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RESEARCH ARTICLE

A Study of Teachers' Attitudes towards Digital Educational Technologies: a Qualitative Analysis

Ekaterina V. Bushina [1], Azkhariya M. Karimova [1], Aleksandra P. Fakhretdinova [2]

1 *Higher School of Economics, Moscow, 101000, Russia*

2 *Tomsk state University, Tomsk, 634050, Russia*

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Abstract

Digitalization and digital technologies have become an integral part of the education system, radically transforming both teaching methods and the role of teachers. Therefore, examining teachers' attitudes toward digitalization is essential for enhancing the effectiveness of education and ensuring the successful implementation of technologies in the educational process. Teachers' attitudes are shaped by various factors, such as expectations, barriers, competencies, and perceptions of the effectiveness of the technologies used.

This study surveyed 50 Russian teachers from different regions (45 of whom were women) with an average age of 43 years and an average length of service of 18 years. The authors analyzed respondents' answers to open-ended questions about the practices and purposes of using digital technologies, the advantages and disadvantages of digitalization in education, and teachers' perceptions of the role of digitalization in the future of education.

Phenomenological analysis revealed several interrelated central trends and aspects (educational, material and technical, psychological, and transformational) that characterize school teachers' attitudes toward digitalization. The findings indicate that, although digital transformation is generally perceived positively, a certain degree of resistance remains. Many teachers point to insufficient material and technical resources in schools and a lack of various types of support for the use of digital technologies.

Teachers view the future of education in the digital age as an opportunity to facilitate their work, improve educational quality, and enhance the digital competence of all participants in the educational process. The results obtained have practical significance for the development of Russian education in the context of ongoing digital transformation.

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Keywords

digitalization of education, digital technologies, transformation, teachers, education system, school

JEL codes: I20, O15

Introduction

In an era of rapid change, digitalization plays a key role in many aspects of our lives, including the educational environment, as it transforms the ways we process, transmit, and consume information through efficient and accessible digital technologies. In this context, the digitalization of education refers to the introduction of new technologies into the educational process, as well as the transformation of teaching methods and communication among various educational stakeholders.

In the modern context of educational digitalization, many researchers agree that digital technologies are essential teaching tools that contribute to the effectiveness of the learning process and foster interactive learning environments that enhance student motivation (Collins and Halverson 2010; Starichenko 2020). Moreover, digital technologies open up new opportunities for communication and interaction among teachers, students, and parents (Petrov et al. 2023).

Several authors emphasize the broad potential of digital technologies to support cognitive development and personalize learning through diverse immersive educational tools such as problem-solving games, modeling software, 3D printing, and augmented and virtual reality (Problemy i perspektivy ... 2019). By engaging with dynamic digital environments, learners can explore and discuss key concepts from multiple perspectives, thereby improving both the quality and effectiveness of the learning process.

The potential of digital technologies in education is viewed by teachers largely in a positive light. Digitalization is often perceived as an interactive tool that increases learner engagement in the educational process (Raave et al. 2024), thereby supporting the adaptation of learning to individual needs and improving learning outcomes. At the same time, Russian studies indicate that teachers associate their expectations of digitalization primarily with the simplification of routine administrative processes, which, in turn, would allow them to devote more attention to pedagogical activities and to developing meaningful forms of interaction between teachers and students (Aimaletdinov et al. 2019; Starichenko 2020). However, these expectations are tempered by the realities of implementation, which often fall short of educators' aspirations.

Despite the generally positive attitudes toward the digitalization of education, researchers note that many teachers – like other educational stakeholders – often lack a clear understanding of the essence of the digital transformation of the modern education system or of how digital technologies can ensure the quality and effectiveness of teaching (Petrov et al. 2023; Abramov et al. 2021). One of the key obstacles is the insufficient qualifications and underdeveloped digital competencies of teachers: on the one hand, a limited understanding of the capabilities of modern educational technologies, and on the other, an inability to apply these technologies to create a genuinely modern educational environment (Starichenko 2020).

A lack of knowledge, practice, or sufficient motivation to use digital tools in teaching often results in the simple transfer of materials and resources from offline to digital formats

without adapting or rethinking instructional methods. Consequently, many researchers emphasize the importance of studying teachers' digital competence (Deryabin et al. 2021) and digital literacy (Vezirov and Babayan 2021). For instance, a study by Aimaletdinov et al. (2019) among Russian teachers found that although many educators possess basic technological skills, their ability to effectively integrate these tools into classroom practice varies considerably. This mismatch often leads to frustration, as teachers are expected to meet the growing demands of the educational process despite insufficient digital competencies and limited practical experience in implementing digital educational environments in their lessons.

At the same time, obstacles to effective digitalization are associated not only with access to resources but also with the quality and level of development of digital infrastructure – such as Internet connection speed, the availability of modern equipment in schools, and the provision of technical support (Novikova and Ravino 2022). These institutional factors exacerbate challenges related to the development of digital skills and often create a sense of inadequacy among teachers (Aimaletdinov et al. 2019; Pronyushkina and Lukich 2024). Teachers also express concerns that the use of technology may increase their workload, as they are frequently required to spend additional time mastering new tools, preparing digital materials, and resolving technical problems (Radina and Balakina 2021).

As a means of overcoming these challenges, many scholars advocate for professional development programs that focus not only on technical training with new tools and software but also on new pedagogical techniques, strategies, and methods (Abramov et al. 2021; Vezirov and Babayan 2021). Raave et al. (2024) emphasize the need for professional development that is context-sensitive and tailored to teachers' varying levels of digital competence. Similarly, L.V. Lidak (2024) highlights the value of programs that incorporate reflective practice, enabling teachers to critically assess their use of digital tools and align them with broader educational goals.

