effectively. In this context, the study examines the digital skill levels, data literacy, communication and collaboration abilities, digital material production competencies, security awareness, problem-solving approaches, and attitudes toward AI of 69 faculty members working at a public university. Data were collected through an online survey titled “Digital Competency Needs of Faculty Members”, prepared by four experts and consisting of nine sections. The survey included 5-point Likert-scale items, open-ended, and multiple-choice questions. Findings show that participants consider themselves sufficient in basic digital literacy but report weaknesses in advanced cognitive skills such as data analysis, visualization, interpretation, and data security. While they feel confident in online communication, they find themselves less capable in digital collaboration and creative content production. In problem solving, they feel competent in identifying and addressing digital issues but need more support in developing creative solutions. Faculty members also expressed the need to use AI for language and grammar checks, visual generation, research support, literature reviews, presentation preparation, video editing, data analysis, and summarizing information from various sources. Overall, the results reveal that while faculty members are strong in basic digital skills, they need additional training and support in advanced data use, security, and creative content production.

Keywords: *Digital skills, artificial intelligence, faculty readiness*

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Adaptation of the artificial intelligence acceptance scale for teachers into Turkish

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Abstract

Artificial intelligence is rapidly gaining a foothold in the field of education as a transformative technology with the potential to fundamentally reshape teaching, learning, and assessment processes. In this context, understanding the extent to which teachers adopt this technology and the factors influencing their acceptance emerges as a critical area of research for shaping the future of education. However, a review of the literature reveals a notable gap: the lack of a Turkish data collection instrument that psychometrically measures teachers' acceptance levels of artificial intelligence in a valid and reliable manner. To address this need, the present study aims to adapt the "Teachers' Acceptance of AI Instrument" into Turkish and examine its psychometric properties. The original instrument consists of a total of 38 items, including 11 items that explore teachers' experiences with AI use, as well as five subscales: Perceived Usefulness (6 items), which measures beliefs about the contribution of the technology to teaching; Perceived Ease of Use (5 items), which addresses perceptions regarding the ease of using AI tools; Behavioral Intention (5 items), which determines the willingness to use these technologies in future lessons; Self-Efficacy (6 items), which evaluates beliefs about one's ability to effectively use AI; and Anxiety (5 items), which reflects concerns related to the use of technology. The adaptation process involves several stages: conducting a literature review to identify a suitable scale and assess cultural relevance of the items, obtaining ethical approvals, performing translation and back-translation procedures, analyzing content and construct validity through an expert panel, conducting linguistic and cultural adaptation studies, confirming item clarity through pre-testing and interviews, and finally performing reliability, construct validity, and other psychometric analyses following a pilot study. The study sample consists of 293 teachers from various branches and educational levels working in different provinces of Türkiye. The results indicate that the adapted scale is a valid and reliable tool for measuring teachers' acceptance of artificial intelligence in the Turkish context. As such, it serves as a valuable resource for researchers and education policy makers, laying the groundwork for future studies in this field.

Keywords: *Artificial intelligence acceptance scale, validity, reliability*

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Classroom teachers' views on artificial intelligence technologies in education

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Abstract

In recent years, the role of technology in education has increased significantly, and digital tools and applications have become an important part of instructional processes. In particular, artificial intelligence (AI) technologies are rapidly spreading in the field of education and have the potential to transform teaching processes. In the process of integrating these technologies into classroom practices, teachers' opinions and attitudes play a decisive role. Teachers' positive or negative views on AI technologies will be beneficial in determining in which areas and how they will apply these technologies. At the same time, classroom teachers' experiences in using AI technologies and the challenges they face can affect the efficiency of these technologies in education. In this context, the study aimed to examine classroom teachers' views on AI-supported technologies. In the study, which used the phenomenological design, one of the qualitative research methods, semi-structured interviews were conducted with 7 classroom teachers working in a primary school in the Eastern Black Sea Region, and the data were analyzed through content analysis. Three of the participants stated that they had previously used AI tools in their classes, while four reported that they had never used them. It was emphasized that AI was used in education especially for purposes such as generating visual materials, creating content, and providing problem-solving support. In addition to benefits such as quick access to information, increased motivation, and permanent learning, teachers also mentioned issues such as lack of technical knowledge, difficulties in use, and a decrease in students' willingness to conduct research. Most of the participants stated that they were willing to use AI tools; however, some teachers expressed concerns about incompatibility with the current education system and the weakening of human interaction. Nevertheless, teachers stated that they had high expectations from AI in enriching lessons, accessing up-to-date content, and encouraging students to conduct research. In future evaluations, the view that the use of AI technologies will become widespread and an indispensable element of education came to the fore, while some participants expressed concerns that AI could replace teachers. Another important finding of the study was the shared opinion that teachers need comprehensive training, seminars, and practical support programs to use AI tools effectively. Additionally, it was emphasized that the technological infrastructure of schools should be improved, hardware resources should be enriched, and initiatives should be taken to increase teachers' motivation. As a result, it was observed that teachers generally have a positive perspective on AI-supported technologies; however, factors such as lack of knowledge, insufficient infrastructure, and pedagogical concerns limit their preferences for AI in education. The findings are expected to guide policymakers, school administrators, and teacher education programs for the effective integration of AI applications into educational environments.

Keywords: *Artificial intelligence technologies, classroom teachers, education, teacher opinions*

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Artificial intelligence, data mining, computer-based education and learning analytics in education: New approaches and applications

Sibel Bozdemir[a], Selami Eryılmaz[b]

Abstract

Today, artificial intelligence in education, data mining, computer-based education and learning analytics stand out as powerful tools that transform pedagogical processes, increase students' academic success, support teachers' pedagogical decisions and ensure that education policies are data-driven.oday, artificial intelligence in education, data mining, computer-based education and learning analytics stand out as powerful tools that transform pedagogical processes, increase students' academic success, support teachers' pedagogical decisions and ensure that education policies are data-driven. This study examines the pedagogical effects of artificial intelligence-supported learning systems, the contributions of data mining applications to student performance, the benefits of integrating computer-based education and learning analytics. In light of the literature review data, it has been seen that artificial intelligence and data mining based systems increase students' motivation and participation with individualized learning paths, adaptive content presentation, instant feedback mechanisms and gamification.n light of the literature review data, it has been seen that artificial intelligence and data mining based systems increase students' motivation and participation with individualized learning paths, adaptive content presentation, instant feedback mechanisms and gamification. The use of artificial intelligence is useful in identifying students' learning deficiencies and optimizing their pedagogical interventions in a data-oriented manner. However, the ethical use of AI and data mining-based systems, issues such as algorithmic transparency, data security and the preservation of pedagogical control need to be carefully considered.owever, the ethical use of AI and data mining-based systems, issues such as algorithmic transparency, data security and the preservation of pedagogical control need to be carefully considered. Since excessive dependence on technology can cause students' critical thinking and problem solving skills to be pushed to the background, these systems should be integrated as supportive tools. The study highlights the potential of computer-based education and learning analytics to strengthen equality and inclusion in education; and provides integration strategies and recommendations with distance and hybrid education models.tudy highlights the potential of computer-based education and learning analytics to strengthen equality and inclusion in education; and provides integration strategies and recommendations with distance and hybrid education models. The findings reveal that when artificial intelligence, data mining, computer-ased.

Keywords: *Artificial intelligence, data mining, computer-based education, learning analytic*

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A systematic content analysis of AI-supported feedback applications in education published on DergiPark between 2020 and 2025

Tuğba Kocadağ Ünver[a], Hafize Keser[b]

Abstract

Artificial intelligence (AI) is a technology that enables computer systems to develop capabilities similar to human intelligence, such as learning, problem solving, decision making, and prediction. In recent years, AI has been widely used in education to understand students' individual needs, personalize instructional processes, and enhance learning outcomes through data analytics. Effective use of AI in educational technologies contributes to making learning experiences more efficient and sustainable. Feedback is a critical instructional strategy that helps students understand what they are doing correctly or incorrectly, thereby enhancing learning performance. AI-supported feedback systems provide personalized guidance by responding to student performance in real time and optimize learning processes. These systems play a particularly important role in improving students' learning experiences in big data and online learning environments. This study aims to systematically examine research published between January 2020 and August 2025 on AI-supported feedback applications in education. Articles were retrieved from DergiPark by searching for keywords in titles, abstracts, or author keywords: "yapay zekâ", "AI", "artificial intelligence", "eğitimde yapay zekâ", "artificial intelligence in education", and "geri bildirim / feedback". Included studies were thematically analyzed in terms of technology types, feedback types, application areas, and research methods. In addition, publication trends by year and key findings are presented in tables and figures. The results aim to reveal the most common application areas of AI-supported feedback in education, preferred technologies, and gaps in the literature.

Keywords: *Artificial intelligence in education, feedback, systematic content analysis, artificial intelligence*

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Using pictures in assessment materials: Do animated pictures affect performance?

Beyza Özata[a], Güldem Alev Özkök[b]

Abstract

Using both text and visual representations in assessment materials helps students process information through cognitive channels. Different types of pictures can be used in assessment materials depending on the subject and assessment groups. The gradual appearance of the information provided in these visuals on the screen helps students form mental models. The gradual presentation of picture in assessment materials is described as dynamic picture. This study examined the effect of presenting informational pictures used in assessment materials in static and dynamic forms on student performance. With the quasi-experimental study design, the control group was presented assessment items containing static pictures, while the experimental group was presented the same items arranged using dynamic pictures. The study involved 106 middle school students. As a result, no statistically significant difference was found between the achievements of students who were presented assessment materials containing animated informational pictures and those who were presented assessment materials containing static informational pictures.

Keywords: *Multimedia assessment, multimedia effect in assessment, informational pictures, animated pictures*

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AI-supported instructional plan design based on student learning outcomes

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Abstract

Education systems are undergoing a rapid transformation with an increasing need for data-driven, flexible, and personalized learning environments that address individual differences. Enhancing student achievement largely depends on teachers' ability to design customized instructional plans for each learner. However, this process imposes significant challenges in terms of time and content management. To address this issue, the integration of artificial intelligence (AI)-based natural language processing (NLP) methods into instructional planning emerges as an innovative solution to improve efficiency, accuracy, and sustainability in teaching practices. This study introduces a digital platform named "NLP MEB: Student Outcome-Based Analysis and Personalized Instructional Planning System", developed in alignment with the Turkish Ministry of National Education curriculum. The system automatically identifies students' missing learning outcomes based on test performances, recommends relevant learning content, and generates AI-supported personalized instructional plans within a multi-agent architecture. With tailored interfaces for students, teachers, and parents, the platform supports content creation, assessment, and classroom management, while fostering data-driven communication among stakeholders.Adopting a design-based research (DBR) methodology, the study presents the design and prototype development of the platform. The system leverages state-of-the-art NLP techniques such as retrieval-augmented generation (RAG) and fine-tuning, and it is built with open-source technologies including React, Streamlit, MongoDB, and Ollama. Future work will focus on pilot testing with teachers from different subject areas, improving the system through feedback, and extending its adaptability to various age groups, special education needs, and mobile compatibility.

Keywords: *Design, NLP, instructional plan*

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The effect of interactive e-books on student achievement and motivation

Umut Can Kurt[a], Aslı Orman[b], Fırat Atamer[c]

Abstract

This qualitative literature review aims to examine the effects of interactive e-books on students' academic achievement and motivation compared to traditional print materials. The research problem was defined as, "To what extent do interactive e-books increase students' academic achievement levels compared to traditional print materials?" For this purpose, 14 academic studies (theses and articles) conducted in Türkiye on the subject were examined using the content analysis method. The reviewed sources indicate that interactive e-books generally positively affect academic achievement, particularly at the comprehension level, and student motivation (especially in the dimensions of attention and satisfaction). Experimental studies reported significant increases in achievement and motivation in favor of groups using interactive e-books. While student and teacher views indicate that interactive e-books enrich lessons, facilitate visualization, and make learning enjoyable, they also point to disadvantages such as usability challenges, technical inadequacies, the need for teacher training, and classroom management difficulties. Key recommendations include using interactive and multimedia elements in the design of instructional materials, organizing in-service training for teachers, and systematically integrating motivation-enhancing elements (such as gamification and personalization) into e-books.

Keywords: *Interactive e-book, academic achievement, motivation, digital learning, multimedia design*

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Investigating the link between self-regulation in three types of interaction and online learner engagement in distance education

Alihan İmancı[a], Mehmet Kara[b]

Abstract

The role of interaction in distance learning environments was investigated in a vast number of studies, and it was shown that it has positive influences on learning outcomes such as achievement, motivation, and satisfaction. Besides, there are studies that reveal that as interaction increases, transactional distance perceived by learners decreases. On the other hand, learner engagement in distance education is considered a significant factor that determines the success of the present distance education programs. In this context, the goal of the present study is to investigate the relationships between distance learners' self-regulation in three types of interaction (learner-instructor, learner-learner, and learner-content) and online learner engagement. The current study is grounded in the transactional distance theory. The participants of the study are the students enrolled in the distance education programs offered by a foundation university. The data used in the study were collected using self-regulation in three types of interaction scale and the online learner engagement scale. Mean and standard deviation scores for each measured construct were computed to reveal students' levels of self-regulation in three types of interaction and online learner engagement. The relevant parametric tests were conducted to reveal the associations between self-regulation in three types of interaction and online learner engagement. The descriptive findings revealed that learners' self-regulation in three types of interaction and engagement is at a relatively high level. The associational findings indicated that there are positive, strong, and significant relationships of online learner engagement with learner-instructor, learner-learner, and learner-content interactions. The obtained findings point out that as learners' self-regulation levels in three types of interaction increase their online engagement level also increases. These findings are congruent with the findings of the relevant studies in literature. Recommendations were offered for future research and practice, given the findings gathered in this study.

