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SWOT analysis of methods and tools of secondary education through digital transformation

M. Temirkhanova[1], G. Abildinova[2], C. Karaca[3]
[1,2]L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan
[3]Technical Sciences Vocational School, Aksaray University, Aksaray, Türkiye
*gulmira_2181@mail.ru

Abstract. Digital transformation has reshaped teaching and learning in secondary education. This study conducts a SWOT analysis of digital methods and tools with a focus on the Astana International School. A mixed-methods design (surveys of 50 teachers and 200 students, semi-structured interviews, and document analysis) is mapped to five research questions aligned with SWOT and an explicit chain-of-evidence that tags each finding to its originating method. Surveys indicate high adoption (teachers 95%, students 98%) and frequent use of Microsoft Teams (85%) and Google Classroom (70%); among students, Kahoot (75%) and Quizlet (60%) are common. Reported constraints include training needs (80% of teachers), integration difficulties (70%), and perceived monotony (55% students; 25% teachers). AI use is notable (45% of students), alongside academic-integrity concerns (students: 30% often, 50% sometimes, 20% never; teachers: 10%, 40%, 50%). Interviews explain these patterns—insufficient support, calls for diversified CPD, and underuse of virtual labs—and document analysis corroborates adoption and integration emphases without introducing new counts. Implications include targeted investment in reliable infrastructure, structured professional learning, and school-wide integrity scaffolds that balance productive AI use with clear norms. Limitations involve a single-school, self-report, cross-sectional design; future work should evaluate multi-school implementations and longitudinal impacts.

Keywords: Digital transformation, secondary education, teaching methods, educational tools, SWOT analysis.

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Introduction.

The educational landscape has undergone changes with the spread of digital technology in the learning process. In the process of teaching secondary schools, innovative methods are increasingly being introduced that use digital tools to improve the perception and motivation of information by students. Digital tools such as adaptive education platforms, quantitative appraisal tools (gamification) and virtual classroom have changed how teachers provide materials and how students interact with it. In the broader environment of global progress in education, high schools play a crucial part in preparing students for advanced education and meeting the requirements of the workforce by teaching them vital digital skills. In the international baccalaureate program, computer science is not taught among grades 6-10, because each subject must apply digital technologies in the educational procedure, which leads to the development of information and digital skills among a hundred students and teachers.

Although the restructuring of the general education system has great potential, it is difficult to implement it in the secondary education system. Issues such as inequality in access to technology, poor teacher training, and lack of evidence of a long-term impact on student performance remain major obstacles. At the same time, there is a lack of comprehensive research on the effectiveness of digital tools in secondary education in regional contexts such as Kazakhstan. Although digital transformation has been widely studied in the field of Higher Education, its use in secondary schools has been relatively little studied.

This study aims to systematically identify and synthesize the strengths, weaknesses, opportunities, and threats associated with the use of digital methods and tools in secondary education, using participating in school context described above.

Research Questions (RQs).

RQ1 (Strengths): What strengths of digitally supported teaching and learning are perceived by teachers and students?

RQ2 (Weaknesses): What weaknesses or constraints are experienced when integrating digital methods and tools in everyday practice?

RQ3 (Opportunities): What future opportunities (e.g., pedagogical, organizational, or technological) are seen for enhancing learning with digital tools?

RQ4 (Threats): What external threats (e.g., resource, policy, or data-privacy risks) may hinder sustainable digital transformation?

RQ5 (Alignment): To what extent do survey findings align with interview themes and document evidence across the SWOT dimensions?

Analysis of the advantages and disadvantages, potential and risks of digitalization of Secondary Education is an urgent task for several reasons. First, such a study will allow educators to use digital tools more effectively, reducing their negative impact. Secondly, it provides valuable data for the development of public policies aimed at creating equal conditions for access to quality education. Thirdly, the results of the study can be useful for developers of educational technologies, which will help them create tools that meet the specific needs of educators and students. Since the existing research in this area is insufficient, this study will fill an important gap and provide practical recommendations for optimizing the educational process through the use of digital technologies.