However, the lack of systemic institutional support and limited opportunities to apply newly acquired knowledge in classroom practice significantly reduce the effectiveness of professional development programs, leaving many teachers feeling inadequately prepared to address the challenges of digital education.

Despite numerous barriers, there is growing recognition of the transformative potential of digital technologies in education (Abramov et al. 2021; Aimaletdinov et al. 2019), provided that their implementation is supported by sustainable professional development (Lidak 2024) and adequate institutional and administrative support (Starichenko 2020). Teachers' attitudes toward digitalization are shaped not only by their individual experiences but also by the broader educational ecosystem in which they operate (Radina and Balakina 2021). These attitudes encompass teachers' views, beliefs, emotional responses, and behavioral intentions regarding the integration of digital technologies into the educational process (Bryksina et al. 2024).

Novelty of the Study

The present study offers an in-depth analysis of teachers' individual perceptions and expectations regarding digitalization in education. While previous Russian research (Abramov et al. 2021; Bekova et al. 2021; Novikova and Ravino 2022) has primarily

focused on systemic aspects of digitalization in higher education and general trends in teachers' attitudes toward change, this study aims to conduct a qualitative exploration that provides a deeper understanding of the specific aspects of working with digital technologies in which teachers feel confident, the shortcomings they identify in current approaches to digitalization, and their suggestions for improving the implementation of innovations.

An analysis of school teachers' current perceptions will help identify not only existing challenges but also potential opportunities for the successful integration of digital technologies into the educational process. The results obtained will contribute to the development of more effective strategies for teachers' professional development and to the creation of a more supportive environment for the digital transformation of school education in Russia.

Thus, the research question of this study can be formulated as follows: What are teachers' attitudes toward the digitalization of school education?

The aim of the study is to analyze school teachers' attitudes toward various aspects of the digitalization of the modern education system.

The objectives of the study are:

1. To conduct a qualitative analysis of teachers' responses in order to identify the main aspects (macro-categories) of their attitudes toward digitalization;
2. To analyze the themes (categories) that emerge when teachers discuss their experiences of integrating digital technologies into the educational process.

Research methodology

Design

The study employed Interpretative Phenomenological Analysis (IPA) (Busygina 2009; Alase 2017; Smith 2011) to explore teachers' attitudes toward digitalization. This methodological approach focuses on how participants make sense of and interpret their experiences of integrating digital technologies into the educational process. IPA is particularly well suited for examining individual subjective experiences within their contextual and phenomenological dimensions, which aligns closely with the objectives of this study. In addition, this approach enables the analysis of the structure of participants' evaluations by organizing qualitative data into meaningful subcategories.

Although IPA has traditionally been applied to data obtained through in-depth interviews, in recent years it has been successfully adapted for use in digital data collection formats, including online questionnaires with open-ended questions (Darley et al. 2025). In the present study, open-ended online survey questions were used to obtain detailed descriptions of teachers' individual experiences, allowing for the reconstruction of the phenomenon of digitalization from their perspective.

The online format of the survey did not present a barrier; rather, it provided participants with an opportunity to express their views reflectively and uninhibitedly in a comfortable environment, allowing for more thoughtful responses. Thus, IPA was selected as the most appropriate analytical method, as it facilitates the interpretation of the meanings embedded in teachers' responses and enables the identification of typological variations in their perceptions of digitalization through the grouping of data into meaningful semantic clusters.

Procedure

The study was conducted in October 2024 using a socio-psychological survey administered via the online platform Anketolog.ru. The survey included both multiple-choice questions and open-ended items, the latter allowing for unrestricted text responses.

Based on a review of the relevant literature, the questionnaire items were grouped into the following thematic blocks:

1. Socio-demographic characteristics: gender, age, socio-economic status (SES), teaching experience, subject area, and city of residence.
2. Practice of using digital technologies: How do you assess your level of digital technology use in teaching? How often do you use digital tools in your work? What digital tools do you typically use in your practice?
3. Purpose of using digital technologies: For what purposes do you use digital tools in your teaching? In your opinion, for what purposes do teachers generally use digital technologies in the classroom?
4. Perceived benefits of digitalization: What benefits do you think digital technologies can bring to the educational process?
5. Perceived disadvantages of digitalization: What do you see as the disadvantages of using information technology in lessons? What barriers do you face when implementing digital technologies in education?
6. Effective practices for implementing digital technologies: What aspects of teacher training on digital tool use would you like to see improved? What do you think is necessary to enhance the integration of digital technologies into the educational process?
7. Teachers' attitudes toward future digitalization: What are your expectations regarding the use of digital technologies in the future? Do you think your attitude toward digitalization will change over time? Why or why not?

Sample

The study sample consisted of 50 teachers with an average age of 42.9 years (SD = 13; range = 21–73 years). Data collection was concluded upon reaching theoretical saturation, when new responses no longer provided substantially new information or insights on the topic under investigation.

The majority of participants were women (n = 45). The average length of teaching experience was 18.3 years (range = 2–45 years). When asked about family income, most respondents indicated that their income was "basically enough for us" (n = 22), followed by "living on this income is quite difficult" (n = 21), and "we live on this income without experiencing financial difficulties" (n = 6). Participants represented various regions of Russia. The geographic distribution was as follows: Moscow (n = 5), Barnaul (n = 2), Ufa (n = 2), Tomsk (n = 2), and one participant each from St. Petersburg, Izhevsk, Voronezh, Chelyabinsk, and several other cities.

Data Analysis

Qualitative data were processed using Atlas.ti and RAWGraphs 2.0. The analysis followed several sequential steps:

1. Familiarization with the data – detailed reading of participants' written responses and organization of questions into thematic blocks.

