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Sustainable AI in Education: Innovations for Equitable and Ethical Learning Futures

Sergey Barykin[1*], Murat Akramovich Ikramov[2], Nilufar Muratovna Nabiyeva[3]

[1]Graduate School of Service and Trade, 19525, Peter the Great St. Petersburg Polytechnic University, 195251 St. Petersburg, Russian Federation

[2]Marketing department, Tashkent State Economic University, I. Karimov Str., 49, 100066, Tashkent, Republic of Uzbekistan

[3]Department of Economics, Kokand University, Kokand, Uzbekistan, Republic of Uzbekistan

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Corresponding author: Sergey Barykin

sbe@list.ru

ORCID: 0000-0002-9048-009X

ABSTRACT

The global education system is reshaped by the fast growing artificial intelligence (AI), Russia has become a significant place where the hopes of technological innovation meet the demands of equity, sustainability, ethical governance. This study examines the conceptualization of sustainable AI and its implementation in Russian schools and universities. Based on the qualitative interviews, document analysis, and thematic analysis, the research examines the interpretations of sustainability in AI-mediated education among educators, policymakers, and technology developers and its implications on educational practices and institutional decisions. The results show that the stakeholders in the existing study understand sustainable AI not only as an environmental friendly technology, but as a system-wide view of sustainable development, which emphasizes long-term availability, fairness, transparency, and educational incentive. This translation corresponds to the known models of sustainable and ethical AI literature (van Wynsberghe, 2021; Rohde et al., 2023; Khan et al., 2025). The participants recognized the opportunities related to the AI implementation, such as increased personalization of learning, fewer administrative tasks, as well as increased support of inclusive learning. Nevertheless, they equally highlighted the persistent challenges including unequal accesses between urban and rural institutions, lack of algorithmic disclosure, reliance on overseas technologies, and the possibility of social inequalities. The study also reveals that the sustainable introduction of AI in Russian educational environment needs a combined sociotechnical approach that would help to synchronize the national strategy of digitalization with the local institutional conditions,, educator preparedness, and the effective system of ethical governance. Based on qualitative findings the study proposes a context-dependent framework of sustainable AI integration based on human-AI cooperation, localized innovation, and constant assessment of equity outcomes. The study contributed to global discourse on responsible AI in education while emphasizes on the essence of ethically conscious and socially responsible AI adoption.

Keywords: Sustainable Artificial Intelligence, Ethical Educational Technologies, Equitable Learning Systems, AI Governance in Russian Education, Inclusive Digital Pedagogy

1 INTRODUCTION

The 21st-century educational landscape is under the influence of transformative change known as Artificial Intelligence Education, driven by the integration of AI into educational institutions (Prajapati, 2024). AI has the potential to transform the way we learn and educate by making education more personalized, engaging, and efficient (Chen & Chen, 2020; Qu et al., 2022). In recent years, individuals began to speak not about adoption but about sustainability and pay attention to such points as socio-technical resilience, ethical governance, equity, and energy efficiency (Sywelem, 2024; Penev et al., 2024). Researchers from around the world believe that the development of sustainable AI must give serious consideration to the challenges of equity, openness, sustainability, and humane design, meaning that algorithmic infrastructures should empower learners rather than marginalize them (Yang et al., 2021; Kizilcec & Lee, 2022). The development of AI-based educational systems, adaptive tutors, and data-driven decision support has been scaled up in Russia in particular, due to federal priorities in the field of digital transformation and national strategies of technological sovereignty (Almazova et al, 2020). However, it remains a challenge to ensure that AI technologies can support sustainable and fair learning. The multi-faceted challenges faced by the researchers in developing AI-enhanced education are not only the socioeconomic inequalities but also disparities in the digital infrastructure and unequal quality of teacher training (Kostyaev, 2024). Past research suggests that when the training data are characterized by structural inequalities, social biases might be unwittingly replicated by the algorithmic decision-making systems (Zawacki-Richter et al., 2019; Chinta et al., 2024). The same issue has been brought up in the Russian education sector, where the privacy of student data and the transparency in the AI-enhanced learning environments have been questioned (Jose, 2024). Similarly, the research studies highlighted that the practice of algorithmic decision-making can promote social biases without being designed to maintain them, especially when such training data reflects structural inequalities (Lazăr et al., 2024).

The accelerating growth of learning analytics and predictive monitoring instruments has further escalated discussions on the issues of authorization of data, student privacy, and the boundary of moral conduct of surveillance and education (Itani et al., 2025). The studies also highlighted the importance of sustainability within the framework of AI implementation, such as environmental sustainability, energy-aware computing, and system resilience over time (Lin et al., 2023). Also, inclusiveness is one of the key issues. Studies show that AI deployment should be fair, so the targeted policies to underserved areas, a culturally responsive algorithm development, and multilingual AI interfaces should be implemented to support the multilingual context of Russia (Bojorquez & Martínez, 2023).