Research shows that while digital technologies have increased access to education, they have also widened the gap between those who have had access to high quality digital resources and those who have been deprived of this occasion. In response to these challenges, governments and educational institutions around the world are developing new strategies aimed at bridging the digital peak and ensuring equal opportunities for all students.

A concise synthesis of the broader background and related work is consolidated under the Main provision to contextualize the study purpose.

Main provision. The purpose of the research: to conduct an analysis of teaching methods and tools in the secondary education system in the context of digital transformation, identify internal strengths and weaknesses, as well as external opportunities and threats related to digital teaching tools and methods in secondary education. To ground this purpose, we synthesize the broader background and related work relevant to secondary education digital transformation (OECD/UNESCO guidance; platforms/ VR-AR; SWOT use in education), and then specify the remaining gaps motivating our study.

Digital transformation has radically changed education. In this section, we summarize the existing research in this area by applying SWOT analysis to educational tools and methods. In addition, we identify the gaps in knowledge that formed the basis of our research.

The digital transformation of Education, which involves the wide introduction of advanced technologies such as digital platforms, artificial intelligence and adaptive literacy, aims to improve the quality and availability of Education. This process stems from the growing need for the scalability and inclusiveness of educational systems. In its rearmost research, the association for Economic Cooperation and Development (OECD) emphasizes the fundamental role of digital ecosystems in ultramodern education, fastening on the significance of ensuring equity and quality of Education. The OECD also noted that effective governance and well-developed structure are crucial factors for successful digital transformation in diverse educational contexts [1]. UNESCO, in turn, offers a detailed six step model for the transformation of digital education, which covers all crucial aspects of the process, from leadership and collaboration to content development and data analysis. This model is aimed at totally working problems and stimulating invention in educational practice [2]. The Covid-19 epidemic has accelerated the digital transformation of education, revealing the huge eventuality of online literacy and the current problems associated with digital inequality.

Building on international guidance, recent empirical work highlights the role of concrete tools and environments in classroom practice.

Modern educational platforms. Technological platforms such as Microsoft Teams and Google Classroom have helped students and researchers perform in a digital world. Recent studies, however, indicate development towards a new adaptive AI tool [3]. Portals, virtual reality, and virtual probe extensions have also improved not only user activity but even satisfaction [4]. Adaptive learning systems like DreamBox and ALEKS have successfully personalized education, thereby increasing student engagement and academic achievement through real-time accommodation of content to students' specific needs. Research highlighted the significant role of interactive environments and metacognitive support in decreasing transactional distance and improving academic attainment in asynchronous online learning. For example, Yılmaz and Keser (2017) showed that metacognitive support in asynchronous environments had a major impact on student achievement test scores while decreasing perceived transactional distance, emphasizing the importance of well-designed thoughtful instruction in digital platforms [5]. Digital platforms also create opportunities for international projects promoting international cultural exchanges and a better understanding of educational standards across the globe. For example, the collaboration with technology companies, such as Google's initiative for education, attests to how artificial intelligence in teaching will bring innovation in the processes of education. These two will go a long way in achieving what digital technology can do to transform the educational landscape in creating a more inclusive and globally connected educational experience [6]. Virtual reality and augmented reality technologies open new doors to simulation, providing practical learning and interactive immersion. Virtual laboratories have demonstrated their effectiveness for studying complex scientific disciplines [7]. Integrating Artificial Intelligence (AI) tools into school practice is increasingly reported across studies, particularly for personalization, assessment support, and analytics.

Despite expansive research, some knowledge gaps in the field of digital transformation and its operation in education remain unnoticed:

- Most of the existing literature is devoted to higher education, while secondary education has been little studied. There are particularly few studies of regional conditions such as Kazakhstan [8, 9].
- Long-term research is needed to understand how digital technologies affect academic performance and long-term learning experience. Current research is usually limited to short-term analysis [10].
- Current approaches of SWOT application in education settings are very specific, limited to tools or methodologies, and

not comprehensive in evaluating the learning experiences vis-a-vis the digital transformation [11]. There is an urgent need to fill such gaps in order to build evidence-based strategies that inform better efficacies of digital learning tools and methods. Hence, this paper extends efforts with a holistic inquiry into the methods and tools of teaching within the secondary education system regarding digital transformation.