2. Coding and identification of emergent categories – codes were derived from the meanings expressed in response fragments (e.g., "facilitation of labor," "accessibility") and subsequently grouped into larger categories within each block (e.g., goal: logistical aspect).
3. Categorization of themes – macro-categories were identified by synthesizing codes across all question blocks.
4. Interpretation – responses were interpreted at multiple levels, starting from individual codes and progressing to categories and macro-categories.

The resulting matrix of codes, categories, and macro-categories was imported into RAWGraphs 2.0 to construct an alluvial diagram, visualizing the complex structure of the data. In the diagram, nodes (vertical columns) represent codes, categories, and macro-categories, while the flows between nodes indicate connections, with the width of each flow corresponding to the volume of data.

To minimize subjectivity, the analysis was conducted collaboratively by all three authors. Key themes were discussed jointly, and interpretations were verified by cross-checking with the original data. Participant quotes are presented in Tables 1–5 to illustrate the relationships between codes, categories, and macro-categories.

Results

I. Practice of using digital technologies

A frequency analysis of responses to the question on the level of digital technology use (scale: 1 = do not use at all; 5 = use at an advanced level) showed that 20 teachers reported using digital technologies "as needed," 16 reported using them "quite well," and only 5 reported using them "at an advanced level."

Regarding the frequency of use, the majority of respondents (n = 29; 59%) reported using digital technologies "often." A small proportion (n = 1; 2%) reported "rarely" using digital tools, while 19 teachers (39%) indicated using them "regularly" or "in every lesson."

Frequency analysis was also conducted for the question on types of digital technologies used in teaching (Figure 1). The following clusters were identified:

- Hardware and equipment: computer, smart board, laptop, projector – 5 mentions.
- Software and office applications: Microsoft Office suite, Yandex browser, word processors, graphic editors, spreadsheets, electronic storage, video editing software – 6 mentions.
- Educational platforms and resources: YaKlass, Yandex Textbook, Uchi.ru, I will solve the OGE, Unified State Exam, FIPI, Foxford, videouroki, my school, NES, Dnevnik.ru, Infourok website, online tests – 6 mentions.
- Interactive and testing tools: online tests, videos, exam preparation websites, tests, presentations, simulators – 6 mentions.
- Visual and multimedia resources: presentations, videos, online quizzes – 7 mentions.
- Programming and specialized tools: presentations, 3D design programs, programming tools – 2 mentions.
- Networking and communication platforms: Network City, VK Messenger, instant messaging chats – 3 mentions.
- Miscellaneous and unspecified – 4 mentions.

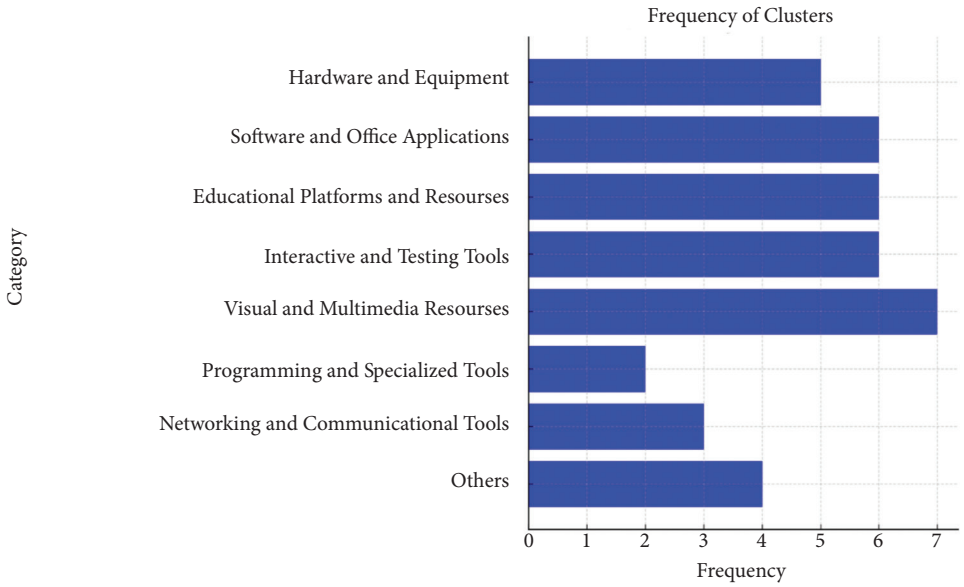

Figure 1. Frequency of digital technologies used by teachers in their work. *Source:* Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025.

II. Phenomenological analysis

The phenomenological analysis was conducted in three stages. At the first stage, responses were analyzed within individual blocks of questions (e.g., goals, improvements). At the second stage, these responses were condensed into general categories (e.g., goals → expectations). At the third stage, macro-categories were identified (e.g., Transformation aspect).

The results, presented in Tables 1–5, are organized according to five blocks of questions:

- Objectives of using digital technologies in the educational process.
- Advantages of using digital technologies in the educational process.
- Disadvantages of using digital technologies in the educational process.
- Expectations regarding the use of digital technologies in the educational process.
- Use of digital technologies in the educational process in the future.

In the final stage, categories and macro-categories were derived through systematic categorization of individual responses. Figure 2 presents a summary alluvial diagram based on the analysis of teachers' responses, including the frequency of codes identified in the study.

A. Objectives of Using Digital Technologies in the Educational Process

The qualitative analysis of the block of questions on the oobjectives of using digital technologies (see Table 1) identified several key categories of teachers' objectives. Five main categories emerged from the responses.

The first category, Material and Technical Aspect, reflects teachers' emphasis on using digital technologies to facilitate their work and improve the presentation of educational material. Respondents noted that digital tools such as video lessons, interactive maps, and presentations make it easier to prepare lessons and organize the educational process more effectively.