Keywords: *Distance education, interaction, transactional distance, online learner engagement*

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Students' online learning experiences during emergency remote teaching after the earthquake

Esma Çukurbaşı Çalışır[a], Yunus Karaömer[b]

Abstract

The aim of this study is to reveal the views of Hatay Mustafa Kemal University students on their online learning experiences after the February 6, 2023 earthquake, when the university urgently switched to remote education. As the institution prepares to return to face-to-face education in the 2025–2026 academic year, evaluating students' experiences is considered important. The study was conducted in June 2025 with data collected from 249 students through a questionnaire developed by the researcher. Within the framework of the descriptive survey model, the data were analyzed using frequency, percentage, and mean values. The findings show that the majority of the participants were female, younger in age, and mostly first-year students. Although internet access was largely sufficient, some students reported connection problems. Students mostly attended classes via computers and smartphones, and overall participation in live classes was found to be regular. The widespread use of supplementary resources outside of live classes indicated that students did not limit their learning to scheduled class hours. According to the results obtained from Likert-type items, students evaluated their online learning experiences at a moderate level across all dimensions. The participation dimension had the highest mean, while motivation and readiness had the lowest. Interaction and content-material dimensions were also found to be at a moderate level. In conclusion, it was observed that Hatay Mustafa Kemal University successfully maintained remote education under post-earthquake conditions, that students adapted to the process, yet motivation, attention, and interaction emerged as areas needing improvement. This study contributes to the institutional memory of the university and provides guidance for planning future remote education practices.

Keywords: *Distance education, online learning experience, student views, emergency remote teaching*

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Effective distance education design: Redesigning a course delivered through distance education

Aslı Göncü[a], Gisu Sanem Öztaş[b], Hamza Aydemir[c], Hakan Tüzün[d]

Abstract

This study focuses on the redesign of the BTE199 Information Technologies course, which is included in Teacher Education Undergraduate Programs in Türkiye. BTE199, a compulsory course for pre-service teachers, is conducted each semester in an online format with approximately 100 students. Interviews held with both students and instructors revealed several issues that hinder the achievement of effective learning outcomes and highlighted the need for a redesign of the course curriculum and content. The study group consisted of eight students and two instructors. The students were enrolled in the Departments of Science Education, English Language Teaching, Primary Education, and Special Education at a public university's Faculty of Education. They were selected from among first-, second-, and third-year students who had either previously taken the course or were currently enrolled. Since the interviews were conducted in the Fall semester of 2023–2024, first-year students were still in the 14-week learning process, and interviews were therefore conducted primarily with second-year students. Of the two instructors, one was highly digitally competent, experienced in teaching the course, and an expert in the field, while the other had not previously taught the course and had limited digital competence. The redesign process, carried out using a formative research approach, aimed to improve course content, student interaction, technology use, and assessment methods. The new design included H5P applications for interactive content, short quizzes for continuous assessment, forums to enhance collaboration, SCORM-supported materials for structured content delivery, and infographics for knowledge organization. Additionally, an instructor guide was developed to support the effective implementation of the course. Furthermore, it was planned to incorporate students' online interaction data into midterm evaluations to increase participation and motivation. Overall, the implemented changes promote a student-centered and interactive learning experience, offering practical recommendations for educators and instructional designers seeking to improve online learning environments.

Keywords: *distance education design, formative research method, information technologies*

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A systematic review of theses conducted in Türkiye on the Metaverse in education

Muhterem Akgün[a]

Abstract

Advances in science and technology necessitate transformation in education systems. The metaverse is an umbrella term that encompasses all technologies that have emerged in recent years, such as augmented reality, virtual reality, simulation, artificial intelligence, blockchain, and big data. The concept of the metaverse is formed by combining the words meta and universe. By combining the real world with the virtual environment, the metaverse offers users opportunities such as education, socialization, and communication in a virtual environment. It also provides users with fast, free access and the ability to create a virtual identity. It also facilitates collaborative learning and project-based learning in education. Immersion, time-space independence, sustainability, collaboration, scalability, and heterogeneity are key characteristics of metaverse environments. The metaverse can provide equal opportunity by increasing access in education. It also provides students with a personalized learning environment, allowing them to learn according to their own characteristics. Furthermore, the metaverse allows for greater interactivity in 3D virtual environments compared to online learning environments. It also enhances the perception of reality in the virtual environment through wearable technologies. Global problems such as pandemics, natural disasters, and climate crises are increasing the importance of education in virtual environments every day. All countries must adapt their education systems to these global challenges and take the necessary precautions. The metaverse, which refers to all virtual environments, is of great importance in this regard. The purpose of this research is to determine the general trend of theses related to the metaverse in education in Türkiye by examining their publication year, institution, sample, method, analysis used, data collection tools, and variables. The study, conducted using systematic analysis, scanned the YÖK Thesis Center and included 16 master's and doctoral theses related to education. The findings of the research are presented as frequencies and percentages and visualized with tables and graphs. Recommendations are made based on the research results.

Keywords: *Metaverse, systematic review, virtual reality*

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A comparison of physical programming tools with simulation environments*

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Abstract

In recent years, increasing interest in physical programming education has driven the development of various educational tools by numerous companies. These tools enhance students' understanding of abstract concepts by making them more concrete and also foster creativity by allowing learners to design and implement their own projects. While physical programming education emphasizes hands-on practices, its widespread adoption in schools is often constrained by factors such as hardware requirements and cost. In contrast, simulation environments-typically accessible via the Internet, offer a more scalable and cost-effective solution, thereby broadening access to programming education. As experienced during the COVID-19 pandemic, simulation environments can effectively support remote and collaborative online learning in the context of physical programming education. This study aims to compare physical programming tools and simulation-based counterparts across a range of criteria, including hardware requirements, cost, accessibility, installation process, programming language support, feedback and debugging capabilities, extensibility, offline use, support for online collaboration, Turkish language availability, and the presence of community support and learning resources availability. The study designed as a descriptive research. The comparison between physical programming tools and simulation environments was carried out using a qualitative descriptive approach incorporating direct observation, hands-on experimentation, and analysis of official documentation and websites. Prior to the comparison, the most widely used tools and environments were reviewed to identify relevant evaluation criteria. The results of the comparison were organized and presented in tabular format according to these criteria. In addition to cross-category comparisons, intra-category analyses were also conducted to highlight variations within each group. The findings suggest that although physical programming tools positively contribute to programming education, simulation environments offer greater cost-effectiveness and accessibility, making them particularly suitable for use in school settings, especially in crowded classrooms. Moreover, the combined use of physical tools and simulation environments is believed to enhance the learning experience by facilitating students' understanding of abstract concepts and reinforcing this understanding through practical applications.

Keywords: *Physical Programming, Simulation Environments, Programming Education*

*This study is based on the first author's master's thesis conducted under the supervision of the second author.

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Components and indicators of entertainment in augmented reality supported STEAM activities: An investigation on gifted students

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Abstract

Gifted students require enriched learning experiences. Although the integrated STEAM approach is known to enrich the learning environment physically, cognitively, artistically, and emotionally, the literature indicates that the components perceived as sources of entertainment and the indicators of entertainment in STEAM-based learning activities have not been examined in detail. In this context, the present study, supported within the scope of TÜBİTAK 1002-A (Project No: 323K049), aims to identify the components perceived as sources of entertainment and the corresponding entertainment indicators in the extracurricular AR-STEAM (Augmented Reality–Supported STEAM) learning experiences of gifted students. The study employed a single-case design with 30 middle school students from Science and Art Centers (BILSEM). Data were collected through semi-structured interview forms, student diaries, and researcher notes, and analyzed using descriptive and content analysis. The findings indicated that the components perceived as sources of entertainment were grouped under the subthemes of "art and design," "project-making and product development," "discussion and Q&A," "technology," "physical activity and field trips," "group work," "contribution to nature," "rest and break," "creative process," "general activity (AR-STEAM)," "social sharing and joking," "analytical tasks and the 5W1H," "outdoor activity," "learning environment," and "individual work." The indicators of entertainment were grouped under the themes of "humor, laughter, and joking," "happiness, joy, and pleasure," "social support and comfort," "motivation, ambition, and determination," "sense of freedom," "interest," "excitement," and "sense of achievement." Based on the findings, it was concluded that the entertainment indicators identified in the study may emerge within the extracurricular AR-STEAM components determined in this research.

Keywords: *Augmented reality, STEAM, entertainment, gifted students*

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Implementation of the 3D virtual environment-supported distance flipped classroom model with edufy portal: Views and metaphors

Barış Çukurbaşı[a], Dilek Karaca[b], Ali Geriş[c], Semih Gençay[d], Mustafa Fidan[e]

Abstract

Distance education practices that were compulsorily adopted during periods such as the pandemic or earthquakes pose significant challenges in sustaining student interaction and maintaining learning motivation. Particularly in practice-oriented courses like programming, the lack of interaction hinders students' ability to develop a deep understanding of the subject matter. This study addresses these challenges through the implementation of a 3D Virtual Environment (3D-VE) supported Distance Flipped Classroom (DFC) model, developed with the support of the TÜBİTAK 3501 Career Development Program. The model was applied in the Programming Fundamentals course delivered to first-year students (n=32) in a Vocational School Computer Programming program, using the Edufy Portal platform (integrating 3D-VE and SAKAI LMS) over a five-week period, including an orientation week. The research was designed as a qualitative case study. At the end of the experimental process, students' emotional states, metaphorical perceptions, and views regarding the contribution of project components to their learning experiences were collected through a structured survey. In the survey, contributions of the components were evaluated on a 1–9 scale, while a predefined list of emotions and metaphor prompts using the phrase "is like…" were also included. The qualitative data obtained were analyzed using content analysis and descriptive analysis techniques. Findings indicate that students associated their interactive learning experiences with Edufy Portal predominantly with positive emotions such as excitement, enjoyment, and a sense of accomplishment. Gamified and interactive features of the Portal emerged as the elements contributing most strongly to learning, while videos and lecture notes provided in the Capsule component were perceived as the most effective learning materials. In metaphor analysis, Edufy Portal was described with positive images such as "beginning," "game," and "savior." These results demonstrate that Edufy Portal made a substantial positive contribution to the remote learning process by offering rich opportunities for interaction and personalized learning support. It is concluded that innovative digital learning platforms designed with 3D-VE support play a significant role in developing sustainable, accessible, and motivating educational environments. Furthermore, it is recommended that such platforms be expanded to different disciplines and continuously improved based on student feedback.

Keywords: *Distance education, Flipped classroom, 3D virtual environment, Edufy Portal, programming education*

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Designing gamification elements based on intrinsic and extrinsic motivation

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Abstract

Gamification is a growing trend that can influence student motivation and performance in learning environments. Current studies present the concept of motivation connected with gamification in two ways namely, intrinsic and extrinsic. These two types of motivation are very significant in terms of understanding how students achieve goals and behave. However, there is still vigorous debate about whether individual gamification elements actually weaken or improve students' intrinsic and extrinsic motivation. What is interesting is that discussions of intrinsic and extrinsic motivation in the studies do not rely on the use of specific gamification elements related to these concepts. In order to fill this gap in the literature, a design-based study was conducted on the distribution of gamification elements in the context of intrinsic and extrinsic motivation. In this study, the classification of gamification elements was carried out in three steps. In the first step, theoretical approaches such as self-determination theory, flow theory, motivation theories, and expectation theory, which underlie the internal or external treatment of elements, were examined. In the second step, 17 studies obtained from database searches using the keywords “gamif” and “educat”, “teach*”, “learn*” were systematically analyzed, focusing on gamification elements in the motivational context. In the third step, the opinions of 8 experts from the field of educational technology were consulted in order to clarify the distribution of elements that fall into the gray area. As a result of the study, various gamification elements such as points, badges, leaderboards, and time limits were identified as extrinsic motivation, while elements such as curiosity, fun, autonomy, chance, and instant feedback were identified as intrinsic motivation elements. The framework of gamification elements based on intrinsic and extrinsic motivation obtained as a result of the study is expected not only to guide educators and researchers in designing more effective learning environments but also to contribute to bridging the theoretical and practical gap in the gamification-motivation literature.

Keywords: *Gamification, intrinsic motivation, extrinsic motivation, gamification elements, design-based study*

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Metaphorical perceptions of digital play among preschool teachers

Mustafa Alpsülün[a], Hasan Celal Balıkçı[b]

Abstract

The aim of this study is to reveal preschool teachers' metaphorical perceptions of digital play. The study was conducted using a qualitative research design based on the phenomenological approach, and the data were collected from a total of 49 preschool teachers working in a specific province. The data were obtained through an online form, in which participants were asked to produce metaphors related to digital play and to justify these metaphors with brief explanations. Of the participants, 71.4% were female and 28.6% were male. The average age was 33, and the average professional experience was 7.7 years. When the frequency of digital play use in their classrooms was examined, the responses "sometimes" and "rarely" were the most common. The most frequently used tool was the smart board. An analysis of the metaphorical perceptions showed that some teachers described digital play with inclusive and instructive elements such as "home," "world," and "ivy," while others expressed it through more critical and consumption-oriented associations such as "virtual world" or "shop." In conclusion, it was found that preschool teachers' perceptions of digital play include both positive aspects (fun, instructive, inclusive) and negative aspects (artificial, addictive, consumption-oriented). This finding highlights the necessity of using digital play within a pedagogical framework and in a balanced manner in preschool education.

Keywords: *Preschool teachers, Digital play, Metaphorical perception, Qualitative research*

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Designing and evaluating an elective course on using cartoons in education for pre-service teachers

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Abstract

This study presents the design and iterative development of an elective course, Using Cartoons in Education, aimed at preparing pre-service teachers to critically and intentionally employ cartoons as educational materials in classroom contexts. The course has been offered at a faculty of education since the fall of 2022 and, beginning in spring 2023, has been available exclusively during the spring semester. The course follows a 14-week structure in which students first explore theoretical perspectives on visual and multimodal learning, then design and present classroom applications of cartoons within their disciplinary areas. To ensure continuous improvement, a cyclical evaluation model has been adopted. Pre-service teachers complete a pre-course survey to articulate their expectations and a post-course survey to reflect on their experiences. Findings from each cycle inform revisions of the course plan for subsequent semesters. Currently, three consecutive cycles of student input have been collected and analyzed. Preliminary results indicate that students initially approach cartoons primarily as entertainment, but gradually recognize their pedagogical value in fostering critical thinking, creativity, and student engagement. They also highlight the need for more practical examples and cross-disciplinary applications. By integrating student feedback into course design, this study contributes to the growing literature on innovative instructional materials in teacher education and demonstrates how iterative evaluation can enhance elective courses for pre-service teachers.