SWOT analysis in relation to educational tools and methods. SWOT analysis provides a precious base for assessing the effectiveness of educational tools and styles. The analysis of Strengths, Weaknesses, Opportunities and Threats provides useful information for perfecting digital education strategies, totally relating strengths, weaknesses, opportunities and threats. Daugherty and his exploration group (2022) used SWOT analysis to estimate adaptive literacy ways in advanced education [8]. Their research has linked important benefits such as increased participation and substantiated literacy paths, as well as weaknesses such as data entry costs and the complexity of data integration. Also, research on the use of Web 2.0 operations in literacy has linked their eventuality for the development of commerce and cooperative literacy [11].

However, the study also revealed problems, including the need to constantly modernize technology and train teachers. The analysis of Strengths, Weaknesses, Opportunities and Threats was also used to develop learning strategies for advanced education institutions. These studies have shown that combining the strengths of educational institutions with new opportunities, such as perfecting digital knowledge, can produce a solid foundation for digital education [12]. SWOT's analysis of the virtual interaction of students in Kazakhstan allowed us to gain a critical understanding of digital educational environments. The researchers highlighted the potential of virtual platforms to improve cooperation and communication when identifying threats such as technological barriers and limited digital competencies [9].

Taken together, this background frames the theoretical and practical significance of the present inquiry in the secondary-school context.

The theoretical significance of the research lies in the fact that it contributes to the development of the theory of digital transformation of education, expands the understanding of the impact of digital technologies on learning processes in secondary education. The study solved the problem of scientific proof of the effectiveness of the use of digital tools in the educational process and also identified the main factors contributing to the successful integration of technology into the educational environment.

The practical significance of the research lies in the possibility of applying the developed methodological recommendations in the conditions of real pedagogical practice in secondary schools. The results create prerequisites for modernizing the methods and means of organizing the educational process using digital technologies. The applied significance of the conducted research lies in the development of recommendations for improving the skills of teachers, introducing new technologies into the educational process and creating conditions for eliminating digital inequality in the secondary education system.

Materials and Methods.

This study employs an amalgamated approach, which is a mixture of quantitative and qualitative methods to permit one to comprehensively assess the entire process of digital transformation in secondary schools and how it affects teaching methods and tools. Digital data helps in determining the extent of the use of digital technologies while qualitative data gives some idea of how participants view those technologies in the learning process.

Reporting and Traceability of Methods

To increase transparency, we explicitly map each method to its primary outputs and where these outputs are reported in the Results (Table 1).

Table 1. Method–Output–Result Traceability

Method	Instrument / Focus	Primary Outputs Used in Results	RQs Addressed
Teacher & student surveys	Structured items on platform use, training needs, integration difficulties, perceived monotony, AI use, academic integrity	Percentages for overall use (teachers 95%, students 98%), platform frequencies (Teams 85%, Google Classroom 70%; Kahoot 75%, Quizlet 60%), training needs (teachers 80%), integration difficulties (70% "Yes"), monotony (teachers 25%, students 55%), academic integrity distributions	RQ1 (Strengths), RQ2 (Weaknesses)
Semi-structured interviews (teachers, administration)	Perceived support, professional learning, reasons for underuse of advanced tools	Insufficient support; call for diversified CPD; underuse of virtual labs due to lack of skills; 65% indicating no formal training (from interviews)	RQ2 (Weaknesses), RQ5 (Alignment)
Document analysis (lesson plans, curricula, teaching materials)	Presence and role of digital tools in formal documentation; alignment with pedagogical goals	Qualitative corroboration and contextualization of tool use and integration focus; no new counts are introduced	RQ1–RQ4 (context), RQ5 (Alignment)