Table 1. Results of the qualitative analysis: codes and categories for the block of questions "Objectives of Using Digital Technologies in the Educational Process"

Encodings	Examples of statements
	Category: Material and technical aspects
Work facilitation	automation of work; saving time; simplifying lesson preparation and implementation
Digital tools	practice tests; video tutorials; additional information sources; data storage; report generation
Technologies	presentations; interactive maps; simplification of creating multiple task versions and conducting experiments
	Category: Educational Aspect
Quality of education	improving quality; better perception of material; improved learning outcomes; enhancing the learning process
Digital tools	monitoring; diagnostics; faster testing; consolidation of material
Visualization	visualizing new material; demonstrating complex phenomena; preparing colorful visual aids and handouts
Practice	hands-on practice; developing practical skills; conducting experiments
Diversity	diversifying lessons; making classes interactive and engaging; introducing new activities and quizzes
Lesson/training	facilitating the learning process during lessons; easier preparation; making lessons more interesting
	Category: Transformation
Accessibility	making learning more accessible for modern students; presenting material clearly and conveniently
Work facilitation	saving time; simplifying classroom processes; reducing teacher workload
Modernity	keeping up with current trends; ensuring modern and relevant teaching approaches
Effectiveness	improving efficiency in material assimilation; enhancing learning outcomes
	Category: Psychological aspect
Psycho-emotional development	improving students' attention and memory
Motivation	engaging students; making lessons more interesting; increasing motivation to learn
	Category: Actors
Teachers	simplifying teachers' work; speeding up lesson preparation; facilitating instructional tasks
Schoolchildren	improving students' understanding; providing more knowledge; making lessons more engaging and appealing

Source: Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025

The second category, Educational Aspect, highlights teachers' recognition of the role of digital tools in enhancing the quality of education. Respondents emphasized the value of visualization, demonstration of complex concepts, and diversification of classroom activities, which contribute to better understanding and retention of material.

The third category, Transformation Aspect, describes digital technologies as a means of modernizing the educational process. Teachers associated their use with improving the efficiency and accessibility of education, ensuring alignment with modern educational standards, and optimizing lesson preparation and delivery.

The fourth category, Psychological Aspect, focuses on the perceived impact of digitalization on students' psycho-emotional development and motivation. Teachers noted that digital tools make lessons more engaging, help sustain attention, and foster students' interest in learning.

The fifth category, Social Aspect, concerns the influence of digitalization on the main participants in the educational process – teachers and students. Respondents pointed out that digital technologies not only simplify teachers' work but also make lessons more interactive and appealing for students, thereby supporting a more dynamic and collaborative learning environment.

Overall, the goals of using digital technologies in teaching encompass material, technical, educational, transformational, psychological, and social dimensions of the learning process, reflecting a multifaceted perception of digitalization in professional practice.

B. Advantages of Using Digital Technologies in the Educational Process

The qualitative analysis of the block of questions on the advantages of using digital technologies (see Table 2) identified three main categories reflecting the benefits perceived by teachers.

Table 2. Results of the qualitative analysis: codes and categories for the block of questions "Advantages of Using Digital Technologies in the Educational Process"

Encodings	Examples of statements
	Category: Educational Aspect
Quality of education	improving the learning process; assimilating material quickly and efficiently
Competencies	fostering development; teaching organization and time management; contributing to the child's personal growth
Motivation	increased student interest; engaging and informative lessons; diversification of educational activities
Work facilitation	making the teacher's job easier; saving time and effort; fast and convenient processes
Lesson/training	simplifying the learning process for children; reducing teachers' preparation and checking time; improving lesson quality
	Category: Transformation
Accessibility	access to information; visual and engaging presentation of material; availability of large amounts of data, including outside the classroom
Modernity	modern approach; data can be saved and reused like notes in a notebook

Encodings	Examples of statements
Technologies	use anywhere; speeding up data processing; introduction of new technologies
Effectiveness	mobility; opportunity to work in any setting; quick knowledge testing; acceleration of processing
	Category: Actors
Teachers	facilitating teachers' work; saving teachers' time
Schoolchildren	restoring children's interest in school education; increasing engagement and understanding
	Other
Uncertainty	I don't know; I find it difficult to answer
Lack of benefits	none; it is just a tool
Perceived advantages	many advantages; only positive outcomes

Source: Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025

The first category, Educational Aspect, highlights teachers' perceptions of digital technologies as tools that improve the quality of education, foster the development of organizational skills, and make the learning process more engaging and diverse. Respondents also noted that digitalization facilitates teachers' work, making lesson preparation and delivery more efficient (e.g., "quick and convenient," "teaches organization").

The second category, Transformation Aspect, emphasizes the role of digital tools in enhancing accessibility to educational materials, enabling data storage and retrieval at convenient times, and accelerating processes related to information management and processing (e.g., "accelerating the processing process").

The third category, Actors, reflects the dual benefits of digitalization for both teachers and students. For teachers, digital technologies simplify lesson preparation and classroom management, while for students, they increase engagement, motivation, and interest in learning (e.g., "to bring back children's interest in school education").

Overall, the benefits of using digital technologies encompass educational, transformational, and social dimensions of the learning process.

C. Disadvantages of Using Digital Technologies in the Educational Process

The qualitative analysis of the block of questions on the disadvantages of using digital technologies (see Table 3) revealed four main categories reflecting the challenges and limitations perceived by teachers.

The first category, Health-Saving Technologies, highlights teachers' concerns about the negative impact of digital tools on students' health, particularly eye strain, poor posture, and reduced attention span (e.g., "eye strain").

The second category, Material and Technical Aspect, reflects issues related to limited access to digital tools due to their high cost, as well as frequent hardware and software malfunctions that interrupt or delay lessons (e.g., "system glitches").