Keywords: *Course design, cartoons, teacher training, instructional design*

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A bibliometric study on the use of the Metaverse in education

İbrahim Enes ÖNER[a]

Abstract

With technological developments, companies are creating new materials and software to offer users in line with individual needs. One such material is the metaverse, a virtual universe that has recently begun to be used in various professions. The metaverse is a technology that allows users to access a virtual environment using their own hardware and user accounts, enabling interaction with others in that environment. The metaverse has many applications, including virtual entertainment, meetings, environment tours, and healthcare. One such purpose is education. In education, the metaverse is used in many areas, such as conducting experiments, teaching in virtual classrooms, and recreating real school life in a virtual environment. This study aims to examine research on the use of the metaverse in education using bibliometric methods. To this end, the Web of Science (WoS) database was used to examine research on the use of the metaverse in education. The WoS database is popular among researchers because of its extensive publication network, various indexing methods, and ability to establish relationships. For the research, a search was conducted in the WoS database using the keywords "metaverse" and "education." The search only included articles. According to the results, 1,291 articles on the use of the metaverse in education will be published between 2008 and 2026, with 5,816 researchers involved in these publications. Research has shown an upward trend since 2020, with the majority of publications originating from China, South Korea, Japan, Singapore, and the United States. The search terms most often used in the study were metaverse, education, virtual reality, augmented reality, and technology. Additionally, materials being developed for use in the metaverse environment were found. The findings suggest that research on the use of the metaverse in education will increase in the coming years. Virtual classrooms will be equipped with diverse content to present new materials to students, and the effects of these technologies on students will be examined within the framework of various variables.

Keywords: *Metaverse, education, bibliometrics*

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A sustainability-oriented evaluation of preservice teachers' artificial intelligence literacy and digital learning skills

Ayça Hilal Kahya[a]

Abstract

In the 21st century, rapidly developing digital technologies have become a key driver in shaping modern education systems (Dağaşan, 2025). The fast pace of technological change and globalization has significantly transformed both the structure of teacher education institutions and the competencies expected from teachers (Coşkun, 2022). Contemporary visions such as Society 5.0 and Education 5.0 emphasize the human-centered and sustainable use of technology, making it essential to strengthen preservice teachers' digital pedagogical competencies. Another important dimension is the integration of artificial intelligence (AI) technologies into educational environments. Identifying preservice teachers' levels of AI literacy and digital learning skills plays a critical role in both their long-term professional development and the sustainable transformation of education systems. According to Zawacki and Richter (2019), teachers are only beginning to explore the potential benefits of AI applications in classroom practices. Therefore, understanding the impact of AI in education requires examining not only individuals' knowledge but also their attitudes, usage habits, and ethical perspectives toward AI (Türel et al., n.d.). In this regard, preservice teachers' digital learning skills and AI-supported pedagogical competencies are considered essential for the sustainability of future education models. The main aim of this study is to determine preservice teachers' levels of AI literacy and digital learning self-efficacy, and to highlight the importance of integrating these competencies into educational technologies in a sustainable way. The study was conducted with 77 preservice teachers enrolled at Selçuk University Faculty of Education during the 2024–2025 spring semester. Data were collected through the Artificial Intelligence Literacy Scale and the Digital Learning Self-Efficacy Scale, and analyzed using descriptive statistics, t-tests, and Pearson correlation analysis. Findings showed that preservice teachers' AI literacy levels were generally moderate, while their digital learning self-efficacy was moderate to high. Moreover, a positive and significant correlation was found between the two variables ($r = 0.334$, $p = 0.003$). The results indicate that digital pedagogical competencies and AI literacy should be addressed through a holistic approach to support sustainability in education. In this context, it is important for preservice teachers to be aware of issues such as data security, ethical use, and digital equity, and to adopt a perspective that considers the social and environmental impacts of technology. Based on the findings, it is recommended that teacher education programs include more AI applications, offer practical courses where preservice teachers can experience integrating these technologies into classrooms, and design content that covers ethical, social, and cultural dimensions. Furthermore, conducting similar studies in different universities, disciplines, and demographic groups would improve generalizability, while developing comprehensive teaching designs related to Society 5.0 and Education 5.0 is also emphasized as important. In conclusion, this study provides concrete evidence for institutions and policymakers working toward sustainability in education and proposes a holistic roadmap for future AI-supported education models.

Keywords: *Sustainability in educational technologies, artificial intelligence literacy, digital pedagogical competencies, data security, teacher education*

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Artificial intelligence and sustainability in education: A literature-based review

Pınar Mıhcı Türker[a], Mücahit Öztürk[b]

Abstract

The purpose of this paper is to examine the contributions and limitations of artificial intelligence to sustainability in education from a literature-based perspective. This document review presents a conceptual framework based on existing research and aims to develop recommendations for the field by discussing current trends in this field. In this context, the contributions and limitations of artificial intelligence to sustainability in education are examined from a literature-based perspective. Consequently, integrating artificial intelligence systems into the education system from a sustainability perspective will provide comprehensive, effective, and long-term benefits. Thus, it will contribute to making education systems equitable and sustainable at societal, economic, social, and global levels. Furthermore, the negative aspects of artificial intelligence in terms of sustainability in education, such as data security, inequalities among students, and inaccurate decision-making, are also highlighted. This demonstrates that the integration of artificial intelligence in terms of continuity in education is a multifaceted and complex process.

Keywords: *Artificial intelligence, sustainability in education, AI and sustainability in education*

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Examining the information technologies and software course curriculum in terms of sustainable development

Muhterem Akgün[a]

Abstract

With advances in science and technology, all countries have accelerated their efforts to achieve sustainable development goals in their education systems. Global problems such as climate change, social inequalities, and educational quality can only be solved by establishing a culture of sustainability. Access to inclusive, quality education for all and lifelong learning are among the sustainable development goals. UNESCO has emphasized the key role education plays in achieving the sustainable development goals. The elements of sustainable development education include determining policies, strategies, and programs, ensuring the integration of curricula, integrating teacher training, and aligning classrooms with other learning objectives. Acquiring skills in information and communication technologies is among the goals of quality education. In Türkiye, Information Technologies and Software is a compulsory course in 5th and 6th grades to equip students with information and communication technologies skills. The purpose of this research is to examine the outcomes of the Information Technologies and Software (ITS) course within the framework of sustainable development competencies. This research is important in determining the adequacy of the Information Technologies and Software course curriculum in achieving sustainable development goals by evaluating the outcomes of the Information Technologies and Software course in terms of sustainable development education competencies. The data collection tools for the research, which was conducted using the document analysis method, consist of the 2018 Information Technologies and Software course curriculum and the key competencies for sustainability determined by UNESCO. Within the scope of the research, the 5th and 6th grade outcomes of the curriculum were subjected to thematic content analysis and descriptive analysis in terms of eight competencies: systemic thinking, anticipatory competence, normative competence, strategic competence, collaboration, critical thinking, self-awareness, and problem-solving competence. As a result of the research, the inclusion of sustainability competencies in the ICT course outcomes was determined, and recommendations were made in line with the results.

Keywords: *Information technologies and software course, sustainable development, curriculum*

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Teacher development in the digital age: The role and sustainability of ÖBA for lifelong learning

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Abstract

The Teacher Information Network (Öğretmen Bilişim Ağı/ÖBA), developed by the Ministry of National Education, is an online education platform that aims to support teachers' continuous professional and personal development. The platform is accessible without time and space limitations, and the fact that the content is provided free of charge and certificates are awarded for completed courses are important features that have potential to increase teachers' motivation. By offering comprehensive training modules in areas such as digital competences, STEM education, mathematical thinking, and learning to learn, ÖBA contributes to teachers' professional development. The aim of this research is to evaluate the ÖBA platform in terms of key competences required for lifelong learning and sustainability in education. In the study, the course contents of the platform, diversity of topics, the level of support for lifelong learning competences, and its sustainability as a long-term learning environment were analyzed. Using document analysis technique, 214 courses were examined, and the contents were classified according to subject areas by means of content analysis. Afterwards, with the descriptive analysis method, the level of support provided by the courses for the eight key competences identified by the European Commission was revealed. In addition, based on a checklist developed based on the literature, the platform was evaluated in terms of accessibility, pedagogical design, interaction, feedback, sustainability, and data security. The findings showed that ÖBA has a strong content infrastructure especially in the areas of digital competences, STEM education, mathematical thinking, and professional development. The elimination of time and space limitations, the provision of free content, and the certification of learning outcomes constitute significant sources of motivation for teachers. From the perspective of lifelong learning, however, the courses supporting competences such as foreign languages, entrepreneurship, and cultural awareness remain limited; furthermore, the fact that some courses are accessible only to teachers of certain branches prevents other teachers from benefiting from the platform. In addition, the predominantly one-way transmission of content restricts interaction. In terms of strengthening teacher collaboration and providing personalized learning opportunities—hence ensuring a sustainable learning environment—it can be recommended to add a module that allows teachers to interact with each other. In conclusion, ÖBA offers teachers a valuable and sustainable digital learning environment. The evaluation showed that the platform has a strong digital infrastructure, but it needs to be improved with more inclusive, personalized, and innovative content. Updates in this direction will contribute more effectively to teachers' professional development and lifelong learning processes.

Keywords: *Teacher Information Network, lifelong learning, digital competences, teacher education, sustainability*

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Parents' experiences and perceptions of online courses for elementary school children: A qualitative study

Salman Akan[a], Hasan Çakır[b]

Abstract

This study is designed as a qualitative research to examine in detail the experiences, perceptions, and attitudes of parents who have enrolled their children of various ages in online courses. In line with this objective, the study delves into parents' motivations for choosing online courses, their expectations throughout the course process, the positive and negative experiences they encountered, and their thoughts on the impact of the courses on their children's development. The research adopts a phenomenological (phenomenology) approach aimed at presenting participants' experiences in a holistic manner. Semi-structured interviews were used as the primary method for data collection in the study. The interview questions prepared using this method consisted of a total of 11 questions based on literature review and expert opinions. A total of eight parents were reached in the study. Five parents' children participated in robotics coding courses, while three participated in English courses. All participants' children are enrolled in elementary school. The collected data were analyzed using the content analysis approach, a qualitative research method. During this process, the researcher also consulted with peers, and the data was first coded, then categorized, and finally included in the study under three themes. These themes were formed as follows: parents' experiences of their children's participation in online courses, parents' perceptions of online courses (benefits and disadvantages), and factors influencing parents' decisions to enroll their children in courses. The results of the study showed that parents evaluated the online course experience positively. Despite the difficulties encountered (such as scheduling, instructor indiscipline, and feedback problems), the flexibility offered by the courses and the developments they provide (particularly the acquisition of skills related to areas of interest, increased self-confidence, and improved communication skills) support this positive perception. The majority of parents indicated that they would recommend online courses to other parents if appropriate conditions were met (child's willingness, a good institution/instructor). The study recommends improvements in online courses, including adjustments to class scheduling, homework tracking, group management, instructor training, and security; parents taking conscious action in course selection, child monitoring, and communication; and future research focusing on child development, parent satisfaction, social interaction, screen time, and academic impacts.

Keywords: *Online courses, parents' experiences, parents' perceptions*

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Implementing mentorship processes for the use of artificial intelligence in academic contexts: From anxiety to solution

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Abstract

Faculty members often experience concerns when integrating artificial intelligence (AI) tools into academic processes, which can hinder their effective and reliable use in education. This study explores how mentorship can alleviate such anxieties and examines the impact of mentor guidance on enhancing technical competence, ethical awareness, and perceptions of data security. The problem addressed centers on faculty members' concerns regarding trust, data privacy, and ethical issues when adopting AI tools in academic writing, course material development, and teaching practices. The aim of the study is to explore how mentorship can transform these anxieties, foster technical competence, and enhance ethical awareness. A qualitative research design with a phenomenological approach was employed. Data were collected through semi-structured interviews and observations conducted over 11 weeks with one mentor and one mentee. Thematic analysis was applied to identify the sources of anxiety and the strategies used to mitigate them. The mentor provided technical guidance, regular validation of AI outputs, and continuous support on ethical and data security issues. Findings indicate that the mentee initially experienced strong concerns about the reliability of AI-generated information, the adequacy of their own usage skills, and the implications for data privacy and ethical compliance. However, these anxieties were substantially reduced through mentorship. In particular, repeated validation processes and targeted technical training increased the mentee's confidence, while discussions on ethics and privacy raised awareness of responsible AI use. The mentorship process not only improved technical proficiency but also fostered critical engagement with ethical and pedagogical aspects of AI integration. The results highlight that mentorship is a critical factor for ensuring the safe, effective, and ethical adoption of AI tools in academic and educational settings. The study suggests the development of structured, mentor-supported programs in higher education to strengthen AI integration and to provide faculty members with sustainable support in overcoming anxieties.

Keywords: *Artificial intelligence, mentorship, anxiety, data privacy, ethics*

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AI-assisted English writing activities with primary school students: A case study

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Abstract

In the areas of reading, writing, speaking and listening, which are the four basic skills of language learning, digital tools both enrich the learning experience and make it more accessible. In terms of writing skills, technology integration in education has evolved from traditional pen-and-paper methods to digital writing platforms. Recent studies have found and suggested that artificial intelligence (AI)-supported writing tools make positive contributions to the development of writing skills and student motivation by transforming students' writing processes with their features such as providing extensive language data access and providing individualized feedback. Generative AI models stand out in the field of writing education with three main functions: supporting creativity in text production, correcting grammatical and syntactic errors, and providing guidance on academic writing. The aim of this study is to understand how primary school 4th grade students experience the AI-supported writing process, to investigate the factors affecting their writing skills in this process, and to observe student participation during AI-supported writing activities. This research was carried out with the case study design within the scope of qualitative research method. Within the scope of this study, it was aimed to examine the experiences of primary school 4th grade students with the ChatGPT AI application on English writing skills. The participants of the study consisted of twenty-one fourth-grade students studying in a private school affiliated to the Ministry of National Education. The fact that artificial intelligence applications are currently used in English teaching in the school where the application will be made has been a criterion for the preference of this school. In this respect, the criterion sampling from purposive sampling strategies was determined as the sampling method. Classroom practices and observations were made with all students, and face-to-face interviews were held with 5-6 students from different skill levels as a supporting data. The data of the study were analyzed by content analysis method. The findings of the study are presented under the themes of identifying spelling errors and using feedback, interaction with Chat GPT, and participation. It has been observed that students generally transfer the feedback they receive from ChatGPT directly to their texts and carry out this process selectively, they interact directly and actively with ChatGPT, and there has been an increase in student participation with the activities. The findings of this research reveal that generative AI tools offer important opportunities in the development of written expression skills of primary school students. In addition, it has been observed that the content alternatives and structured feedback suggested by ChatGPT positively affect students' motivation to produce text and their habits of thinking about writing. It is recommended that future research will examine this process in more depth with longer-term applications and quantitative-qualitative mixed designs in different age groups.Additionally, the study offers recommendations to guide future research adopting the scenario-based learning approach.

