



World Conference on Social Sciences, Law and Public Policy

Hosted Online from Toronto, Canada

Date: 26th May 2026

Website: <https://econferencia.com>

EXPERIMENTAL RESEARCH ON DEVELOPING STUDENTS' EDUCATIONAL COMPETENCIES IN DIGITAL CULTURE AND INFORMATION SECURITY

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Abstract

This article presents the results of experimental research aimed at developing students' educational competencies in digital culture and information security. The study evaluates the effectiveness of an educational intervention based on innovative pedagogical methods, digital technologies, project-based learning, case studies, and interactive training activities. Particular attention is given to assessing changes in students' digital literacy, media and information literacy, cybersecurity awareness, digital ethics, and responsible online behavior before and after the implementation of the experimental program. The findings confirm that the proposed pedagogical model significantly improves students' educational competencies and contributes to the creation of a safe and responsible digital learning environment.

Keywords: experimental research, digital culture, information security, educational competencies, pedagogical experiment, digital literacy, cybersecurity education, digital ethics, project-based learning, educational effectiveness.



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The rapid digital transformation of contemporary education has fundamentally changed the objectives of pedagogical practice. Educational institutions are increasingly expected to prepare students not only for effective academic performance but also for responsible participation in digital society. Consequently, experimental research aimed at developing students' educational competencies in digital culture and information security has become an important direction of modern educational science. Such research provides empirical evidence regarding the effectiveness of innovative pedagogical models, teaching methods, digital technologies, and competency-based educational approaches.

The experimental study was designed according to the principles of competency-based education, learner-centered pedagogy, and evidence-based educational research. The primary objective was to determine the effectiveness of an integrated pedagogical model intended to improve students' competencies in digital culture, media and information literacy, cybersecurity awareness, digital ethics, responsible online communication, and digital citizenship.

The experimental methodology consisted of three consecutive stages: the diagnostic stage, the formative stage, and the evaluation stage. During the diagnostic phase, students' initial competency levels were measured using standardized questionnaires, digital literacy tests, practical performance tasks, classroom observations, self-assessment instruments, and structured interviews. These diagnostic procedures made it possible to identify students' existing knowledge, practical digital skills, attitudes toward information security, ethical awareness, and behavioral patterns within digital environments.

The initial findings demonstrated that although most students possessed satisfactory operational skills in using computers, smartphones, and online platforms, considerable deficiencies existed in higher-order competencies. Many participants experienced difficulties in evaluating the reliability of digital



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information, identifying misinformation, protecting personal data, recognizing phishing attempts, understanding copyright regulations, and applying cybersecurity principles in authentic situations. Similar tendencies have been reported in international studies, indicating that technical proficiency alone does not ensure comprehensive digital competence.

The formative stage represented the core of the experimental intervention. A comprehensive pedagogical program was implemented through the integration of innovative instructional methods, including project-based learning, problem-based learning, case-study analysis, collaborative learning, digital simulations, gamification, reflective practice, and artificial intelligence-supported learning environments. These instructional strategies were selected because they actively engage learners in authentic digital situations requiring critical thinking, collaboration, ethical reasoning, and practical problem-solving.

Project-based learning proved particularly effective in promoting integrated competency development. Students worked collaboratively on educational projects such as "Safe Internet Campaign," "Digital Citizenship Handbook," "Cybersecurity Awareness for Teenagers," and "Digital Ethics in Social Media." Throughout these activities, participants searched for reliable information, critically evaluated multiple digital sources, designed multimedia educational materials, developed awareness campaigns, and publicly presented their findings. Such projects simultaneously enhanced information literacy, communication skills, creativity, teamwork, and responsible digital behavior.

Case-study methodology was another significant component of the intervention. Students analyzed authentic scenarios involving cyberbullying, phishing emails, identity theft, fake news dissemination, unauthorized sharing of personal information, online fraud, artificial intelligence misuse, and violations of digital ethics. Working individually and in groups, participants identified potential



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threats, analyzed underlying causes, proposed preventive strategies, and justified their decisions according to legal, ethical, and technological principles. This instructional approach significantly strengthened analytical reasoning and cybersecurity awareness.

Digital simulations further contributed to competency development by recreating realistic virtual environments in which students practiced responding to cybersecurity incidents. Simulated exercises included recognizing malicious websites, configuring privacy settings, identifying manipulated digital content, securing online accounts, and responding appropriately to suspicious online communication. Because these simulations closely resembled real-life digital experiences, students developed procedural knowledge that could be transferred directly to everyday online activities.