Data collection:

- Surveys were conducted among teachers and students of the Astana International School, fastening on their experience in using digital tools and teaching styles.
- Document analysis: lesson plans and curricula, teaching materials, and assessment tools were reviewed to identify patterns of tool use and alignment with pedagogical objectives
- Interviews: semi-structured interviews were conducted with teachers and school administrators to better understand the benefits, challenges and opportunities of digital transformation.
- The SWOT analysis system is adapted for the systematic evaluation of the collected data: Strengths and weaknesses were identified: internal factors such as the effectiveness of training methods, user engagement and technical support were identified.
- Opportunities and threats were analyzed: external factors, including advances in educational technology and possible obstacles. SWOT analysis allowed us to summarize the qualitative and quantitative results structurally, which allowed stakeholders to obtain useful information. Instruments and coding were designed to answer RQ1–RQ4 (SWOT) and RQ5 (cross-source alignment), and each reported result is explicitly tagged to its originating method

Participants. The main direction of study was given to teachers and students of the Astana International School as an object of research for the introduction of digital tools in secondary education. The model is included:

- 50 teachers with different levels of specialized and technological knowledge in various disciplines.
- 200 students in grades 6-10 offer a wide range of technological achievements and applications. The model presented different points of view, which increased the accuracy of the research in the context of digital secondary education.

Ethical considerations. Participation in the study was voluntary, all participants received informed consent. To ensure data confidentiality and anonymity, appropriate

measures have been taken to ensure that personal responses are not associated with specific participants. The study was previously approved by the Ethics Committee of the Astana International School.

Results.

The survey of teachers (Table 2) shows a high level of use of digital platforms (95%), especially the Microsoft Teams (85%) and Google Classroom (70%). However, 80% of teachers, particularly more experienced staff, reported a need for training on new technologies (e.g., virtual labs, AI-enabled platforms). Despite the popularity of Kahoot (75%) and Quizlet (60%), students noted the heterogeneity of methods, which reduces the usefulness (55% called classes boring).

Table 2. Results of the survey among teachers and students

Question	Teachers' answers (%)	Students' answers (%)
Do you use digital learning tools?	Yes: 95%	Yes: 98%
Which platforms are used most often?	Microsoft Teams: 85%, Google Classroom: 70%	Kahoot: 75%, Quizlet: 60%, AI-tool: 45%
Do you need training to work with digital tools?	Yes: 80%	No: 65%
Do you encounter difficulties in integrating digital technologies?	Yes: 70%	No: 40%
Do you find the use of digital tools boring because of the monotony?	Yes: 25%	Yes: 55%
Do you use AI tools in training?	No: 60%	Yes: 45%
How often does technology violate academic integrity?	Often: 10%, Sometimes: 40%, Never: 50%	Often: 30%, Sometimes: 50%, Never: 20%

Among students (Table 2), the use of AI, such as ChatGPT, is 45%. However, 30% of students admitted that artificial intelligence is often used unethically, which confirms the need to implement academic integrity programs. The survey also showed that 70% of teachers find it difficult to integrate technology due to a lack of support from the school.

An interview between teachers and the administration confirmed that the school should strengthen support for teachers. The administration proposed to diversify the teaching of continuing education, as well as teaching methods, in order to avoid monotony. Teachers noted that innovative platforms such as virtual laboratories remain unused due to a lack of skills.

The results of the interview between teachers and the administration. In interviews with teachers and the school administration, the following main points were identified:

- Technical support: teachers noted that the school's assistance in digital learning is insufficient. For example, 65% of teachers said that they did not receive formal training during the interview.
- Administrative support: the administration is aware of the need to provide training to teachers with extensive experience who do not reliably use complex technologies.
- Objectives of digital transformation: management considers it necessary to diversify methods in order to reduce the standardization of the use of tools such as Kahoot.