Keywords: *Generative AI, elementary school, English, writing skills, ChatGPT*

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Examination of classroom pre-service teachers' attitudes towards distance education

Muhammet Yıldırım[a], Yiğit Emrah Turgut [b]

Abstract

The rapid advancements in information and communication technologies have led to fundamental changes in the field of education and facilitated the widespread adoption of distance learning applications. The integration of technology into teaching and learning processes has made distance education an indispensable part of contemporary education by enabling the creation of accessible, flexible, and student-centered learning environments. In light of these developments, it has become necessary to examine the attitudes of education stakeholders toward distance learning. Specifically, examining the attitudes of classroom pre-service teachers', who will play an active role in future teaching and learning processes, toward distance education is of great importance for both developing their professional competencies and designing effective teaching environments. Therefore, the aim of this study was to determine the attitudes of pre-service classroom teachers toward distance education and to examine these attitudes in terms of variables such as gender, internet usage time, grade level, and readiness for online learning. This research, which adopted the descriptive survey model from quantitative research methods, was conducted with 131 classroom pre-service teachers. The data collected thru the online survey was analyzed using the SPSS 29 program; independent samples t-tests and one-way analysis of variance (ANOVA) tests were applied. According to the research results, it was determined that the attitudes classroom pre-service teachers toward distance education were at a moderate level. It was determined that the levels of readiness for online learning were high. While the attitudes of pre-service teachers toward distance education do not show significant differences based on gender, they do vary statistically significantly based on whether they own a computer, their internet usage duration, and their grade level. This situation reveals that positive attitudes toward distance education may be directly related to access to and experience with digital opportunities. Additionally, it was observed that there was a moderate, positive, and significant relationship between the attitudes of pre-service teachers toward distance education and their readiness levels for online learning. In other words, as readiness for online learning increases, attitudes toward distance education also become more positive. This finding underscores the importance of supporting the digital skills and online learning experiences of pre-service teachers to enhance the quality of distance education.

Keywords: *Attitude, distance education, pre-service teachers*

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Comparison of the effects of text-based and visual block-based coding instructions on the learning motivation of specially talented students

Seyit Yörür[a], Mehmet Akif Ocak[b]

Abstract

Technology and digital transformation have led to significant changes in education systems; digital literacy, coding, and algorithmic thinking have become fundamental elements of 21st-century skills (Papert, 1980; Wing, 2006). Coding education contributes to students' cognitive capacities by developing problem-solving, creative, and systematic thinking skills (Grover & Pea, 2013). Two fundamental approaches commonly used in teaching processes are text-based programming (Python, Java, C++, etc.) and visual block-based programming (Scratch, Mblock, etc.). While text-based programming strengthens algorithmic thinking and abstract problem-solving skills (Lye & Koh, 2014), it can be challenging for beginners. (Özmen & Altun, 2014). Visual block-based environments, on the other hand, increase motivation with their intuitive structure but may be limited in terms of abstraction skills (Brennan & Resnick, 2012; Grover & Pea, 2013). While coding education studies in Türkiye mostly focus on secondary and university levels, research on gifted primary school students is limited (Küçük & Sönmez, 2023). Science and Art Centers (BİLSEM) offer differentiated education programs to maximize the potential of these students (MEB, 2022; Renzulli, 2011). This study aims to compare the effects of text-based (Python) and visual block-based (Mblock) coding instruction on learning motivation for gifted primary school students. The findings are expected to contribute to the development of effective strategies for teaching programming to gifted students and to educational policies. The primary purpose of this study is to compare the effects of text-based (Python) and visual block-based (Mblock) coding instruction on learning motivation for gifted primary school students. 1. Is there a statistically significant difference between the pre-test and post-test scores of students who received visual block-based coding (mblock) instruction in learning motivation? 2. Is there a statistically significant difference between the pre-test and post-test scores of students who received text-based (Python) coding training? 3. Is there a statistically significant difference between the learning motivation of the experimental (mblock) and control (Python) groups as a result of the training process? Which coding method increased students' motivation more? This study will use a quantitative data collection method. To assess students' motivation for coding training, a motivation scale with previously validated and reliable studies will be used (Avcı & Ersoy, 2018). The scale was developed by Çilengir & İzmirli, (2023). The study group will consist of 20 gifted students between the ages of 10 and 12 who are studying at the Ankara Gölbaşı Science and Art Center (BİLSEM) within the Individual Talent Recognition Program. This quasi-experimental study will conduct a comparative training process between Mblock (experimental group) and Python (control group) groups of 10 students each, and examine the effects on learning motivation in these two groups. The study is in the data collection phase, and the findings and conclusions will be included in the report.

Keywords: *Coding education, text-based programming, block-based programming, gifted students, motivation, BİLSEM*

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* This study was produced from the master's thesis of the first author, a student at the Gazi University Institute of Educational Sciences, completed under the supervision of Prof. Dr. Mehmet Akif OCAK.

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Personality meets AI: Examining big five predictors of ChatGPT engagement

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Abstract

Large language models (LLMs) such as ChatGPT are increasingly integrated into academic, professional, and personal contexts. Despite their widespread adoption, individual differences in usage patterns remain underexplored. Personality traits, particularly those captured by the Big Five framework, are well-established predictors of technology acceptance and online behavior (Costa & McCrae, 1992; McElroy et al., 2007). The present study examines how personality traits relate to ChatGPT usage, with the aim of identifying psychological predictors of engagement with AI tools. A total of 352 university students were recruited via online surveys. Participants provided demographic information and completed the 10-item Big Five Inventory developed by Rammstedt and John (2007), with the Turkish adaptation by Türküm et al. (2016). They also completed the ChatGPT Usage Scale developed by Abbas et al. (2024), adapted into Turkish by Besalti (2025). Correlational analyses were conducted to assess associations between personality traits and ChatGPT usage. Results revealed distinct patterns between personality and ChatGPT usage. Openness showed a weak positive but non-significant association ($r = 0.07$, $p > 0.05$). Conscientiousness demonstrated a significant negative correlation ($r = –0.15$, $p < 0.001$). Extraversion displayed a non-significant relationship ($r = –0.02$, $p > 0.05$). Agreeableness was significantly negatively correlated ($r = –0.13$, $p < 0.001$). Finally, neuroticism exhibited a weak, non-significant negative correlation ($r = –0.03$, $p > 0.05$). Overall, the findings indicate that conscientiousness and agreeableness are key predictors of reduced ChatGPT usage, while other traits play a limited role. These results underscore the role of personality in shaping human-AI interaction and highlight the importance of cultural and methodological considerations when interpreting such patterns. Future research should examine larger and cross-cultural samples to clarify these relationships and inform the development of adaptive, personality-sensitive AI systems.

Keywords: *ChatGPT usage, personality traits, big five traits, large language models*

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Interdisciplinary collaboration experiences of instructional design experts

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Abstract

Considering the rapid development of technologies and learning environments, the role of instructional design experts in developing appropriate technologies and learning settings has become increasingly important. It is well established that the instructional design process is not an individual endeavor but a collaborative effort. In projects involving content experts, subject-matter specialists, and other team members from diverse knowledge and expertise areas, the effective management of collaboration processes can occasionally present challenges. Such challenges may negatively affect the quality of educational materials, the efficiency of instructional processes, and team dynamics. In this context, understanding how instructional design experts experience collaboration in projects and the challenges they encounter is crucial for enhancing the effectiveness of products developed within the instructional design process. Accordingly, the aim of this study is to explore in depth the experiences of instructional design experts throughout the instructional design process. The study addresses the following research question: How do instructional design experts experience collaboration within team-based projects? Specifically, it examines: 1. How do instructional design experts experience collaboration in projects involving experts from different fields? 2. How do team dynamics influence the collaboration process? 3. What are the main challenges that instructional designers face during teamwork? 4. Based on their experiences, what recommendations do instructional designers have for enhancing collaboration? The study employed a qualitative research approach. Twelve individuals serving as instructional design experts in projects or work processes were included as participants in the study. To obtain in-depth information regarding instructional design experts' collaboration experiences with other specialists, semi-structured interviews were conducted. The data collected were analyzed using open coding in MAXQDA 25. Findings indicate that instructional design experts assume a role in ensuring pedagogical foundations and bridging disciplines within team-based projects. Experts support collaboration by maintaining flexibility, even when roles and responsibilities within the team are often unclear. Working with content experts from diverse fields highlighted the critical task of balancing pedagogical design with content depth. Academics and technical teams occasionally override pedagogical priorities, resulting in power imbalances and limited participation in decision-making processes. Time constraints pose challenges in maintaining pedagogical quality, increase workload, and heighten the need for internal team communication. To overcome these challenges, instructional design experts rely heavily on process management, communication, and problem-solving skills. Participants recommended clarifying roles and responsibilities, holding regular meetings and workshops, developing a shared language, ensuring pedagogical suggestions have a more active role in decision-making, and including student feedback in the process to enhance collaboration. These findings underscore the critical role of instructional design experts in team-based projects and identify strategies necessary to strengthen collaborative processes.

Keywords: *Instructional design, interdisciplinary collaboration, instructional technology design processes.*

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Exploring the role of artificial intelligence in music education

İsmail Yıldız[a], Ali Korkut Uludağ[b], Mehmet Yıldız [c]

Abstract

The literature on the use of artificial intelligence in music education not provide a wide range of publications and focuses on specific topics with very limited solutions. In order to provide a better understanding of this development and to reveal trends, we present a review of the use of artificial intelligence in music education. In this study, we analyse the scope and trends of research on artificial intelligence in music education by performing a bibliometric review of existing publications in the field using the Prisma methodology. In this scope, 2277 articles were examined from the WoS and Scopus databases using keywords such as artificial intelligence, deep learning, machine learning, music, education, teaching and learning. Publications were included in the study based on the criteria of being article-type and written in English after being obtained using relevant keywords. First, the data obtained from both databases were automatically merged using the R programme, excluding duplicate data. Subsequently, the studies were manually reviewed, and AI-focused studies in music education were examined. The data were analyzed through the bibliometrix package. The findings indicate an extreme increase in the number of publications, particularly from the 2020s onwards. Calvo-Zaragoza, Jorge Widmer, Gerhard, and Rafael Ramirez-Melendez are the authors with the most publications in the field, while the United States, China, and India are the countries with the most frequent publications. In the keyword analysis, concepts such as deep learning, machine learning, and music were found to be prominent. This finding indicates that research on the use of artificial intelligence in music education predominantly focuses on machine learning, particularly deep learning-based methods, for the analysis of musical data such as notes, sound, and rhythm. The co-occurence analysis revealed two distinct research clusters: one focusing on artificial intelligence, machine learning, and music-related applications, and the other emphasizing human-centered studies such as speech recognition, emotion recognition analysis. The thematic map shows that while machine learning appears as a well-developed motor theme with high centrality and density, deep learning–music–artificial intelligence is positioned as a highly relevant but less developed theme, and clusters like estimation–sensors represent emerging or declining topics. The findings indicate that research on artificial intelligence in music education is primarily shaped by machine learning and deep learning, with music emerging as a central but less mature theme. Additionally, the prominence of human-centered studies and the presence of emerging topics such as sensor-based estimations suggest a growing interdisciplinary orientation in the field.

Keywords: *Artificial intelligence, music education, machine learning, deep learning, bibliometric analysis*

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Examining the perception of digital citizenship in the context of different cultures

Betül Düzenli Çil[a], Hasan Çakır[b]

Abstract

The research aims to comparatively examine the perceptions of digital citizenship among Turkish and Russian middle school students studying in Türkiye within a cultural context. The lack of sufficient studies in Türkiye regarding the comparative examination of digital citizenship perceptions among different cultural groups highlights the importance of this research in filling a gap in the field. Conducted in the form of a case study, using qualitative research methods, the study included five Turkish and five Russian students from the same school. Data were collected through in-depth interviews and analyzed using content analysis. The findings indicate that students perceive the internet as a tool that facilitates life, but they also harbor security concerns. Both student groups actively use the internet for educational and communication purposes. Turkish students prioritize social interaction, making foreign friends, and sharing practical knowledge, while Russian students emphasize language learning, communication with distant relatives, and access to online courses. It was determined that Russian students focus more on security and technical competencies in digital skills, whereas Turkish students are less aware in this area. Similar awareness was observed regarding digital health and safety, while knowledge gaps were identified in areas such as digital commerce, law, access, rights, and responsibilities. Cultural differences are seen to significantly affect perceptions of digital citizenship. While students demonstrate conscious internet usage in areas such as education, communication, ethics, health, and safety, they experience knowledge deficiencies in more complex topics like digital commerce, law, and rights. This situation is associated with the students' ages and their parents' ability to meet their needs in these areas. The research suggests the inclusion of informative training on topics like cyberbullying and safe e-commerce in the curriculum and aims to help students gain secure digital experiences.

Keywords: *Digital citizenship, internet, cultural differences*

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Evaluation of work and processes aimed at improving the awareness, visibility and recognition of a higher education institution within the framework of 'Quality Assurance System' and 'Strategic Plan'

Mehmet Karakoç [a]

Abstract

All educational activities across Higher Education Institutions are attempted to be carried out simultaneously (synchronously) with many academic and administrative units such as departments, coordinatorships, centers, directorates, offices, and vocational schools, under an umbrella that will cover all services in a particular field. Examples of these units include the information center, disabled students unit, Erasmus office, human resources, career and alumni association, student affairs, private secretary, technology transfer office (TTO), international / external relations office (IRO), information technology (IT), public relations and promotion, administrative and financial affairs, library and documentation, health, culture and sports (SKS), construction work and technics, application and research centers, research laboratories, and correspondence office. Within this scope, existing commissions and boards carry out studies on many topics such as open access, scientific research projects (BAP), education, quality, legislation, and strategy development. Moreover, with the participations of both internal and external stakeholders, it is aimed to realize and complete t[b]he work and processes within the Institution in an effective and qualified manner. In this study, the steps that can be taken to improve the (1) awareness, (2) visibility and (3) recognition of a Higher Education Institution are discussed within the framework of 'Quality Assurance System' and 'Strategic Plan'. Additionally, (i) a more visible diploma for students, (ii) more visible academic development and progress for faculty members, and (iii) more efficient oral and written communication processes for institutions are also considered, that become more important with current technological developments. On the other hand, some points that need to be emphasized are as follows: (1) continuously strengthening the quality of educational activities for students as a target audience who are / will be a stakeholder of the University, (2) actively involving students to all processes, (3) learning about the situations of students and employees through one-on-one interviews, (4) considering how the knowledge gained from here can be used in teaching and administration processes, (5) using the Internet effectively, and (6) serving / presenting information through platforms such as websites and social media with consistency and integrity. By carrying out the processes in the context of a 'Quality Assurance Policy' aligned with the Institution's 'Strategic Plan', it is clear that these issues can significantly contribute to maximizing visibility. This way and by acting in a coordinated manner, it is obvious that the academic visibility of Türkiye of ours can reach much better levels.