The third category, Educational Aspect, emphasizes that the use of digital technologies can sometimes reduce the overall effectiveness of the learning process. Teachers noted that digital tools often require additional time for setup and familiarization, which can lower

Table 3. Results of the qualitative analysis: codes and categories for the block of questions "Disadvantages of Using Digital Technologies in the Educational Process"

Encodings	Examples of statements
	Category: Health-Saving Technologies
Health	strain on the eyes; harmful primarily for vision and posture; affects the development of students' attention
	Category: Material and technical aspects
Availability	paid tools; expensive equipment
Digital tools	advertising-related content
Technologies	lack of equipment and specialized programs; system failures and technical problems take up classroom time
	Category: Educational Aspect
Effectiveness	time wasted on setup; extensive time spent figuring things out independently; decreased student productivity
Transformation	overreliance on frontal teaching; lack of differentiated approaches; reduction in collaborative and group activities
Competencies	insufficient knowledge; lack of information with increasing technological complexity
	Category: Psychological aspect
Psycho-emotional development	decreased student comprehension; reduced reading; diminished live dialogue
Motivation	partial student engagement
Effectiveness	overuse risks; phone and applications overloaded; need for moderation; some resistance to adoption

Source: Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025

productivity. The predominance of frontal instruction limits opportunities for group and collaborative learning, while insufficient digital competence among both teachers and students complicates effective use of technology (e.g., "less productivity of students").

The fourth category, Psychological Aspect, captures teachers' concerns about changes in students' cognitive and emotional development. Respondents observed that children are becoming less capable of processing information deeply, losing interest in reading, and engaging less in live communication. Oversaturation with digital content can also reduce motivation and overall engagement in the learning process (e.g., "children stop reading").

Overall, the disadvantages identified encompass health-related, technical, educational, and psychological dimensions of the digitalization process in education.

D. Expectations Regarding the Use of Digital Technologies in the Educational Process

By analyzing the responses to the block of questions about teachers' expectations regarding the use of digital technologies in the educational process, five categories were identified (Table 4). In particular, expectations within the Actors category are clearly differentiated between teachers and students. Teachers expect their work to become easier through the automation of routine tasks (including the reduction of bureaucratic workload), as well

Table 4. Results of the qualitative analysis: codes and categories for the block of questions "Expectations from the Use of Digital Technologies in the Educational Process"

Encodings	Examples of statements
	Category: Actors
Teachers	introduction of digital technologies into knowledge transfer; use of gamification in assessment and monitoring; facilitation of teachers' work
Schoolchildren	increasing students' interest in learning; these technologies represent the future and will enhance engagement
	Category: Educational Aspect
Competencies	need to know how to use digital tools; improving digital literacy among teachers and students; viewing digitalization as advantageous; teacher as mentor and system administrator
Motivation	increasing students' motivation; facilitating mastery of material
Quality of education	broader and improved education; digital tools make lessons more effective; enhancing learning outcomes
	Category: Positive Expectations
Accessibility	digital educational resource make teachers' work easier; improved accessibility of materials
Optimism	expansion, grand scale, positive outlook; aiming for the best outcomes
Work facilitation	ease of work; reduced bureaucratic workload in completing forms
	Category: Resistance to Digitalization
Uncertainty	I don't know; I haven't thought about it; no specific expectations
Negative perceptions	teachers overloaded with paperwork; education at a standstill; emergence of negativity
Modernity	inevitable development; need to keep up with the times; interesting and necessary
	Category: Transformation
Systemic transformation	moving away from notebooks and textbooks; automation of some educational areas; integration of artificial intelligence
Modernization	expansion; development of new visual features; overall improvement and advancement
Technologies	robot teachers may appear; system improvement expected; hope AI* will power education; holographic visualization of mobile objects

Source: Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025. *Note:* * Artificial intelligence

as through the possibility of using new teaching methods (e.g., gamification, digital educational resources[1]) and improving the knowledge transfer process. With regard to students, teachers associate digitalization with increased interest in learning and view it as an opportunity for personal and academic growth.

1 Digital educational resource.

Within the Educational Aspect category, the focus is on developing competencies (enhancing digital literacy among both teachers and students), fostering motivation, and improving the overall quality of education (expanding opportunities and enhancing learning outcomes). The "Transformation" category reflects expectations of profound changes – both positive and negative – in the educational process, such as the shift from traditional to digital methods (abandonment of notebooks and textbooks), automation of certain tasks, and the integration of artificial intelligence and emerging technologies (robot teachers, holographic visualization).

Overall, teachers' expectations are predominantly optimistic ("set for the best results"), yet they also reveal elements of uncertainty and skepticism regarding the future of digitalization, stemming from concerns about an increased bureaucratic burden and a possible decline in educational quality ("education is heading towards a dead end"). Thus, the findings indicate a complex and ambivalent attitude of teachers toward digitalization – one that combines positive expectations of improving the educational process with apprehensions about potential negative outcomes. The dominant trend is the perception of digitalization as a powerful transformational process capable of fundamentally reshaping the educational landscape and requiring adaptation from all actors within the education system.

E. Using Digital Technologies in the Educational Process in the Future.

The first category, Material and Technical Aspects, highlights the need to increase funding for educational institutions, enabling schools to subscribe to high-quality educational platforms and improve their facilities ("raise the level of the school's facilities"). Respondents emphasized the importance of access to unified software, high-speed internet, and well-equipped workspaces. Additionally, they pointed to the necessity of establishing school-based technical support centers and training senior teachers in digital skills. The potential for actively using modern digital tools, such as artificial intelligence, neural networks, and various educational platforms, was also recognized.