Digital competence and AI have transformed from a positive skill to a vital professional standard for educators. With the introduction of AI technologies in schools, educators cannot just use digital tools but also implement them pedagogically to improve students' motivation, engagement, and learning (European Commission, 2018). Ethical practices and sustainability in the classroom are also determined by their digital literacy and AI competence (Ng et al, 2023; Zhang , 2025). This has resulted in sustainable AI in Russian education becoming one of the primary research directions, connecting technological innovation, ethical responsibility, and social equity (Arbulú Ballesteros et al., 2024). Due to the need to design learning futures that are not technologically advanced only and inclusive, transparent, and environmentally conscious, it is important to understand how these forces interact to make such designs. Since Russia

continues to adopt AI in its educational settings, it must adopt a sustainability-focused strategy so that technological development benefits society in the long term.

1.1 Theoretical Framework

The study is based on three interconnected perspectives, including: (1) theory of sustainable AI, (2) equitable and ethical AI in education, and (3) theory of sociotechnical systems. Combinely, these perspectives offer a theoretical prism through which one can perceive the way in which the Russian educational institutions are planning and introducing AI technologies with a long-term focus on innovation and social responsibility.

1.1.1 Sustainable AI Theory

The theory of sustainable AI focuses on the responsible development of AI through long-term, resource-sensitive methods. Recent studies define sustainable AI as involving ecological sustainability, socio-economic equality, ethical governance, and human-centered design (Floridi, 2021; Owe and Baum, 2021). Within the educational context, sustainability requires the alignment of AI tools with learning objectives, institutional resources, and the welfare of learners and educators. Sustainable AI enables a balanced development of high-speed technological advancement and ethical values in Russia, where education modernization is directly associated with national development policies, fair access to geographically dispersed areas, reducing the impact of the algorithms, and fostering long-term stability in technologies (Holmes et al., 2021). The concept of sustainable AI theory is based on transparency, accountability, and continuity in the evaluation of societal outcomes (Atianashie, et al., 2025).

1.1.2 Theory of Equitable and Ethical AI in Education

The second theoretical pillar is associated with the ethical and equity considerations in AI education. The equity models emphasize the importance of AI in minimizing educational gaps (Akgun & Greenhow, 2021). In the past, there were differences in educational opportunities in rural and urban areas in Russia, and it is essential to adopt AI properly. Another factor that affects the successful adoption of AI tools is the differences in digital literacy, local infrastructure, and socioeconomic background (Mumtaz et al., 2025). The ethical issues overlap with the regulations on data protection and national digitalization strategies, which influence the AI implementation practices (Radanliev, 2025).

1.1.3 Sociotechnical Systems Theory

The Sociotechnical Systems theory identifies various dimensions of a system, including subsystems, and focuses on the interplay between social and technical elements (Oosthuizen & Pretorius, 2016). Technology is viewed as a component of an evolving system of individuals, procedures, organizations, and cultural standards. This approach comes in handy, especially when examining the use of AI in the Russian education sector, because it can be used to see how human, technical, and organizational factors interact. Infrastructure alone is not sufficient to implement AI effectively; educators should also be trained in it, the institution must be ready, the policy should be well coordinated, and cultural acceptance should be ensured (Fraillon et al., 2020). The resources and capabilities of Russian schools are unequal, and a sociotechnical perspective is necessary to explain diverse AI integration patterns (Wang et al., 2024). Strong AI innovation is based on good coordination between technology and employees, and systems should be flexible, open, and morally accountable (Kudina & van de Poel, 2024).

1.1.4 Integration of the Frameworks

Combining sustainable AI, equitable and ethical AI in education, and sociotechnical theory provides a comprehensive framework to understand AI in Russian education.

To begin with, the theory of sustainable AI informs the evaluation of the viability, equity, and long-term environmental concerns. Second, equitable and ethical-equity views focus on equity, openness, accessibility and guardianship of student rights. Third, the sociotechnical theory places AI in the institutional practices, cultural norms, and regulatory systems.

Collectively, these structures underscore the conceptualization of sustainable AI as a social and technical process and not a technological result, placing value on considerate policy, ethical administration, and human-focused interaction.