Keywords: *University, visibility, stakeholder, quality assurance system, and strategic plan.*

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Digital transformation in higher education: Learner and faculty experiences with hybrid learning

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Abstract

Digitalization in higher education has emerged as one of the most rapidly evolving domains worldwide, particularly in the aftermath of the COVID-19 pandemic. The pandemic triggered a marked increase in the use of digital tools, and the initially temporary recourse to emergency remote education provided the conditions for hybrid learning models to become institutionalized as a permanent component of the higher education ecosystem. In the present context, this trajectory has entered a new phase with the accelerating integration of artificial intelligence and machine learning–based applications, including adaptive learning platforms, automated feedback systems, chatbot-supported student services, learning analytics and performance monitoring, as well as plagiarism detection and academic integrity mechanisms. A growing body of research emphasizes that these technological developments have reconfigured teaching and learning processes, creating significant opportunities for enhanced accessibility, personalization, and inclusiveness. At the same time, the literature highlights enduring challenges, most notably the inadequacy of technological infrastructures, disparities in digital literacy, escalating costs, and institutional resistance, all of which continue to undermine sustainability. Collectively, these global dynamics suggest that digitalization in higher education should not be viewed solely as a technological transformation, but rather as a multifaceted phenomenon that requires consideration through pedagogical, sociological, and institutional lenses. Within this framework, the present study aims to investigate how online education practices, influenced by hybrid learning approaches in the post-pandemic period, are reflected in the experiences of learners and faculty members. Methodologically, the study employed a descriptive survey design, and data were collected through online questionnaires specifically constructed to capture multiple dimensions of participants' engagement with online learning. The study was conducted voluntarily with a total of 185 participants, comprising 156 faculty members and 29 learners. The findings reveal that online learning in higher education presents a multidimensional profile for both faculty and students. Faculty members generally assessed the contribution of digital materials and tools to teaching effectiveness positively; however, they simultaneously emphasized persistent limitations, particularly in relation to technical support, infrastructural constraints, and the relative pedagogical weaknesses of online instruction compared to face-to-face formats. Learners, by contrast, reported moderate satisfaction regarding the accessibility of course materials and the contribution of digital resources to their learning, while drawing attention to low participation in synchronous sessions, motivational challenges, and technical difficulties. One of the study's most salient findings is that a substantial proportion of learners did not engage with the provided learning materials at all, thereby illustrating the frequently cited distinction in the literature between access and actual use. Moreover, while faculty members largely perceived the materials as pedagogically valuable, students expressed lower levels of perceived usefulness, reflecting what has been described as the "perception gap." This divergence between instructors' valuation of content and learners' actual integration of materials into their learning processes underscores the need for more inclusive and learner-centered instructional design. Another noteworthy finding indicates that learners rated assignments and supplementary resources as more beneficial to their learning than did faculty members, suggesting that learners place greater value on active participation and practice-oriented experiences. In conclusion, although the contribution of online learning to the learning process is recognized to some extent, the study highlights an ongoing need for improvements in infrastructure, digital literacy, and pedagogical interaction. The findings further reveal the concrete manifestations of the access–use divide, perception gaps, and digital literacy challenges within higher education, thereby offering important insights into the relationship between national digitalization policies and the lived experiences of learners and instructors.

Keywords: *Digitalization in higher education, hybrid learning, distance education, user experiences*

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Block-based programming tools in education: A systematic review of the literature (2020–2025)

Ayça Hilal Kahya[a], Ayşenur Özgan[b], Ali Battal[c]

Abstract

In recent years, it has been emphasized that students should acquire skills such as computational thinking, algorithmic thinking, and problem-solving from an early age. Especially, it is stated that computational thinking (CT) skill is something everyone should possess. CT skill is regarded as a competency that facilitates adaptation to life in today's rapidly changing information age and an indispensable skill set applicable to interdisciplinary practices (Yeni vd, 2023). At this point, computer programming activities stand out as a significant tool in developing students' CT skills (Tsai vd, 2019). In the literature, it is seen that various techniques such as unplugged activities, block-based programming, text-based programming, and physical programming are used in CT instruction (Rao & Bhagat, 2024; Weinberg, 2013). Accordingly, block-based programming tools, which offer an effective and accessible learning environment especially for K-12 level beginners in programming, hold particular importance. Compared to other programming teaching tools, block-based programming, possessing a more visual and intuitive structure, facilitates students' programming learning process. Due to this structure, block-based tools are observed to be used in numerous academic studies conducted. This study aims to examine the research conducted in our country regarding block-based programming tools over the past five years (2020-2025). To this end, a systematic literature review was conducted in the TR Dizin and YOK tez databases. Multiple searches were performed in the specified databases using the keywords "blok tabanlı", "scratch", "code.org", "blockly", "block-based" and alternative related terms. Out of the 270 studies initially identified, following a rigorous screening process based on predetermined inclusion and exclusion criteria, 56 studies on the use of block-based programming at the K-12 level in Turkiye between 2020 and 2025 were included in the analysis. Of these studies, 52 are theses and 4 are articles. While the application regions of the included studies were concentrated in Marmara, Central Anatolia, and Eastern Anatolia, it was determined that they also encompassed sample groups from different geographical regions. It was found that the vast majority of the studies employed mixed methods and were conducted particularly with 4th-6th-grade students. The findings reveal that block-based programming is most commonly used in information technologies, mathematics, and science courses, while its application remains limited in other subjects such as English and life sciences. This situation indicates that the integration potential of block-based programming across different disciplines is not yet fully utilized. The general finding of the studies is that block-based programming enhances students' problem-solving, algorithmic thinking, and computational thinking skills, as well as increases their motivation towards the course. However, some limitations regarding teacher competencies and implementation processes were also identified. When the distribution of studies by year is examined, although there has been an increase in the number of research studies related to block-based programming education in recent years; areas for development have been observed in terms of methodological diversity, interdisciplinary use, and regional representation. Future studies in these areas will contribute to the more inclusive and effective implementation of programming education. In conclusion, it was determined that to successfully disseminate block-based programming in educational settings, teacher training and appropriate content support need to be strengthened.

Keywords: *Block-based programming, scratch, systematic literature review.*

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An examination of the views of Information Technology teachers on AI-supported programming instruction in Vocational and Technical Anatolian High Schools

Türker Kazım Aktaş[a] , Figen Demirel Uzun[b]

Abstract

"In the 21st century, technology-driven educational practices are of great importance in enhancing students' cognitive and practical skills. Particularly, programming education stands out as a critical area for meeting the demands of the digital age and preparing students for future professions. Recently, AI-supported tools have shown potential for enriching the learning process in programming instruction, with positive impacts on students' abilities to understand problems, develop algorithms, solve challenges, and generate creative solutions. In this context, vocational and technical Anatolian high schools are educational institutions that prepare students directly for the workforce and technology-driven professions, equipping them with competencies that align with the requirements of the digital age. However, the experiences, perceptions, and challenges faced by teachers working in vocational and technical Anatolian high schools regarding these tools have not been sufficiently explored. This study aims to understand the views of Information Technology teachers in vocational and technical Anatolian high schools on AI-supported programming instruction. The main research question is: ""What are the experiences, perceptions, and expectations of Information Technology teachers regarding programming instruction using AI tools?"" The research was conducted using a qualitative research design with a content analysis approach. A semi-structured interview form was used as the data collection tool. The form was designed to include both teachers who use AI tools in their classes and those who do not, aiming to uncover teachers' experiences, perceptions, opportunities, and challenges encountered. The collected data were systematically analyzed using content analysis, where meaningful expressions in the texts were coded to create themes. These themes reveal the teachers' perspectives along with the opportunities and barriers associated with AI-supported programming instruction. The results of the study identified the perceptions, expectations, usage patterns, difficulties encountered, and development suggestions of teachers working in vocational and technical Anatolian high schools. Based on these findings, recommendations for improving educational policies or teaching strategies were developed. This study has contributed to raising awareness about the effective use of AI tools in programming instruction and has supported the widespread and efficient implementation of such practices.

Keywords: *Vocational and Technical Anatolian High School, Information Technology teacher, artificial intelligence (AI), programming instruction*

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A theoretical review of mathematics self-efficacy and entrepreneurial skills in the context of digital education

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Abstract

Today, educational technologies are rapidly developing, and sustainable, accessible, and inclusive education models are becoming increasingly important. Mathematics education not only facilitates the transfer of academic knowledge but also has the potential to develop entrepreneurial skills such as problem solving, analytical thinking, creative thinking, strategic decision-making, and risk-taking. Therefore, a theoretical examination of mathematics self-efficacy and entrepreneurial skills can significantly contribute to the design of innovative educational practices and the development of sustainable educational models. This study was conducted within a theoretical framework and based on a literature review, discussed how mathematics self-efficacy and entrepreneurial skills can be linked in digital educational environments. Digital platforms, gamified applications, virtual learning environments, and micro-competency-based learning materials were examined in terms of strengthening students' sense of self-efficacy and fostering entrepreneurial skills. These approaches theoretically provide a foundation for student-centered, flexible, and innovative designs of digital learning environments. Inclusivity and equal opportunity in education are also important dimensions of the study. Including students from diverse socio-economic backgrounds, with special needs, or with diverse learning needs ensures the sustainable and equitable use of digital learning environments. In this context, digital educational technologies not only improve academic skills but also contribute to equal opportunities in education. From a sustainable education perspective, the use of digital media reduces environmental impact by reducing paper and physical material consumption. Furthermore, distance and hybrid education models can contribute to the environmental sustainability of educational processes through strategies such as energy efficiency and carbon footprint reduction. Ethical responsibility, data security, and privacy issues in AI-supported educational tools were also considered as integral parts of the theoretical framework. Consequently, supporting mathematical self-efficacy and entrepreneurial skills through digital educational technologies offers significant contributions to both individual learning processes and sustainable, inclusive education policies. This theoretical study aims to provide a conceptual foundation for future applied research and innovative educational designs. It is expected to shed light on the sustainable, inclusive, and innovative development of educational technologies.

Keywords: *Mathematics education, entrepreneurship, digital learning, sustainability*

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The role of generative artificial ıntelligence tools on the problem posing skills and self-efficacy beliefs of primary school mathematics teacher candidates

Beyzanur Yılmaz[a], Devrim Çakmak[b]

Abstract

In this study, it is aimed to effect of generative artificial intelligence (GAI) tools on the problem-posing skills and problem-posing self-efficacy beliefs of preservice elementary mathematics teachers. The research employed a quasi-experimental design with a pretest-posttest control group, a quantitative research method. The research was carried out with 32 pre-service teachers who voluntarily wanted to participate in the study among the primary school mathematics pre-service teachers studying in the second year of a state university in the 2024-2025 academic year. Data were collected using the "Problem-Posing Self-Efficacy Belief Scale" by Kılıç and İncikabı (2013), for which the necessary permissions were obtained, and the "Problem-Posing Skill Test," developed by the researcher based on expert opinions. The intervention for both the experimental and control groups was conducted over four weeks, with each group attending a single 90 minute instructional session per week. While the preservice teachers in the experimental group were provided with an educational and practical process on problem-posing with GAI tools, the control group received the same content without the use of GAI tools.The data analysis process for the study is ongoing as planned and outlined below. The findings obtained from the analysis will be presented at the conference. The "Problem-Posing Skill Test" will be analyzed and scored based on six main criteria and their sub-components. Each item in the "Problem-Posing Self-Efficacy Belief Scale" by Kılıç and İncikabı will be scored on a scale of 1 to 5. The collected data will be processed using the SPSS 25 statistical software and examined for normality of distribution using the Kolmogorov-Smirnov and Shapiro-Wilks tests. If the data are normally distributed, t-tests and ANOVA will be conducted. If the data do not show a normal distribution, the Mann-Whitney U test and the Wilcoxon Signed-Rank test will be used for data analysis.

Keywords: *Generative artificial intelligence, problem posing, problem posing self- efficacy belief, primary school mathematics teacher candidates*

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Stakeholder perspectives on the use of generative artificial intelligence tools in Science and Art Centers

Tuba Kopuz[a], Alper Aslan[b]

Abstract

Science and Art Centers (BİLSEM) hold a significant place in the education system as institutions that provide gifted students with the opportunity to develop their individual potential. In recent years, the integration of digital technologies into the teaching processes of these institutions has been increasingly emphasized. Among these technologies, generative artificial intelligence (GAI) tools stand out for offering rapid access to information, personalized learning experiences, and opportunities for developing creative products. However, the effective use of such tools depends not only on technical infrastructure but also on the informed and conscious involvement of administrators, teachers, and parents. The aim of this study is to evaluate the use of generative artificial intelligence tools in BİLSEM by examining the perspectives of administrators, teachers, and parents, within the framework of current usage, responsibilities, and expectations. The study was conducted using a qualitative research method, and data were collected through interviews. The data were analyzed using descriptive analysis. The study included six participants: two administrators (A1, A2), two teachers (T1, T2), and two parents (P1, P2). One of the administrators holds a master's degree and has 20 years of administrative experience, including 5 years at BİLSEM. The second administrator is a bachelor's degree graduate with 12 years of administrative experience, one of which is at BİLSEM. Among the participating teachers, one holds a bachelor's and the other a master's degree. Both have over 10 years of teaching experience and have worked at BİLSEM for 10 years. As for the parents, one is a high school graduate and a homemaker, while the other is a bachelor's degree graduate and works as a teacher. According to the study findings, variations were observed in how participants use these tools. A1 stated that the establishment of an AI lab increased usage among teachers and students, whereas prior usage had been superficial. T2 noted that teachers at the institution had widely integrated AI tools into their lessons. P2 expressed that while these tools are beneficial, they also pose risks and should be used with caution. Participants pointed to different areas of responsibility regarding the effective use of AI tools. A1 identified the establishment of technical infrastructure, provision of tools, and organization of teacher training as administrative responsibilities. A2 emphasized compliance with legal regulations and acknowledged limitations in personal digital competence. T1 stated that teachers are responsible for continuous learning, staying updated with innovations, and attending training programs. Both P1 and P2 agreed that instilling conscious usage habits in their children is a parental responsibility. In terms of expectations, participants emphasized different aspects. A1 expressed the desire for students to produce creative outputs using AI tools. T1 requested support from IT teachers. T2 highlighted the need for licensing, resource support, and in-service training from the institution. P2 expected increased guidance on safe and accurate usage and stressed the importance of teachers setting practical examples. These findings provide scientific evidence on how AI-based technologies can be used effectively, safely, and sustainably in these institutions.