The second category, Training and Practice, focuses on the importance of advanced professional development. Respondents suggested organizing specialized training courses, for example, for working with children with disabilities, while avoiding a purely formal approach ("lecturing from the Internet"). They emphasized the need for practical experience – more hands-on courses and regular practice sessions that allow teachers to apply digital technologies effectively in real teaching situations.

The third category, Transformation, reflects the focus on improving the availability of educational platforms and alternative learning options. Respondents underlined the importance of reducing teachers' administrative workload and recognizing that digital technologies should be seen as tools to support, not replace, educators. They also stressed the need for well-developed methodological guidance for integrating technologies, while maintaining teacher autonomy in deciding when and how to use digital tools.

The fourth category, Social Skills, emphasizes the psycho-emotional and communicative dimensions of digitalization. Respondents noted the importance of engaging all participants in the educational process in interactive dialogue and strengthening collaboration between teachers and parents. Developing teachers' professional competencies through high-quality training and fostering students' interest and motivation in digital learning were also seen as priorities.

The fifth category, Actors, concerns the impact of digital technologies on various participants in the educational process. Respondents mentioned both parents ("interaction with teachers") and students ("digital literacy courses," "increased interest in learning"). Some

Table 5. Results of the qualitative analysis: codes and categories for the block of questions "Using Digital Technologies in the Educational Process in the Future"

Encodings	Examples of statements, quotes
Category: Material and Technical Aspects	
Availability	funding; improving schools' material resources; allocating funds so that schools can subscribe to high-quality educational platforms
Equipment	accessible and unified software; sufficient internet speed; well-equipped workspaces
Technologies	ongoing technical support; clear instructions; school-based technical support centers; training senior teachers in digital skills
Digital tools	AI, neural networks, and various educational platforms in the classroom
Category: Digital Competencies	
Advanced training	timely professional development; specialized courses for specific areas (e.g., classes with disabilities*); conferences; advanced training beyond reading online lectures
Practice	increased hands-on practice; practical courses of at least 2–3 months; accumulating more experience
Category: Transformation	
Accessibility	more accessible platforms; quality offline training; availability of alternative options
Work facilitation	reducing unnecessary reporting; understanding digital tools as aids, not substitutes for teachers
Effectiveness	teachers should use software as needed; lack of detailed methodology for integrating technologies; teachers must determine independently whether to use digital tools
Category: Social Skills	
Psycho-emotional development	engaging all participants of the EO** in interactive dialogue; facilitating collaboration between teachers and parents
Competencies	better-trained teachers; increased knowledge and skills
Motivation	demonstrating the advantages of digital tools; enhancing student interest and understanding
Category: Actors	
Parents	collaboration between teachers and parents I don't know, I find it difficult to answer
Schoolchildren	digital literacy courses for students; fostering student interest and understanding nothing additional needed; I can manage with current resources
Other	
Uncertainty about improvement	I don't know, I find it difficult to answer
Lack of drive for improvement	nothing additional needed; I can manage with current resources

Source: Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025. *Note:* * Disabilities, ** Educational organization.

teachers, however, expressed uncertainty about potential improvements or felt that further technological development was unnecessary, noting the existing challenges of adapting to current changes.

Overall, the future use of digital technologies in education encompasses material, educational, transformational, and social aspects, reflecting the complex and multifaceted nature of digitalization in schools.

All aspects of the question blocks were grouped into macro-categories, including Transformation, Material and Technical Aspect, Educational Aspect, and Psychological Aspect. The results are presented in Figure 2, which also displays the most common categories and code frequencies. For clarity, macro-categories are arranged in descending order of frequency.

The macro-category Other was excluded from the figure, as it contained isolated, disparate teacher responses that could not be systematized and would have complicated the visualization. Additionally, the macro-categories Actors and Health-Saving Technologies were omitted because they were described in detail in the preceding results and primarily reflect the frequency of terms such as "teachers," "schoolchildren," "parents," and "health" across different question blocks. Including these categories in a generalized figure was deemed inappropriate, as it would not accurately convey the relationships between actors and the specific thematic groups under study.

Figure 2 clearly illustrates the focus of teachers' attention regarding the digitalization of education. The most frequently mentioned macro-category is Transformation, which appears 256 times in the dataset. This macro-category encompasses categories such as Positive Expectations of Teachers, Advantages of Digitalization, and Improvements Due to Digitalization of Education.

The next most frequent macro-category is the Educational Aspect, appearing 238 times in teachers' responses. It includes categories such as Goals of Digitalization, Benefits of Digitalization, Improvements Due to Digitalization, and Expectations. This block also incorporates the Disadvantages category, highlighting teachers' needs for mastering new technologies, improving digital competence and literacy (both their own and that of colleagues), concerns about the rapid pace of digitalization, and apprehension regarding the transformation of the educational process.

The Material and Technical Aspect appears 117 times and reflects improvements associated with digitalization, including the use of digital tools, acquisition of new competencies, and increased student motivation through greater diversity in lesson materials. At the same time, it also highlights challenges, such as insufficient classroom equipment, limited access to digital technologies and platforms, inadequate professional development courses, and a lack of IT support within schools.

The Psychological Aspect appears 74 times across goals, expectations, shortcomings, and improvements. Teachers' opinions on the impact of digitalization on students' psycho-emotional well-being and attention are mixed. Many respondents believe that increased visibility, diverse ways of presenting materials, and a more personalized approach enhance the quality of education, boost student motivation, improve attention, and support academic performance. However, a subset of educators view digitalization as imposing a considerable cognitive and psychological burden on participants in the educational process. Reported concerns include fragmented thinking, reduced attention spans, eye strain due to high information load, and diminished interpersonal communication among students and teachers.