1.2 Research Objectives

The current research study aimed to:

- Understand the conceptualizations of Russian educators, policymakers and developers of sustainable AI in education.
- Determine the opportunities and challenges perceived regarding the adoption of AI in Russian schools and universities.
- Analyze the role of sustainability, equity and ethical considerations in AI implementation practices.
- Develop a model for sustainable and fair AI integration based on the Russian educational context**.**
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2. LITERATURE REVIEW

AI in education has received significant attention worldwide, largely due to its potential to improve the learning process, individualize instruction, and enhance administrative efficiency. In Russia, increasing investment in AI is an indicator of national ambition and a broader understanding of the strategic value of digital transformation. The literature review explores recent research on AI in education, with particular attention to sustainability, ethics, and equity in the Russian context.

2.1 AI in Russian Education

In Russian schools and universities, the early stages of AI integration in higher education have focused on improving educational processes through automated and personalized assessment feedback tools, making content student-centered, and real-time support tutoring systems. The widespread integration of AI in Russian educational systems is due to the federal efforts to support the modernization of digital infrastructure. Nowadays, more and more Russian educational centers acknowledge the benefits of AI use in their activities (Lipchanskaya & Balashova, 2021; Davydov et al., 2024). The application of intelligent tutoring systems, adaptive platforms and automated assessment tools is becoming a more prevalent method of encouraging instruction, particularly in Science, Technology, Engineering, and Mathematics (STEM) subjects. Research has revealed that AI-driven platforms can improve student learning and engagement with the content, as well as provide feedback (Bradáč & Kostolányová, 2017).

The largest cities, like Moscow, Saint Petersburg, and Kazan, have been on the leading edge of AI integration and applied learning analytics, plagiarism detection applications, and student support predictive models in universities, however, the existence of geographical differences remains. Connectivity, teacher training, and digital literacy in regions such as Siberia and the Far East can be problematic, raising concerns about unequal access to AI-based opportunities (Chernova et al., 2019).

2.2 Sustainability and Ethical AI

Sustainable AI is focused on long-term, anthropocentric, and ethically-oriented technological growth. Researchers proposed that AI systems should be designed to be transparent, explainable, and accountable to reduce the risk of algorithmic bias and misuse (Yang et al., 2021). Sustainability, in the Russian context is also associated with digital sovereignty, such as dependence on the local AI models and infrastructure (Roberts et al., 2023).

Algorithmic bias, student surveillance, and lack of transparency in the decision-making process are some of the risks highlighted by the research studies in Russia (Mumtaz et al., 2025). Tools based on AI and used specifically for remote proctoring during the COVID-19 pandemic became the subject of controversy, with concerns about privacy, consent, and psychological effects. Researchers also stress that ethical principles and national standards to control the implementation of AI in educational institutions (Radanliev, 2025).

2.3 Equity and Access

The major issue with sustainable AI adoption is equity. Digital divide in Russia leads to disparities in access to the internet, school funding, and socio-economic inequalities, which define the way students can use AI-driven learning tools (Emtsov, 2025). Some rural schools lack stable internet access or up-to-date devices, which means AI technologies are often ineffective and can further increase disparities in schooling (Gladkova & Ragnedda, 2022; Turwelis et al., 2022).

The research studies proposed that the *i*ntroduction of AI under equal conditions *requires* substantial investments in infrastructure, extensive training, considerations of ethical and cultural standards, and ongoing state support, especially in rural areas *(*Sergeeva et al., 2025; Cathrin & Wikandaru, 2023; Barnes & Hutson, 2024). In the absence of these, there is a greater chance that AI will benefit pupils in the well-resourced places, at the cost of the sustainability goals.

2.4 Teacher Preparation and Effectiveness

The skills, attitudes, and confidence of educators are significant in the successful implementation of AI. According to Russian studies, the situation is unclear: on the one hand, some educators are eager to use AI-based tools; on the other hand, some are afraid of losing their professional autonomy because they are not well trained (Moura & Carvalho, 2024). Courses on digital pedagogy have gradually become part of the teacher education curriculum, but training on AI is unevenly distributed among institutions.

According to scholars, sustainable AI involves empowering educators to be critical of technology, not merely of the tools developed (Shardey et al., 2025). Ethical awareness, data literacy, and knowledge of AI limitations should also be addressed as a part of professional development (Tan et al., 2024).

2.5 AI Governance and Regulation

In AI governance and regulation, the development of digital humans is governed by government-set laws that establish clear rules and standards for the application of such emerging technology (Mouta et al., 2024). Russia has also come up with multiple national AI governance approaches such as the Federal AI Strategy, 2021 and the digital education modernization plan. These policies underline the necessity of ethical, transparent, and secure AI systems; nevertheless, implementation differs significantly in different regions (Center for Security and Emerging Technology, 2019).

Researchers note that there is a discrepancy between the high-level policy aspirations and the institutional implementation. Although national guidelines are available, not all schools have specific algorithm transparency, student consent, and responsible data use protocols (Penev et al., 2024; Nguyen et al., 2023).