Table 3. The final analysis table

Key Point	Teachers (%)	Students (%)
Using digital tools	95%	98%
Need for training	80%	35%
Uniformity of approaches	25%	55%
Using AI	40%	45%
Academic dishonesty (violations)	50% (sometimes or often)	80% (sometimes or often)

In Table 3, the results show the need for an integrated approach: training teachers, improving their access to new technologies and teaching students the principles of academic integrity.

Discussion.

We discuss findings in relation to RQ1–RQ5 and interpret their implications for practice and policy.

Summarizing the results of the SWOT analysis:

RQ1-Strengths. The study confirmed the many advantages of using digital tools and teaching methods in secondary education. One of the most important efforts is to increase student participation through the use of platforms such as Microsoft Teams and Kahoot, especially in science, technology, engineering and mathematics subjects that promote interaction and collaboration. Individual learning is also made possible thanks to adaptive technologies that allow teachers to take into account the individual needs of students, which has a positive effect on academic performance. Students appreciated the flexibility of digital resources that provide access to educational materials anytime and anywhere, helping them adapt to different learning styles. In addition, digital tools provide real-time feedback that allows teachers to identify knowledge gaps in time and take measures to eliminate them.

RQ2-Weaknesses. The introduction of digital widgets has revealed a number of significant limitations. The main obstacles remain specialized problems, such as unreliable internet connection and limited access to modern devices. Teachers, especially aged teachers, are faced with the need to learn how to manage with new technologies, which overloads their time and resources. Digital fatigue caused by long screen time reduces the provocation of students and negatively affects their health. In addition, over-reliance on technology leads to a reduced focus on introductory chops such as critical thinking and problem working, especially if tools are used in repetitious and predictable ways.

RQ3-Opportunities. Digital transformation opens up numerous opportunities for the secondary education system. Inventions such as artificial intelligence and virtual reality operations give new ways to produce substantiated and engaging literacy. Government support aimed at barring digital inequality will help increase access to technology for numerous students. Transnational systems enforced through digital platforms give students and teachers with opportunities for intercultural education. In addition, digital tools make it possible to gauge up high- quality education in underserved areas, adding availability and equity in the educational terrain.

RQ4-Threats. A number of external factors can hamper the successful digital transformation of Education. Technological walls, such as inadequate structure and cybersecurity threats, remain pressing issues. The high costs of acquiring; implementing and supporting the technology make it difficult to use it in schools with limited budgets. Resistance to change, especially among teachers and administrators, prevents the introduction of

innovative teaching methods that require a change in traditional methods. In addition, student's data privacy issues are causing concern among parents and teachers, which requires strict security measures to protect information.

RQ5 — Alignment of survey, interview, and documents. Document analysis of lesson plans, curricula, and teaching materials was used to contextualize and corroborate the reported patterns of tool adoption and integration focus; no additional counts were introduced. Interview themes align with the survey signals: school leadership and teachers report insufficient support and call for diversified CPD and teaching methods to avoid monotony; teachers also note that virtual laboratories remain underused due to lack of skills. For illustration, 65% of teachers reported they had not received formal training (interviews). These points are consistent with 70% reporting integration difficulties, 80% reporting training needs, and 55% of students reporting monotony. Table 3 consolidates the key survey indicators referenced across RQ1–RQ4.

The results of this study comprehensively explore the implications of digital transformation on secondary education, analyzed using the SWOT model. These results correspond to the objectives of the study by clarifying internal and external factors affecting the effectiveness of research methods and tools.

Conclusions regarding the objectives of the study. The purpose of the research was to assess the strengths, weaknesses, opportunities and threats related with digital technologies in secondary education. Identifying strengths such as increased activity and personalization establish that digital tools can necessarily improve learning outcomes. Nonetheless, weaknesses such as technical problems and over-reliance on technology point to areas that need attention. External factors, including new technologies, opportunities for political support, limited funding and resistance to change, ensure a balanced approach to the prospects of digital transformation, in contrast to threats such as in contrast to threats such as budget constraints, resistance to change, cybersecurity risks, and data-privacy concerns.