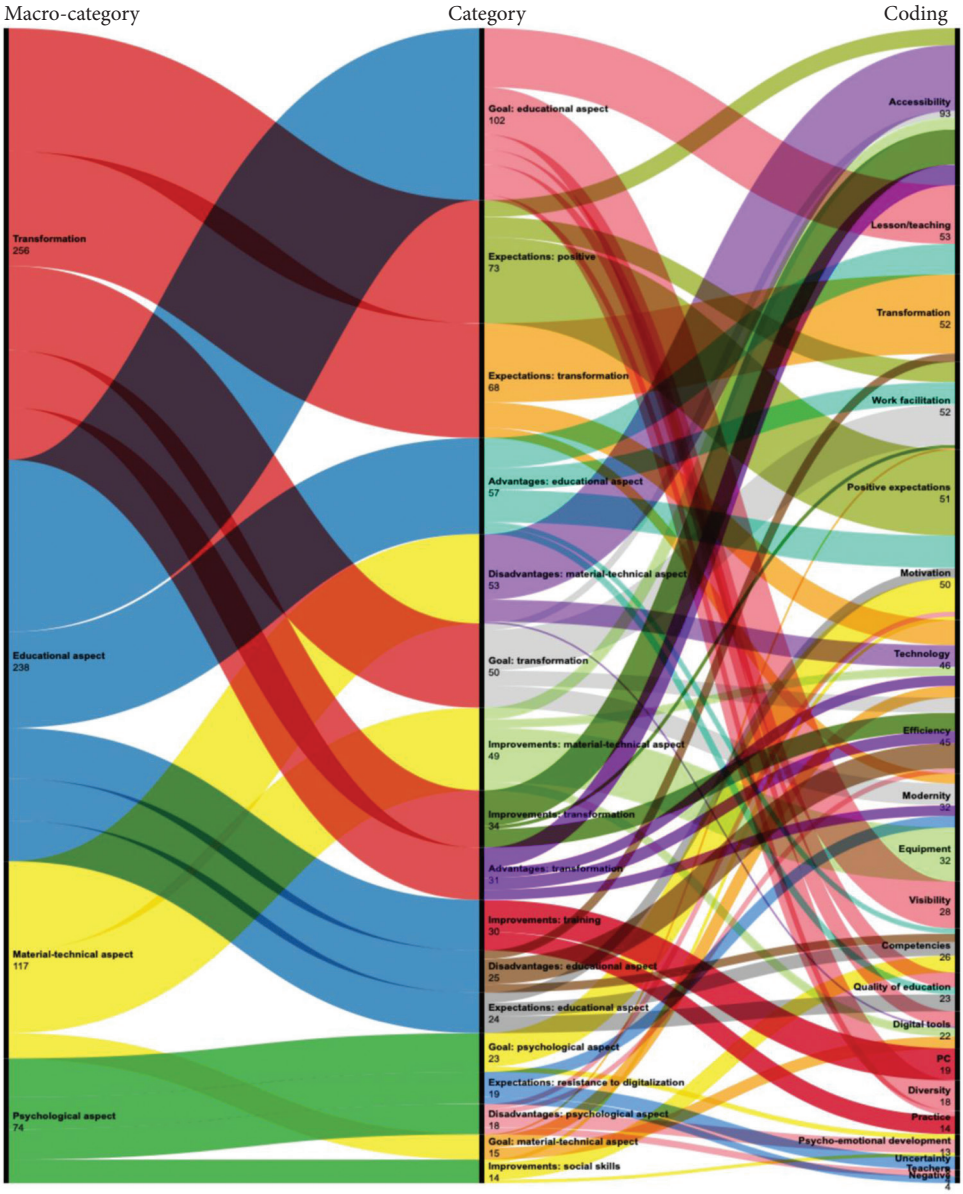

Figure 2. Summary alluvial diagram illustrating the results of a phenomenological analysis of teachers' attitudes toward digitalization in education. *Source:* Socio-psychological study of Russian teachers' attitudes toward digitalization in education, 2025.

Discussion and Conclusions

The rapid and widespread digitalization of the school education system – often occurring under conditions of external pressure and without adequate preparation (Timotheou et al. 2023; Raave et al. 2024) – has brought to the forefront not only the role of digital technologies in the educational process but also the attitudes of various educational actors, particularly school teachers, toward these transformations. Much of the existing research on educational digitalization is largely theoretical and often framed within a philosophical context. Empirical studies (Bryksina et al. 2024; Kulikova 2024) tend to rely predominantly on quantitative assessments. In contrast, the qualitative methods employed in our study enable a deeper exploration of more nuanced phenomena, such as teachers' attitudes toward digitalization. Based on the results of a qualitative analysis of teachers from various regions of Russia, we identified the key aspects of educational digitalization that are most salient and concerning to teachers.

An analysis of Russian teachers' attitudes toward the digitalization of education revealed the predominance of the following macro-categories: Transformation, Material and Technical Aspect, Educational Aspect, and Psychological Aspect. The most prominent macro-category is Transformation, reflecting teachers' perception of digitalization as a dynamic, transformative process that is reshaping the educational landscape. Despite the fact that digitalization has been underway for some time and state policy aims to create and maintain a digital educational environment (Order of the Government ... 2023), teachers appear to focus more on the ongoing and prospective nature of this process rather than on outcomes already achieved.

Digitalization is thus seen not as a static factor but as a continuous process of development and transformation, presenting both opportunities and challenges. This perspective explains the emphasis on the future, inevitable change, and the need to adapt to evolving technologies and teaching methods, rather than on the expectation that teachers should lead educational transformation. It also underscores the importance of continuous professional development, not only in terms of technical skills but also in adapting to rapidly changing digital educational environments.