An innovative aspect of the experiment involved the integration of artificial intelligence technologies into instructional activities. Students utilized AI-powered educational assistants to summarize scientific literature, generate presentation outlines, analyze complex information, and support collaborative research. However, the pedagogical process consistently emphasized critical evaluation of AI-generated content, verification of information accuracy, identification of algorithmic limitations, academic integrity, and responsible AI use. Consequently, students learned not only to benefit from intelligent technologies but also to recognize their potential risks and limitations.

Throughout the intervention, considerable attention was devoted to developing digital ethics and responsible digital citizenship. Interactive seminars addressed issues such as online privacy, intellectual property protection, cyberbullying prevention, respectful online communication, responsible social media participation, digital well-being, and legal aspects of information security. Role-playing activities enabled students to examine ethical dilemmas involving digital



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communication and artificial intelligence, thereby strengthening their moral reasoning and decision-making competencies.

The effectiveness of the experimental program was continuously monitored through formative assessment strategies. Digital portfolios documented students' learning progress, project outcomes, reflective journals, multimedia products, and competency achievements. Teachers conducted systematic classroom observations, while peer assessment and self-evaluation encouraged students to reflect critically on their own learning experiences and digital behavior.

The evaluation stage employed both quantitative and qualitative assessment methods. Statistical analysis demonstrated substantial improvement across multiple competency dimensions. Students showed significantly higher levels of media and information literacy, cybersecurity awareness, responsible digital communication, ethical reasoning, critical evaluation of online information, and practical information security skills compared with their initial diagnostic results. Performance-based assessments revealed that participants became more proficient in identifying digital threats, protecting personal information, evaluating information credibility, and applying cybersecurity measures within authentic digital environments.

Qualitative findings obtained through interviews and reflective journals further supported these results. Students reported increased confidence when navigating digital environments, greater awareness of online risks, stronger motivation to practice responsible digital behavior, and improved ability to collaborate effectively using digital technologies. Many participants emphasized that project-based activities, case studies, and practical simulations were considerably more effective than traditional lecture-based instruction because they closely reflected real-world digital experiences.



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The experiment also highlighted the essential role of teachers in facilitating competency development. Educators functioned not merely as information providers but as mentors, facilitators, consultants, and organizers of authentic learning experiences. Their continuous guidance helped students connect theoretical knowledge with practical application while promoting independent learning and reflective thinking.

Parental involvement represented another important factor influencing experimental outcomes. Information sessions and collaborative activities involving parents contributed to greater consistency between school-based instruction and students' digital behavior outside educational settings. Such cooperation strengthened the sustainability of newly developed competencies and reinforced responsible technology use within family environments.

Institutional support likewise proved essential for successful implementation. Schools equipped with reliable technological infrastructure, secure digital platforms, adequate internet connectivity, and ongoing teacher professional development created more favorable conditions for competency development. These findings demonstrate that digital competence education depends not only on instructional methods but also on broader organizational and technological environments.

The experimental evidence confirms that the integrated pedagogical model significantly improves students' educational competencies in digital culture and information security. The most substantial improvements were observed in critical thinking, media and information literacy, cybersecurity awareness, ethical decision-making, digital communication, and responsible digital citizenship. The findings further indicate that competency development is most effective when cognitive instruction is combined with authentic practical activities, collaborative learning, continuous reflection, and systematic pedagogical assessment.



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Overall, the experimental research demonstrates that scientifically grounded pedagogical interventions based on competency-oriented methodologies provide an effective mechanism for preparing students to function safely, ethically, and responsibly within rapidly evolving digital environments. The integration of innovative instructional strategies, digital technologies, artificial intelligence, authentic assessment, and continuous pedagogical monitoring contributes significantly to developing digitally competent learners capable of participating actively in contemporary knowledge societies while maintaining high standards of information security and digital responsibility.

References:

1. Savchenko S. V., Shekhavtsova S. O., Zaselskiy V. I. The development of students' critical thinking in the context of information security. – CEUR Workshop Proceedings, 2020.
2. Zhiyenbayeva S., Tezekova O. TEACHING INFORMATION LITERACY AS A TOOL FOR PSYCHOLOGICAL SECURITY IN ADOLESCENTS IN DIGITAL AGE //3i: intellect, idea, innovation-интеллект, идея, инновация. – 2025. – Т. 2. – №. 3. – С. 143-151.
3. Guillén-Gámez F. D. et al. Digital security in educational contexts: Digital competence and challenges for good practice //Computers in the Schools. – 2024. – Т. 41. – №. 3. – С. 257-262.
4. Nazarenko T. et al. Development of Students' Informational and Communicative Competence Based on the Introduction of Digital Learning Tools. – 2023.
5. Saginbayeva K. et al. Models and Structure of Competencies of Training of the Future Specialist Field of Information Protection in Globalization //J Adv Educ Philos. – 2025. – Т. 9. – №. 12. – С. 585-594.