This discussion addresses each research question in turn (RQ1–RQ5) and synthesizes implications for practice and policy. The results correspond to the existing literature. Our findings on AI uptake and academic-integrity concerns parallel recent higher-education perspectives [13]. They also resonate with evidence on supporting self-regulated learning in large-scale online settings [14]. Teachers' platform-level observations (e.g., Teams vs Classroom) are consistent with preliminary comparative reports [15]. For example, the results on interpersonal learning are consistent with the conclusion of Daugherty, K. et al. (2022) that modified technologies enhance commitment and learning results. Similarly, the problems of digital lethargy and technical interference are consistent with the problems identified in the study of Web 2.0 tools [11]. However, this study expands the scope of application by focusing on secondary education, a relatively little studied area compared to higher education.

The research highlights the need for professional development to teach teachers the skills needed to effectively integrate digital tools. Teachers should also combine digital and traditional methods to maintain students ' active and critical thinking skills. School management: the results highlight the need for reliable infrastructure and equal access to technology. The school administration should prioritize funding and initiatives to bridge the digital divide.

Conclusion.

The purpose of this study was to dissect the approaches and implements of secondary education through the prism of digital conversion using the SWOT analysis system. The key findings revealed the important benefits of digital tools in increasing participation, flexibility and personal learning, and identified issues such as technical obstacles and digital fatigue. The possibilities of technological innovation and

political support were compared with risks such as limited funding and resistance to change.

Methodologically, the study maintains a clear chain-of-evidence by tagging each reported result to its originating method (surveys, interviews, documents), thereby increasing transparency without introducing additional measurements.

The research complements the literature and suggests effective strategies for stakeholders, focusing on secondary education, especially in the Kazakh context.

Actionable Takeaways. Priorities for secondary schools include (i) ensuring reliable infrastructure and access, (ii) structured, diversified CPD for teachers targeted at advanced tools (e.g., virtual labs), and (iii) school-wide academic-integrity scaffolds that balance productive AI use with clear norms. These actions directly address the dominant signals reported by teachers and students (high adoption with training needs, integration difficulties, perceived monotony, and integrity concerns).

Limitations

The study is limited to a single-school context and relies on self-reported survey and interview data. Some raw percentages were inconsistently recorded at source (e.g., the “Yes/No” pair on integration difficulties), so we report the conservative signal (e.g., “70% ‘Yes’”) in the main text and retain full raw figures in the appendix. The study is cross-sectional and does not estimate long-term learning outcomes.

Future Work

Future research should probe the long-term impact of digital transformation and develop context-sensitive frameworks for managing implementation. Taken together, answers to RQ1–RQ5 indicate that targeted investments in infrastructure and teacher professional learning are pivotal for sustainable digital transformation in secondary education. Future studies should assess durability of effects over time, evaluate interventions in teacher professional learning, and compare multi-school implementations across varied infrastructure baselines in Kazakhstan.

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SWOT-анализ методов и инструментов среднего образования в условиях цифровой трансформации

М. Темирханова[1], Г. Абильдинова[2], Караджа Дж[3]
[1,2]Евразийский национальный университет имени Л.Н. Гумилёва, Астана, Республика Казахстан
[3]Профессионально-техническое училище технических наук, Аксарайский университет, Аксарай, Турция