Keywords: *Generative artificial intelligence, BİLSEM, stakeholders*

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The “Teacher” in digital learning environments in the era of AI

Murat Sümer[a]

Abstract

The evolution of distance education from traditional, text-based formats to digital learning environments has necessitated a reevaluation of the roles and responsibilities of teachers. This transformation raises several critical questions: How will the roles of teachers in distance education evolve, and what factors will shape this change? To what extent do instructional technologies influence these roles? What specific competencies must teachers in distance education possess to be effective? Current discussions within the instructional dimension of distance education aim to address these questions. Although existing studies often derive conclusions by comparing teacher roles in face-to-face and digital learning contexts, they fall short in providing comprehensive insights into the roles and competencies unique to distance education. While trends such as the teacher's transition from the central figure in instruction to a facilitator, the re-emergence of the teacher's active presence through synchronous technologies, and the involvement of teachers in the development of instructional materials are increasingly observed, several challenges persist. These include the growing workload placed on teachers, the inadequacy of support services, and the ambiguity surrounding instructional roles. This study will define the position of teachers within the framework of distance education, examine the evolving nature of their roles and the requisite competencies, explore cross-cultural differences and discuss emerging trends and challenges associated with instructional roles in the distance education, especially in the AI era. To investigate that, this study is designed as a systematic literature review which consists of 5 steps according to Petersen et al. (2008). Those steps are description of research questions, searching for relevant published research, screening of those research, coding of them and analyzing and mapping the data. Two of the biggest databases, Web of Science and Scopus, will be scanned within the last 5 years.

Keywords: *Teacher, digital learning, AI, systematic review*

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Development of learning management system for increasing effectiveness in education

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Abstract

This study examines a learning management system developed for Süleyman Demirel University students with the objective of enhancing educational effectiveness and providing valuable resources for both students and instructors by integrating support into educational processes. The system was designed using the .NET 9 software language and is supported by contemporary software architecture and user-friendly interfaces. The objective of this study is to enhance the efficiency of educational processes for students, to facilitate access to teaching materials, to provide interactive learning experience, and to establish a dynamic system that can be tailored to the needs of different departments and programs. The scope of this study encompasses the distinctions between the newly developed system and existing education management software, as well as the modules developed to address the diverse educational and training requirements stipulated by accreditation institutions. The modules developed through an analysis of instructors' and students' needs aim to enhance student engagement and personalize learning processes.This study proposes a novel solution that is distinct from an open-source, plugin-based, generalist system. The proposed solution boasts a straightforward user interface, facilitates seamless access, and is capable of quantifying outcomes from the National Education Core Program and weekly subject-learning processes within the accreditation framework. The findings demonstrate that this learning management system.

Keywords: *Learning management system, measurement and evaluation, Bloom's Taxonomy, Doc Taxonomy, examination accreditation system*

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Development of an AI chatbot based on fine-tuned large language model and its integration into Moodle LMS

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Abstract

This study presents the development and implementation of an AI chatbot utilizing a fine-tuned large language model (LLM) for enhancing educational services in a Moodle Learning Management System (LMS). An open-source platform, Anything LLM, was deployed on a dedicated server to create a customizable training environment. Data pertaining to the remote education services provided by İnönü University's Distance Education Unit was collected and used to fine-tune the LLM employing Retrieval-Augmented Generation (RAG) techniques, enabling the model to deliver contextually relevant and accurate responses tailored to university-specific queries. Subsequently, a Moodle Chatbot Plugin was developed using scripts generated by the trained workspace and integrated into İnönü University's Moodle LMS portals. The effectiveness of the chatbot was evaluated through analysis of student chat history data and satisfaction surveys, which indicated high efficiency and user satisfaction. Additionally, a notable reduction in support requests to the education unit was observed, demonstrating the chatbot's practical impact on operational efficiency. This approach highlights the potential of fine-tuned LLMs in educational AI applications, offering a scalable solution for personalized student support in e-learning environments.

Keywords: *AI chatbot, fine-tuned LLM, Moodle LMS, RAG, anything LLM, educational AI integration*

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Virtual reality applications in education before and after the Covid-19 pandemic: A systematic literature analysis

Duygu Batmaz[a], Mustafa Furkan Baldemir[b], Ekmel Çetin[c]

Abstract

This study provides a comparative analysis of the use of virtual reality (VR) technology in the field of education by examining trends before and after the COVID-19 pandemic. The pandemic accelerated digital transformation within educational systems and brought forward the potential of innovative technologies such as VR in the context of remote learning. Accordingly, studies published between 2016 and 2024 were systematically analyzed using the Web of Science database. The literature review identified 440 publications in the pre-pandemic period and 1,752 publications in the post-pandemic period. Selected representative studies were evaluated in terms of technology usage, areas of application, and educational impact.

Keywords: *Virtual reality, covid-19, educational technologies*

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Determining the digital addiction and learning motivation levels of "Kariyer Destek Eğitim Merkezi" students

Ayşenur Özgan[a], Ahmet Naci Çoklar[b]

Abstract

The quality of the learning process in non-formal education may vary depending on numerous factors, such as program diversity offered to participants, digital resources, implementation procedures, planning of educational activities, and learner competencies. This study examines digital addiction levels and learning motivation among graduates of the "Kariyer Destek Eğitim Merkezi "(KADEME), an institution conducting non-formal education activities. KADEME is a hybrid career development center established under the initiative of the Konya Metropolitan Municipality, aiming to equip university students with 21st-century competencies in personal, social, and professional development domains. Grounded in experiential learning, KADEME transforms learning into an active experience through workshops, field projects, mentorship, and camp programs. The study aims to determine digital addiction and learning motivation levels among KADEME graduates, identify the effect of digital addiction levels on learning motivation, and develop recommendations to enhance the efficacy of educational programs. Within the research scope, digital addiction and learning motivation levels will be measured among students who trained and graduated in 2025 from KADEME-affiliated platforms—Diplomasi360, Benimle Oynar Mısın? and Pergel—operating under the Konya Metropolitan Municipality. Data will be collected from 150 students. Results obtained through this survey-model research will be analyzed, and evidence-based recommendations will be proposed.

Keywords: *Non-formal education, learning motivation, digital addiction.*

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A systematic literature review on AI and content recommender systems in cybersecurity education: A focus on pedagogical approaches

Yudum Özkan[a], Mustafa Murat İnceoğlu[b]

Abstract

The dynamic and complex nature of cybersecurity necessitates the development of technically advanced learning environments that reflect real-world scenarios and center on hands-on experience. However, existing learning environments rarely adapt the learning experience to individuals with different proficiencies and backgrounds. This situation points to a significant gap in the pedagogical individualization and adaptation of the learning experience. Artificial intelligence (AI)-powered content recommender systems (CRSs) have significant potential in designing personalized learning (PL) pathways by moving away from the traditional, standard approach and adapting instructional methods, content, and pace to student needs. While proven effective in general education, these systems, in the context of cybersecurity education, often focus on technical capacity, leaving the pedagogical and learner-centered adaptation dimensions limited. This study aims to analyze the current state of AI-based CRSs in cybersecurity education from the perspective of pedagogical adaptation and personalization through a systematic literature review (SLR). The review will be conducted on comprehensive academic databases, including Scopus, Web of Science, IEEE Xplore, and ACM Digital Library, covering the period from 2013 to 2025. The year 2013 was strategically chosen as it marks the beginning of significant breakthroughs in the field of deep learning, ensuring the review captures the most current trends. The search strategy is structured around three main themes (technology, cybersecurity education/practice, and pedagogy) to maximize the coverage of relevant literature. The inclusion criteria are limited to peer-reviewed publications that address AI/CRS applications in the context of cybersecurity education and discuss pedagogical adaptation dimensions, with a preference for studies that provide empirical data. The research process will adhere to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and rigor. The findings of this review are expected to highlight the lack of pedagogical adaptation in cybersecurity education and draw attention to existing research gaps, particularly at the middle and high school levels. The review will demonstrate how AI technologies can optimize educational outcomes by tailoring content and feedback to individual student needs and will identify current best practices, limitations, and future research directions in the field. Ultimately, this study aims to provide a robust framework to guide educators, curriculum designers, and policymakers in developing more effective, personalized, and evidence-based cybersecurity learning experiences.

Keywords: *Artificial intelligence; cybersecurity education; instructional design; adaptive learning; recommender systems*

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A systematic review of department and program recommendation systems

Salman Akan[a], Sevgi Yıldırım[b], Sibel Somyürek[c]

Abstract

This study aims to systematically review research on department and program recommendation systems published between 2009 and 2025. The research was conducted in accordance with PRISMA guidelines. A search was performed using specific keywords in the Scopus, Web of Science, IEEE Xplore, Google Scholar, and ScienceDirect databases. Of the initially identified 50 publications, 28 were excluded for not meeting the inclusion criteria, and the remaining 22 were reviewed. The review examined the distribution of the studies by year and sample size, the user and department/program features considered in the developed systems, the data collection methods, the recommendation approaches, and the similarity metrics used. The results of the qualitative content analysis reveal that publications in the field of department recommendation systems have shown a steady increase since 2017, with a notable concentration in 2022 and 2024. The sample sizes of the reviewed studies were most frequently in the 200–999 range, while the 1–49, 50–199, 1000–4999, and 5000+ groups, as well as studies with unspecified sample sizes, were distributed at similar rates. When analyzing the user features that recommendation systems rely on, it was found that student academic achievement was most commonly used, followed by interests, demographic information, and qualities related to educational participation and learning habits. In terms of department/program features, the systems were largely structured around department descriptions, followed by course information, institutional details, and interest-based profile features. The study also found a variety of data collection methods, with log data being the most widely used. Methods like surveys, psychometric tests, expert evaluations, and observations were less frequently employed but were often used in a supportive capacity. Furthermore, the analysis determined that hybrid approaches were predominantly used in the reviewed studies. Among single-approach methods, machine learning was more common than others, though content-based, collaborative filtering, and rule-based methods were also present. The most common similarity metrics were Euclidean Distance, Pearson Correlation, and Cosine Similarity, which are often used in combination with other approaches like Kendall Tau, k-Nearest Neighbor, and rule-based matching to achieve more accurate results.

Keywords: *Recommender systems, department recommendation, program recommendation, university preference*

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From adoption to ethical awareness: Students' and faculty's engagement with generative AI

Ersin Kara[a], Şenol Bakay[b], Rafet Çevik[c], Ömer Delialioğlu[d]

Abstract

This study explores students' and faculty's generative AI adoption across several aspects, including attitudes, utilization, working knowledge, competencies, and ethical concerns. Data were collected through surveys administered to both groups during the 2024–2025 spring semester, with 320 students and 47 instructors participating. Descriptive methods were used to analyze the data. Survey results reveal that students generally perceive GenAI as supportive of their learning, understanding course content and improving assignment quality. Most students report confidence in using GenAI and awareness of its ethical implications, though fewer feel knowledgeable about how the technology generates content. Students express a clear need for guidance, emphasizing the importance of instructor-provided rules and examples. Competency ratings indicate students feel most skilled with textual content and computer code, while reporting lower skills in video and sound, with images and slides falling in between. Faculty expressed moderate confidence in their technical skills for using GenAI and in their understanding of how GenAI generates content, with moderate-to-high confidence regarding ethical issues. Approximately half have adapted assignments in response to students' use of GenAI, whereas fewer have adjusted teaching methods to integrate it. Competency patterns mirror those of students, with the strongest skills in textual content and the weakest in video and sound. Faculty are divided on academic integrity, yet a majority support encouraging student use. These findings suggest that students are optimistic about GenAI but seek structured guidance, while faculty demonstrate cautious engagement, highlighting gaps in technical competencies and pedagogical integration. Insufficient technical knowledge among both students and faculty may contribute to uninformed perceptions regarding ethical use. These results highlight the need for targeted training initiatives.

Keywords: *Generative AI, higher education, adoption, competencies, ethics*

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A Game-based learning tool for data security and ethical awareness: An interactive puzzle game developed with Godot

Abdullah Mesud Gündüz[a], Selami Eryılmaz[b]

Abstract

The issue of personal data security is of critical importance, particularly for young users and pre-service teachers. However, awareness levels regarding this topic often remain inadequate. Traditional instructional methods are frequently insufficient in enabling learners to comprehend abstract concepts such as ethical data use. This study presents a 2D puzzle-based digital game designed to enhance personal data security awareness and ethical decision-making skills. The game was developed using the open-source Godot game engine and aims to present users with various digital scenarios in which they must decide whether or not to share certain types of personal data. The puzzle scenarios are based on realistic digital environments such as social media, e-commerce, and health applications. Users are expected to make ethically appropriate decisions in response to each data request. Following each decision, users receive brief legal and ethical feedback, and a scoring system is used to reinforce the learning process. The study is grounded in constructivist learning theory, game-based learning approaches, and Rest's Four-Component Model of moral development. The pilot implementation of the game is planned to be conducted with volunteer pre-service teachers from various universities in Türkiye. The planned application aims to measure changes in participants' awareness of data security through a pre-test and post-test model with approximately 25–30 participants via an online platform. In addition, qualitative data will be collected through open-ended questions following the game, enabling a deeper evaluation of the game's perceived effectiveness in terms of being educational, engaging, and memorable. This study aims to contribute both theoretically and practically to the field of educational technology by offering a sustainable and accessible digital solution for personal data ethics education.