At the same time, teachers are not always psychologically prepared for these transformations, as reflected in both passive and active resistance to the use of digital technologies in teaching (Psychological Aspect). The findings highlight the polyvalent nature of teachers' attitudes toward digitalization, indicating that the transformation of education is incomplete and ongoing. Many teachers still perceive the educational process as feasible without digitalization, demonstrating a lack of awareness that digital technologies are becoming an integral component of modern education. The heterogeneity of teachers' readiness and the psychological unpreparedness of the teaching community reflect key barriers to the full digital transformation of the educational system.

One of the leading macro-categories identified in our study was the Educational Aspect, which reflects the perceived advantages, disadvantages, and primary changes in education associated with increasing digitalization. Consistent with previous studies (Kolykhmatov 2020; Wohlfart and Wagner 2023), our findings highlight the key role of digitalization in facilitating teachers' work and enhancing both the accessibility and quality of education. Achieving a balance between the use of technology and traditional teaching methods is crucial for creating an effective learning environment.

Contrary to some respondents' concerns, the near future does not suggest that teachers will be replaced by robots. Clarification of modern trends in the role of digital technologies should emphasize blended or hybrid learning models, which integrate online resources

into traditional classroom instruction (Kozlov et al. 2022). This approach allows educators to harness technology for interactive elements while maintaining engagement and personal connection with students.

At the same time, some educators expressed concerns about the potential dehumanization of the educational process, fearing that technology could replace live teacher-student interaction. These concerns align with findings from other Russian studies, which identify the decreasing importance of communication in the classroom as a key challenge of educational digitalization (Strokov 2020).

In line with previous studies (Kozlov et al. 2022; Starichenko 2020), our findings indicate that, overall, teachers respond positively to the digitalization of education. They generally do not expect it to cause radical changes in their work, but rather view digital tools as supplementary aids for lesson preparation, instruction, and report compilation. Many teachers also recognize benefits for students, including increased engagement in lessons, easier comprehension of material, and improved productivity through new methods of monitoring and assessing knowledge.

These results can be attributed to factors such as the lack of a fully supportive environment for teachers, the rapid pace of digitalization, and the varying readiness of school teachers to embrace change. Our findings complement existing research on the role of educational digitalization from the teachers' perspective (Lidak 2024; Strokov 2020), while also contributing scientific novelty. Positive outcomes are most likely to occur in schools that are well-equipped with the necessary technology, provide access to specialists who can support teachers in mastering digital tools, and foster a positive attitude and psychological readiness to adopt digitalization. In such contexts, digitalization can facilitate teachers' work, enhance student motivation and attention, and ultimately improve both the accessibility and quality of education.

The findings of this study have practical implications for teachers, school administrators, and professional development organizations, as they help identify and develop mechanisms that both facilitate the integration of digital technologies in schools and support educators by enhancing their digital competencies.

Although the sample included teachers from various regions of Russia, the cross-regional generalizability of the findings was not addressed in this study. Future research should examine teachers' attitudes toward educational digitalization while considering sociodemographic characteristics, school status, and internal conditions such as material and technical resources, organizational structure, administrative support, and opportunities for professional development. Such studies would allow for the identification of key trends and challenges in the professional environment and support the formulation of effective educational policies and teacher support programs.

Conclusion

Teachers, as key agents of change in the classroom, play a central role in the successful integration of digital technologies. Their attitudes, beliefs, and practices are crucial in shaping how technology is adopted and utilized within educational institutions. Understanding not only the methods of technology integration but also the underlying motivation and pedagogical competencies of teachers is essential for creating conditions conducive to innovative teaching methods and for designing professional development programs that address the real needs and challenges faced by modern schools.

The study identified key areas of teacher activity that are influenced by the digitalization of education. The findings indicate that the future of education in a digital world depends not only on technological innovations but also on the creation of supportive conditions for teachers. This includes improving school infrastructure, providing tailored professional development programs to enhance digital literacy, and reducing stress associated with technology adoption. Attention must also be given to teachers' attitudes toward ongoing transformation processes, which remain unfinished. Continuous methodological, technical, and administrative support is necessary to foster a positive psychological environment, minimize resistance, and ensure the effective implementation of digital technologies in education.

Some teachers acknowledged the health-promoting aspect in the context of the digital transformation of education; however, their focus was primarily on the health and well-being of students, with less attention given to potential challenges for teachers themselves. This highlights a direction for future research aimed at a more in-depth study of teachers' quality of life in the context of educational digitalization.

To comprehensively understand teachers' attitudes toward digitalization, future studies should examine not only the implementation of new tools but also how the educational experience can be rethought and transformed. Individual characteristics and personal dispositions of teachers should be considered, as these factors influence the development of positive attitudes toward innovation.

Given the rapid pace of digitalization and evolving educational demands, creating a more engaging, interactive, and student-centered learning environment remains a priority. Strategic initiatives in educational digitalization should focus on removing barriers and fostering positive attitudes toward digital technologies among teachers. Such an approach is essential for ensuring the successful, sustainable integration of technology, improving educational outcomes, and creating a higher-quality learning environment for all stakeholders.

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Information about the author

- Ekaterina Valerevna Bushina – PhD in Psychology, Associate Professor, Lead Research Fellow, Center for Sociocultural Research, Faculty of Social Sciences, Department of Psychology, National Research University Higher School of Economics, Moscow, 101000, Russia. E-mail: evbushina@hse.ru
- Azkhariya Mukhamadovna Karimova – Junior Research Fellow, Center for Sociocultural Research, lecturer, Faculty of Social Sciences, Department of Psychology, National Research University Higher School of Economics, Moscow, 101000, Russia. E-mail: amuminova@hse.ru
- Aleksandra Pavlovna Fakhretdinova – PhD in Pedagogical Sciences, Associate Professor, Institute of Education, National Research Tomsk state University, Tomsk, 634050, Russia, E-mail: fakhretdinova@mail.tsu.ru