Аннотация. Цифровая трансформация изменила методы преподавания и обучения в системе среднего образования. В данном исследовании проводится SWOT-анализ цифровых методов и инструментов с акцентом на Международную школу Астаны. Структура, основанная на смешанных методах (опросы среди 50 преподавателей и 200 учащихся, полуструктурированные интервью и анализ документов), включает в себя пять исследовательских вопросов, согласованных с SWOT, и четкую цепочку доказательств, которая привязывает каждый результат к исходному методу. Опросы показывают высокий уровень внедрения (95% преподавателей, 98% учащихся) и частое использование Microsoft Teams (85%) и Google Classroom (70%); среди учащихся распространены Kahoot (75%) и Quizlet (60%). Среди отмеченных ограничений - потребность в обучении (80% преподавателей), трудности с интеграцией (70%) и ощущение монотонности (55% учащихся; 25% преподавателей). Отмечается использование искусственного интеллекта (45% учащихся), наряду с проблемами академической честности (учащиеся: 30% часто, 50% иногда, 20% никогда; преподаватели: 10%, 40%, 50%). Интервью объясняют эти закономерности — недостаточная поддержка, необходимость диверсификации процессов разработки и недостаточное использование виртуальных лабораторий, — а анализ документов подтверждает необходимость принятия и интеграции без введения новых показателей. Последствия включают целенаправленные инвестиции в надежную инфраструктуру, структурированное профессиональное обучение и общешкольные системы обеспечения целостности, которые обеспечивают баланс между продуктивным использованием ИИ и четкими нормами. Ограничения включают в себя ограничение одной школой, самоотчётностью и кросс-секционным дизайном; в будущей работе следует оценить внедрение в нескольких школах и долгосрочное воздействие.

Ключевые слова: цифровая трансформация, среднее образование, методы обучения, образовательные инструменты, SWOT-анализ.

Цифрлық трансформация арқылы орта білім берудің әдістері мен құралдарын SWOT талдау

М. Темирханова[1], Г. Абильдинова[2], Караджа Дж[3]
[1,2]Л.Н. Гумилев атындағы Еуразия ұлттық университеті
Астана, Қазақстан Республикасы
[3]Техникалық ғылымдар кәсіптік мектебі, Ақсарай Университеті,
Ақсарай, Түркия

Аңдатпа. Цифрлық трансформация орта білім беру жүйесіндегі оқыту мен оқыту әдістерін өзгертті. Бұл зерттеуде Астананың халықаралық мектебіне баса назар аудара отырып, Цифрлық әдістер мен құралдарға SWOT-талдау жүргізіледі. Аралас әдістерге негізделген құрылым (50 оқытушы мен 200 оқушылардың сауалнамалары, жартылай құрылымдық сұхбаттар және құжаттарды талдау) SWOT-пен келісілген бес зерттеу сұрағын және әрбір нәтижені бастапқы әдіске байланыстыратын нақты дәлелдер тізбегін қамтиды. Сауалнамалар қабылдаудың жоғары деңгейін (оқытушылардың 95%, оқушылардың 98%) және Microsoft Teams (85%) және Google Classroom (70%) жиі пайдаланатынын көрсетеді; оқушылар арасында Kahoot (75%) және Quizlet (60%) жиі кездеседі. Белгіленген шектеулердің қатарына оқу қажеттілігі (оқытушылардың 80%), интеграциядағы қиындықтар (70%) және монотондылық сезімі (оқушылардың 55%; оқытушылардың 25%) жатады. Академиялық адалдық мәселелерімен қатар жасанды интеллект (оқушылардың 45%) қолданылады (оқушылар: 30% жиі, 50% кейде, 20% ешқашан; оқытушылар: 10%, 40%, 50%). Сұхбаттар осы заңдылықтарды түсіндіреді-жеткіліксіз қолдау, даму процестерін әртараптандыру қажеттілігі және виртуалды зертханаларды жеткіліксіз пайдалану — және құжаттарды талдау жаңа көрсеткіштерді енгізбестен қабылдау және интеграциялау қажеттілігін растайды. Мұның салдары сенімді инфрақұрылымға, құрылымдық кәсіптік оқытуға және мектептегі тұтастық жүйелеріне мақсатты инвестицияларды қамтиды, олар жасанды интеллектті тиімді пайдалану мен нақты нормалар арасындағы тепе-теңдікті қамтамасыз етеді. Шектеулері: бір мектеп шеңберіндегі зерттеу, өзін-өзі есеп беруді, түпкілікті жобалауды қамтиды; болашақ жұмыста бірнеше мектепті қамту және ұзақ мерзімді әсерді бағалау керек.

Кілтті сөздер: Цифрлық трансформация, орта білім, оқыту әдістері, оқу құралдары, SWOT талдау.

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