Keywords: *Personal data security, Ethical decision-making, Game-based learning, Godot, Ethical awareness*

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Scientists' attitudes and ethical sensitivity towards science communication and social media use: Scale development and validation

Ebru Kuşcu Sır[a]

Abstract

In the digital era, social media has become a vital tool for disseminating scientific knowledge to the public. The production and sharing of scientific content by scientists not only reflect individual communication skills but also contribute to the delivery of accessible and inclusive information to diverse segments of society. Science communication, with its focus on scientific knowledge, innovations, and advancements, has emerged as a multi-actor field with broad scope and societal relevance (Boztepe Taşkıran & Ağca, 2025). Defined as the process of sharing information and fostering interaction between scientists and non-scientific audiences, science communication aims to enhance public understanding of science, promote scientific culture, and encourage the adoption of science-based attitudes. While the interactive capacity of social media provides significant opportunities for science communication, it also poses notable risks. On one hand, it enables scientists to reach wide audiences and rapidly share research findings (Boztepe Taşkıran & Ağca, 2025). On the other, the same speed and accessibility facilitate the spread of unverified, non-scientific, or even false information. As falsehoods often spread faster and more widely than verified facts on social media (Vosoughi, Roy, & Aral, 2018), the platform has become a space where both scientific and pseudoscientific content can rapidly proliferate. The ability of scientists to use social media effectively and ethically for science communication is therefore critical—not only in terms of individual communication skills but also for ensuring public access to accurate information, fostering scientific literacy, and mitigating the influence of pseudoscience. Measuring scientists' attitudes, willingness, self-efficacy, usage habits, and ethical sensitivity in relation to sharing scientific content on social media can provide valuable insights for developing strategies to enhance the quality of science communication. This study employs a general survey design. The item pool was initially composed of 29 items developed through a literature review. Based on feedback from three subject-matter experts, it was determined that two items carried very similar meanings; as a result, one of them was removed, and the other was revised in line with the experts' suggestions. The content validity of the scale was established through expert evaluation of the items in terms of language and scope.The draft scale was administered online to 130 scientists working in over 50 universities across Turkey, and data collection is ongoing. The current sample has a mean age of 42.6 years, with 56.2% identifying as female and 43.8% as male. Participants' academic positions include assistant professor (32.3%), lecturer (22.3%), associate professor (20.8%), professor (16.9%), and research assistant (7.7%). They work primarily in faculties of education (52.3%), rectorates (7.7%), vocational schools (4.6%), and faculties of law (4.6%), with the remainder employed in other faculties. Additionally, 22.3% have previously organized events on science communication. During data collection, items from both the scale development and a parallel scale adaptation study were presented within the same form. Participants received separate information on each study and provided voluntary consent. Upon completion, exploratory and confirmatory factor analyses will be conducted to assess construct validity, and Cronbach's alpha coefficients will be calculated to evaluate reliability.

Keywords: *Science communication, social media use, attitude, ethics, validity, reliability*

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AI-Driven micro-credentials based sustainable education model proposal for the banking and finance sector

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Abstract

This study conceptually proposes an AI-supported, micro-credential-based sustainable education model designed to address the rapidly evolving skill requirements of the banking and finance sector. Driven by digital transformation, regulatory changes, and financial product innovations, the need for continuous knowledge and skill development among employees has increased, while traditional long-term training programs have proven insufficient in providing flexible and cost-effective solutions. In this context, micro-credentials -offering short, modular, targeted, and labor market-aligned certifications- hold the potential to accelerate upskilling and reskilling processes. Furthermore, AI enhances learning efficiency by personalizing learning experiences through learning analytics, adaptive content delivery, and automated assessment technologies. The study is based on a systematic review of academic literature, international policy documents, and practical implementations (e.g., MiCreS) published between 2019 and 2025. The conceptual model comprises modular micro-credential content tailored to financial sector training needs, AI-driven personalized learning pathways and automated assessment mechanisms, accessibility and digital certification infrastructure, strategies for economic and environmental sustainability, and accreditation and quality assurance components. The proposed model aims to optimize individual learning journeys for employees while ensuring cost-effectiveness and flexibility for institutional training investments. Expected outcomes include short-term improvements in workforce employability and performance, reductions in training costs, and accelerated internal capability transformation, along with the long-term promotion of sustainable finance practices within the sector. However, the model also presents challenges requiring careful management, such as data privacy, algorithmic bias, digital inequality, and organizational adaptation issues. To ensure success, robust data governance policies, ethical and transparent AI applications, inclusive access strategies, and well-structured national and international accreditation processes are recommended. In conclusion, AI-powered micro-credentials offer a flexible, scalable, and sustainable approach to workforce development in the finance sector. Nevertheless, validating this conceptual proposal will require pilot programs, quantitative evaluations, and longitudinal monitoring studies. The study aims to provide a guiding framework for policymakers, educational providers, and financial institutions.

Keywords: *Artificial intelligence, banking and finance, micro-credentials, sustainable education.*

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The effect of prospective teachers' financial literacy levels on the sustainability of educational technologies: A theoretical review

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Abstract

Education and teaching processes are undergoing rapid change due to the impact of digitalization and technology; academic research supports that the use of technology in education provides convenience in many ways (Elvan and Mutlubaş, 2020). This change is leading schools and teachers to make complex and costly technology investments (Eser, 2014). However, the rapid pace of digital transformation makes it difficult for schools to adapt to these high-cost technological innovations (Batu and Taşdan, 2025). Developing countries are developing strategies to invest more in educational technologies to improve the quality of their education systems (Çetin, 2014). When examining the sustainability of educational technologies, it is seen that studies mainly focus on technological and pedagogical sustainability, with less emphasis on "financial sustainability," which forms the economic and financial basis of sustainability (Balıkçı, 2025). The aim of this theoretical study is to reveal the critical relationship between the sustainability of educational technologies and the financial literacy level of teacher candidates and to discuss the importance of this relationship in light of the existing literature. The integration of financial literacy into the curriculum from childhood onwards and its incorporation as an integral part of the training process of teachers, who are the most critical actors in education, should be opened up for discussion. To serve this purpose, it is considered necessary to provide students with a learning environment where they can experience theoretical knowledge through real-life scenarios, role-playing, and critical thinking practices. The sustainability of educational technologies is not only a technical or environmental issue but also an economic and financial one (Öztopcu, 2018). Teacher candidates should be able to comprehend concepts such as budgeting, cost-benefit analysis, and long-term investment, which are directly related to financial literacy, and make economic choices when selecting, using, and managing digital educational tools (Fidan and Cura Yeleğen, 2022). As the ultimate users of these technologies, teachers should be able to evaluate limited budgets in the most effective way, analyze costs and benefits, and develop long-term sustainable technology policies. Teachers must have financial literacy skills to acquire these abilities (Ministry of National Education [MEB], 2024). Within the scope of this study, the aim is to systematically review the literature on the financial literacy status of teacher candidates and the relevant literature showing the status of financial literacy in teacher education, and to bring together existing theories, concepts, and research findings. This theoretical study aims to discuss the possible role of teacher candidates' financial literacy skills in ensuring sustainability in educational technologies.

Keywords: *Financial literacy, teacher candidates, sustainability, educational technologies.*

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Sustainable management of digital transformation in higher education: Human resources analytics and the council of higher education's 2030 vision

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Abstract

The sustainable management of digital transformation in higher education cannot be reduced merely to investments in technological infrastructure; it also encompasses the development of human capital, institutional governance processes, and a culture of data-driven decision-making. In this context, Human Resource Analytics (HRA) emerges as a strategic approach that enables the development of evidence-based decision frameworks in areas such as training and development, performance management, and talent management, by analyzing data obtained from HR processes through diagnostic, predictive, and prescriptive analytics. Going beyond simple measurement and reporting functions, HRA establishes causal relationships between human capital and organizational outcomes and integrates these relationships into strategic decision-making processes. Within the higher education context, the definition and effective use of human resources performance indicators represent one of the most promising areas of application for HRA. The complexity and dynamism of digital transformation policies implemented in Türkiye make it essential to integrate these indicators into strategic planning and quality assurance mechanisms through a systematic and holistic approach. The purpose of this study is to develop a conceptual framework for the sustainable governance of digital transformation in higher education, grounded in HRA. The proposed framework not only advances theoretical knowledge in the field of higher education and human resource analytics but also contributes to the construction of a sustainable and inclusive transformation model aligned with Türkiye's higher education vision. In this regard, the priorities highlighted in the Council of Higher Education's (YÖK) 2030 Vision—digitalization, data governance, quality orientation, and inclusive access—necessitate positioning HRA not as a mere technical innovation but as a sustainable policy instrument that strengthens strategic decision-making and governance capacity. In conclusion, this study contributes both to addressing theoretical gaps in the literature and to fostering the institutionalization of a holistic, data-driven, and sustainable management approach in higher education.

Keywords: *Higher education, 2030 vision, digital transformation, human resources analytics.*

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Experiences of Science and Art Center teachers on the implementation of the flip learning model

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Abstract

Gifted individuals are defined as individuals who outperform their peers in cognitive, psychomotor, and affective development (MEB, 2022); are productive, interested in academic studies, have developed analytical and critical thinking skills; and possess potential skills such as creativity and research/inquiry (Bildiren, 2013). Considering the exceptional differences of gifted individuals and their potential contributions to social development, it is clear that they need learning environments and experiences that will unlock their current potential (Renzulli & Reis, 2021). This need can be met through differentiated learning environments that utilize individualized, innovative teaching models, methods, and techniques that depart from traditional structures and meet the needs of today's gifted individuals (Johnson, 2000). Numerous studies across disciplines have examined how the flipped learning model can be implemented and its effectiveness in providing a better learning experience using its principles (Bergman & Sams, 2012; Chen et al., 2014; Lage, Platt & Treglia, 2000; Missildine, Fountain, Summers & Gosselin, 2013; Zhu & Xie, 2018). The flipped learning model can be effectively used in the education of gifted students because it allows students to learn at their own pace, provides the basis for enriched and differentiated learning environments, facilitates application and inquiry activities that support skills such as critical thinking, problem solving, creative thinking, and synthesis rather than simply acquiring knowledge in classroom activities, and allows students to engage in active learning by taking responsibility for their learning processes (Bergman & Sams, 2012; Bishop & Verleger, 2013). In addition to its contributions to the education of gifted students, the flipped learning model holds significant potential for improving teaching processes through the integration of next-generation technologies such as artificial intelligence. However, effective implementation of the flipped learning model requires an in-depth understanding of teachers' experiences during the implementation process (their views on the model, its challenges, and solutions to these challenges). The views of teachers working at Science and Art Centers(SACs) that educate gifted students are critical for improving the model's implementation process and designing more effective learning environments. Therefore, this study aimed to thoroughly examine SACs teachers' experiences with the implementation of the flipped learning model. The study utilized a single case study design, a qualitative research method. A single case study is a type of case study designed to understand a specific, unique, or typical situation in detail. A single case study focuses on a single case (e.g., a school, a classroom, a group of teachers) (Yin, 2018). The study was conducted with 19 SACs teachers. Data collected using a semi-structured interview form developed by the researchers was analyzed using content analysis. The key findings of the study are presented within the context of participants' descriptions of the flipped learning model implementation process, challenges encountered, and proposed solutions, opinions on individualizing the teaching-learning process of the flipped learning model, and training requirements for implementing the artificial intelligence-supported flipped learning model. The study's results provide both theoretical and practical assessments of the implementation of the flipped learning model within the framework of future educational models and technologies. It is expected to provide insights into the design, implementation, and evaluation of future studies.

Keywords: *Flipped learning, SACs, case study*

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Teachers' views on teaching material design using generative artificial intelligence tools

Esra Altunbilek[a]

Abstract

The increasing use of artificial intelligence (AI) technologies in education makes it essential to understand teachers' perceptions and experiences with these tools. This study aims to explore teachers' views on designing instructional materials using generative artificial intelligence (GAI) tools through a qualitative research approach. In recent years, the widespread adoption of AI technologies in education has made it an important research area to investigate how teachers perceive and utilize these technologies. In this context, the problem of the study is to understand teachers' experiences and perspectives regarding the development of instructional materials supported by GAI. The research was conducted using a phenomenological design, one of the qualitative research methods. The study group consists of nine teachers from different subject areas who participated in an in-service training program in 2025. Data were collected through a semi-structured interview form. Within the scope of the in-service training, participants received instruction on designing instructional materials using GAI tools, and by the end of the training, each participant prepared an electronic book entirely generated with GAI tools in their respective subject areas. Thus, participants were enabled to design instructional materials using various GAI tools (e.g., ChatGPT, Copilot, Ideogram, Microsoft Designer, Narakeet, Canva, Gamma, Diffit, Fliki), and their opinions on these experiences were subsequently collected. The data were analyzed using content analysis. The findings revealed that the majority of teachers perceived GAI tools as innovative, time-saving, and enriching for the instructional process. Participants particularly emphasized the benefits of these tools in creating visuals, videos, presentations, and other instructional content. However, some teachers also highlighted the need to be cautious regarding ethical considerations, reliability, and pedagogical appropriateness. Moreover, they underlined the importance of teacher guidance and supervision over AI-generated outputs during the material development process. In conclusion, GAI tools appear to be powerful digital resources that support teachers in developing instructional materials. Nevertheless, there is a need to raise awareness about their effective and ethical use and to provide continuous guidance for teachers. The study recommends expanding the scope and application of in-service training programs and enhancing support for teachers to integrate pedagogical knowledge with technological tools.

Keywords: *Generative artificial intelligence, instructional material design, educational technologies, in-service training*

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An examination of teachers' artificial intelligence anxiety levels in terms of various variables and their views on the use of artificial intelligence in education

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Abstract

The main objective of this study is to comprehensively examine teachers' anxiety levels and their views on the rapidly expanding artificial intelligence (AI) technologies in the field of education. In today's digitalized world, while AI creates a transformation in many areas from education to health, it also raises concerns among some teachers that their roles might be taken over by these technologies. It is of great importance to identify this situation, investigate its causes, and produce solutions. Therefore, the research aims to determine whether teachers' AI anxiety levels differ significantly according to various demographic variables such as age, gender, seniority, branch, city of work, and computer and internet experience. The research was conducted using a mixed-methods design, combining both quantitative and qualitative data. In the quantitative phase, the "Artificial Intelligence Anxiety Scale" was administered to 68 teachers from different provinces of Türkiye to measure their AI anxiety levels. The quantitative data were analyzed using the Mann-Whitney U Test and Kruskal-Wallis H Test in the SPSS software. In the qualitative phase, semi-structured interviews were conducted with 11 teachers, and the data were analyzed using the thematic analysis method. The quantitative findings indicate that teachers generally have a moderate level of anxiety towards artificial intelligence. The analysis revealed that this anxiety level does not show a statistically significant difference based on demographic variables such as gender, seniority, branch, and social media usage frequency. In particular, it was found that teachers have higher anxiety about issues such as the misuse of AI, it going out of control, and threatening their professions. The qualitative findings show that teachers perceive AI in education as both an opportunity and a threat. While its contributions to educational environments include visualization, personalized learning, and time savings, prominent concerns include data security, students becoming lazy, a decrease in critical thinking, and the threat to professions. The results of this study are expected to contribute to the development of more human-centered, ethical, and sustainable strategies for AI integration in education. The data obtained provide important insights into how artificial intelligence technologies can be used more effectively and securely in education.

Keywords: *artificial intelligence, teacher views, educational technologies, anxiety*

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Academics' perspectives on the use of generative artificial intelligence tools in the scientific research process

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Abstract

Scientific research processes are undergoing a transformation in parallel with technological advancements. One of the most current reflections of this transformation is the integration of generative artificial intelligence (GAI) tools into academic work. Utilized at various stages such as idea generation, data analysis, literature review, and academic writing support, GAI tools offer researchers not only significant time and effort savings but also a wide range of usage purposes. However, the reliability of these tools, their ethical use, their impact on academic originality, and researchers' attitudes toward these technologies have become subjects of ongoing debate in academic circles. In this context, revealing academics' perspectives on the use of GAI tools in scientific research processes is essential for understanding both the current opportunities and potential risks involved. The aim of this study is to reveal the views of academics regarding the use of generative artificial intelligence tools in the scientific research process. The study was conducted using a qualitative research method, and the data were collected through interviews. The obtained data were analyzed using content analysis. The study was carried out with a total of five academics, including one professor, two associate professors, and two assistant professors. All participants held doctoral degrees. Their tenure in academic institutions ranged between 12 and 16 years, and their experience in conducting scientific research varied from at least 12 to a maximum of 25 years. According to the findings, the most commonly used tools among academics are ChatGPT, DeepL, and Consensus. These are followed by applications such as Grammarly and Paraphraser, which are more focused on specific functions. This diversity demonstrates that GAI tools are being positioned according to different research needs. Furthermore, the findings show that academics use GAI tools for a variety of purposes, within a balance of different advantages and disadvantages. When examining the purposes of use, the most frequently mentioned functions include text editing, literature review, citation formatting (in APA style), translation, idea generation, and summarization. Regarding the advantages, it was often expressed that generative AI contributes to accelerating the research process, facilitating literature review and information transfer, enhancing academic writing quality, and generating new ideas. Additionally, higher-level academic benefits such as supporting creative thinking and establishing interdisciplinary connections were also emphasized. On the other hand, academics also highlighted various risks associated with the use of these tools. The most prominent concerns include the generation of fake or inaccurate sources, plagiarism risk, a decline in creativity, reduced publication quality, and increased workload during journal review processes. Concerns were also raised regarding potential harm to academic identity and the facilitation of publication fraud. These findings demonstrate that while GAI tools provide substantial opportunities in research processes, they also encompass risk areas that must be managed with caution.

Keywords: *Academic, Scientific Research Process, Generative Artificial Intelligence.*

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Turkish adaptation of the scientists' science communication self-efficacy scale: Validity and reliability study

Ebru Kuşcu Sır[a]

Abstract

Science communication is an umbrella concept encompassing the processes of knowledge sharing and interaction between scientists and non-scientific audiences. In recent years, the "Public Engagement with Science" approach, which prioritizes social interaction, participation, and dialogue over one-way information transfer, has gained importance. At the global scale, discussions on issues such as pandemics, climate change, nuclear energy, earthquakes, and artificial intelligence are, at times, influenced by anti-science tendencies. This makes scientists' ability to communicate with the public in a reliable and effective manner critical. In this context, the reliable measurement of scientists' communication self-efficacy is important both for individual development and for shaping science policies. The aim of this study is to adapt into Turkish the "Self-Efficacy for Public Engagement with Science" scale developed by Robertson Evia et al. (2018) and to conduct validity and reliability analyses. The scale encourages scientists to consider public engagement activities not as one-way information transfer, but as a reciprocal process. This research was conducted within the general survey model. During the adaptation process, the original scale was translated into Turkish by the researcher, and necessary linguistic and structural adjustments were made based on feedback from subject-matter and language experts. The preliminary form was administered to 130 scientists working at more than 50 universities in different regions of Türkiye, and data collection is still ongoing. The participants' mean age is 42.6 years; 32.3% are assistant professors, 20.8% associate professors, 16.9% professors, and the remainder lecturers and research assistants. Additionally, 52.3% are from faculties of education, 7.7% from rectorates, 4.6% from vocational schools, and 4.6% from faculties of law, with others serving in various faculties. Due to the limitations in accessing academic participants, the data obtained from the same group will be used both in this adaptation study and in another scale development study conducted in parallel. Although both studies are based on different theoretical foundations and measurement tools, the overlap of data sources has been planned as a methodological preference, and ethical approval was obtained accordingly. Participants were separately informed about both parts and voluntarily contributed. This approach not only increases the efficiency of the data collection process but also suggests that findings should be tested comparatively in future studies with different samples. Upon completion of the study, confirmatory and exploratory factor analyses will be conducted for construct validity, expert reviews for content validity, and Cronbach's alpha coefficients for reliability.

Keywords: *Academic, scientific research process, generative artificial intelligence.*

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PBL in the context of critical thinking: Traditional vs individually ChatGPT

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Abstract

This study aims to examine two different Problem-Based Learning processes comparatively in the context of critical thinking. The participants are prospective teachers enrolled in the Instructional Technologies course during the fall 2024-2025 semester. They are studying at Van Yüzüncü Yıl University, Faculty of Education, located in the Van province of Türkiye. A six-week instruction process was conducted using the Traditional PBL method (TPBL) and studying with chatGPT individually (GPRPBL) within the PBL method. At the end of the process, questions about the components of critical thinking skills were asked of the participants online. In addition, Quantitative measurements were also made regarding critical thinking and its sub-dimensions through the Turkish version of the California Critical Thinking Disposition Inventory (CCTDI) (Facione & Facione, 1992). The data of 68 students who volunteered to express their opinions were subjected to qualitative analysis, and the quantitative measurements of 46 students were considered. Thus, the contribution of the conducted processes to the student's critical thinking skills was revealed comparatively. It was observed that the participants were mostly at a moderate level, as indicated by the total score of the critical thinking skill scale and its sub-dimensions. According to the comparisons between the groups regarding mean scores, the TPBL vs GPTPBL groups did not differ. Themes and sub-themes were developed in parallel with the sub-dimensions of critical thinking, including Analyticity, Open-Mindedness, Inquisitiveness, Self-Confidence, Truth-Seeking, and Systematicity. The findings were presented by enriching them with sample expressions. In the context of these themes, TPBL students primarily discussed the benefits of group work to them. In contrast, GPTPBL highlighted the results of their interactions with the AI. Both TPBL and CPTPBL methods are effective in different dimensions, and the use of mixed methods in education and instructional processes will contribute to students' critical thinking skills, thus providing a more effective and efficient process. ChatCPT helps students develop critical thinking skills with the PBL approach despite being a relatively new technology. ChatCPT, which is perceived as particularly socially and emotionally deficient by students, will likely decrease concerns in the future with the increase in studies conducted in this direction and the acquisition of these skills through AI tools. It is also observed that learners have doubts and confusion about some of the information they receive from chatCPT. In this respect, the importance of the teacher's guiding role comes to the fore, and teachers who are AI literate can support their students in this sense. It is recommended that researchers focus on studies that integrate AI into educational environments in the future and conduct more in-depth studies to reveal the role of the teacher.

Keywords: *Problem-based learning, artificial intelligence, chatbot, critical thinking.*

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An examination of digital parenting awareness of parents with preschool children

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Abstract

The widespread presence of digital technologies in all areas of life has transformed not only individuals' ways of interacting with technology but also their parenting roles. Particularly, the early exposure of preschool children to digital media raises questions about how parents guide, supervise, and protect their children in these environments. In this context, this study aims to qualitatively explore the digital parenting awareness of parents with preschool children and to analyze the underlying patterns that shape this awareness. The study was conducted using the case study method, one of the qualitative research designs. The study group consisted of six parents (three mothers and three fathers) who were selected through extreme case sampling based on their scores on the Digital Parenting Awareness Scale. Data were collected through a semi-structured interview form developed by the researchers and analyzed using content analysis. The findings revealed that children primarily use digital media tools for watching videos and playing games, while parents generally allow such use in situations when children are restless, parents are busy, or social pressure is felt. Regarding guidance behaviors, some parents were found to actively provide guidance, ensuring content control and direction; however, others delegated this responsibility to their spouses or did not intervene at all. Parents' perception of digital risks is generally high. Inappropriate content, violence, screen addiction, and problems in social interaction were among the most frequently mentioned risks. Strategies developed against these risks included encouraging social activities, setting time limits, and monitoring content, while some parents managed the process only through prohibition or reactive solutions. Finally, parents' awareness of the impact of their own digital media use habits on their children varied. Parents who used digital media in a limited manner for information purposes stated that they served as positive role models, whereas those with heavy and long-term social media use acknowledged its negative reflection on their children. These findings highlight that programs aimed at developing digital parenting awareness should be designed holistically, focusing not only on children but also on parents themselves.

Keywords: *Digital parenting, preschool children, qualitative research.*

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Evaluation of ARCS-based motivational design thinking (M-DT) education

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Abstract

The purpose of this study is to determine preservice teachers' views on "Motivational Design Thinking" (M-DT) training, which was designed based on the ARCS instructional design model. The study examined the perspectives of ten preservice teachers who participated in the M-DT training. Research data were collected through a semi-structured interview form consisting of open-ended questions prepared by the researchers. The data obtained from the interview form were analyzed using content analysis and descriptive analysis techniques commonly applied in qualitative research. Analyses based on the interview recordings indicated that applications corresponding to the four components of the ARCS model (Attention, Relevance, Confidence, Satisfaction) were integrated into the process and had positive effects. The process evaluation of the M-DT approach, which consists of five stages—Empathy, Problem Definition, Ideation, Prototyping, and Testing—was conducted. These results are consistent with previous studies showing that DT supports divergent thinking, creativity, critical thinking, and learning. Participants' initial uncertainty and anxiety toward M-DT transformed into a phased problem-solving approach incorporating creativity, collaboration, and empathy by the end of the process. The most challenging stage was prototyping due to limitations in resources, time, and skills. In the empathy and testing stages, lack of direction, planning deficiencies, and communication problems were observed. Participants experienced the highest sense of achievement in the prototyping stage, while ideation was the stage in which they felt most creative and comfortable. The highest active participation occurred during ideation, facilitated by the open brainstorming environment and lack of material requirements, whereas testing was reported as the least active stage. The process created a notable transformation in participants' emotions. Initially characterized by anxiety and uncertainty, the process later fostered curiosity, enjoyment, collaboration, and motivation. Ideation, prototyping, and empathy stages were central to this emotional transformation. At the end of the process, self-confidence, satisfaction, pride, and a sense of accomplishment emerged, and participants not only produced projects but also discovered their own potential. Participants stated that an effective M-DT design should be structured and visible, provide individual and emotional support from the instructor, relate problem-based learning to daily life, shape the process through feedback, and support different learning styles. The training process was associated with sustainability (Sustainable Development Goals- SDG) themes, contributing to students' social and environmental awareness. The training was experienced as engaging, meaningful, confidence-enhancing, and satisfying. The instructor's encouraging approach, feedback culture, and practice-oriented activities were found to be important for motivational gains.
The results indicate that the ARCS model provides not only a theoretical framework for DT but also a strong practical structure. Increases in participants' "I can do it" perception, sustained interest in the course, and product-focused sense of achievement support this finding. These findings suggest that preservice teachers can apply the M-DT approach not only in their individual learning processes but also in future classroom practices. ARCS-based M-DT applications can contribute to preservice teachers' ability to design student-centered, problem-based, and collaborative learning environments. Thus, preservice teachers can both enhance their professional motivation and develop the potential to provide learning experiences that foster students' creative and critical thinking skills. The study results show that motivational design contributes to M-DT learning processes by examining participants' progression from anxiety to self-confidence and from uncertainty to collaboration and creativity. In addition, integrating the ARCS model into M-DT applications is emphasized as an effective strategy to enhance preservice teachers' motivation and engagement. Recommendations include structuring the design according to the ARCS model, using a phased learning process, adopting a facilitator role for the instructor, integrating feedback, using real-life themes, utilizing digital tools, and closing with a product-presentation focus. M-DT training supports preservice teachers' creative thinking and problem-solving skills while enhancing their motivation. The study is limited to preservice teachers in the Computer Education and Instructional Technology (CEIT) program and could be replicated in other departments.

Keywords: *Design thinking, ARCS, instructional design, teacher education, motivational learning*

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LinkedIn job postings in the field of information technology: An analysis of content quality and candidate experience

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Abstract

In the digital age, online platforms have become central to job search and recruitment processes. Among them, LinkedIn plays a particularly important role, as the quality of job postings directly affects candidates' motivation to apply and organizations' ability to attract qualified talent. Previous studies have highlighted persistent shortcomings in job postings with regard to transparency, clarity, and inclusiveness. Against this background, the present study examines LinkedIn job postings in the information technology (IT) sector in Türkiye, aiming to identify their strengths and weaknesses and to develop recommendations for improving job posting design. The study employed a convergent parallel mixed-methods design. Quantitative data were collected through a survey administered to 70 participants, including university students, recent graduates, and job seekers. Qualitative data were gathered through semi-structured interviews with 40 participants. In addition, 50 LinkedIn job postings from the IT sector were analyzed through document analysis, focusing on content quality, clarity, visual design, structural consistency, and ethical–inclusive aspects. Quantitative and qualitative findings were compared and integrated to provide a comprehensive understanding. Findings revealed that the majority of job postings lacked essential process-related information. Specifically, 72% of postings did not include an application deadline, 81% did not provide salary information, and 65% omitted details on benefits. Survey results indicated that 63% of participants considered the postings insufficient. Interview participants emphasized the absence of transparent information about the recruitment process, the use of technical terminology without explanation, and the neglect of inclusiveness as major issues. The document analysis supported these findings: while job descriptions were often detailed, process-related information remained incomplete; learning and career development opportunities were highlighted, yet inclusiveness was largely ignored.
In conclusion, the study underlines that enhancing transparency, inclusiveness, and standardization in job postings is crucial for improving candidate experience and attracting qualified applications. Employers are advised to provide comprehensive information—from application deadlines to social benefits—use accessible language, and adopt a candidate-centered perspective in designing postings. These findings are expected to inform both human resource management practices and future research in educational technology and recruitment studies.

Anahtar Kelimeler: *Job posting analysis, LinkedIn, candidate experience, content quality, inclusiveness.*

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