2.6 Gaps in the Literature

Despite the growing interest in sustainable AI in the Russian educational system, the research on this topic is scarce. Current literature is inclined to be either overly specific, discussing the benefits of technology, or overly narrow, addressing single issues in teacher training or privacy. There are not many studies that take an integrated view of sustainability, ethics, equity, and sociotechnical dynamics. This research study is an attempt to fill this gap by providing an in-depth study of the sustainability of AI in Russian educational settings through qualitative findings.

3. METHODOLOGY

3.1 Research Design

The current study employed a qualitative research design to understand how sustainable AI in education is conceptualized by Russian educators, policymakers, and AI developers. The qualitative methodology was selected because it provides a detailed overview of participants' experiences, perceptions, and realities. The qualitative research design is appropriate when studying complex and socially embedded technologies like AI (McLeod et al., 2021). Moreover, the study was informed by an interpretivist paradigm, which recognizes that meanings related to sustainable AI are socially constructed contexts dependent. The main data collection techniques were semi-structured interviews and document analysis, aimed at obtaining deep, descriptive information on how sustainability, ethics, and equity are perceived and implemented in Russian educational settings. .

3.2 Sampling and Participants

Purposive sampling was used to select the study participants. The purposive sampling technique is appropriate for obtaining information from participants with experience in AI utilization and for capturing rich, detailed, and contextually relevant information about the implementation of sustainable AI in Russian educational settings (Palinkas et al., 2015; Ahmad & Wilkins, 2025).

Data was collected from 48 respondents, including 18 teachers from urban and rural schools, 12 administrators and university faculty members, 8 policymakers, and 10 AI developers in Russian EdTech companies. Table 1 gives a detailed demographic breakdown of the participants including region, institutional affiliation, gender, and working experience.

It was considered that a sample of 48 respondents would be sufficient to achieve data saturation, as the same themes and consistent insights were revealed across participant groups during the interviews (Guest et al., 2006; Hennink et al., 2017). The wide range of participants ensured thorough insight into sustainable AI practices, as it included perspectives from teaching, policy formulation, and technological development. Moreover, this diversity helped to triangulate the views, thus increasing the credibility and depth of the research results.

Table 1. Demographic Profile of the Participant

Category	Sub-category	Frequency (n)	Percentage (%)
Participant Role	Teachers	18	37.5
	Administrators & University Faculty	12	25.0
	Policymakers	8	16.8
	AI Developers (EdTech Companies)	10	20.7
Region	Urban	26	54.4
	Rural	22	45.6
Institution Type	Schools	18	37.4
	Universities	12	25.0
	Government/Policy Organizations	8	16.8
	Private EdTech Companies	10	20.8
Gender	Male	28	57.3
	Female	20	42.7
Experience Level	1–5 years	10	18.0
	6–10 years	16	35.3
	11–15 years	12	27.0
	16+ years	10	29.7

3.3 Data Collection

The semi-structured interviews were carried out with a predetermined interview guide, some of the questions in the sample were "how do you understand the concept of sustainable AI in the context of Russian education?," how do you perceive the ethical implications of AI in educational settings, and “are there specific practices you follow or recommend to make sure AI applications are fair and equitable to all students, please describe?, Could you explain what any specific AI tools or systems you use in your institution? And how well do you believe they enhance teaching and learning? What problems do you face with practicing AI in education (e.g., infrastructural, teacher readiness, policy), and are there already existing professional development programs to help with AI adoption?.

The data collection period took four months. The interviews lasted 45-75 minutes and were conducted in Russian or English, depending on the participant's preference. All the interviews were audio-recorded and transcribed. The translations were performed when required for analysis. The policy documents, institutional guidelines and reports on AI implementation in Russian educational institutions were included in document analysis. These documents provided contextual background and triangulated the interviews findings.

3.4 Data Analysis

To analyze the data using thematic analysis, the steps of familiarization, initial coding, theme development, review, definition, and reporting were followed (Braun and Clarke, 2019). An inductive approach to coding was employed, whereby codes were created directly based on the narrative of the participants as opposed to being created a priori. All transcripts of the interviews were transcribed verbatim and imported into qualitative data analysis software (e.g., NVivo 14), which was used to organize, manage, and systematically code the data. Preliminary line-by-line open coding was done to determine significant units of text.

These codes were then systematized by comparing and abstracting into larger groups through a process of comparison and abstraction. These categories were further narrowed down to candidate themes through the identification of patterns and relationships that occurred between codes.

Inter-coder agreement was obtained to increase the reliability of the analysis by having a second researcher code 20% of the transcripts. The discrepancies in coding were addressed and settled by a consensus and the coding framework was refined. A constant comparison method was used in the analysis to ensure uniformity of the analysis across the data set, and analytical reflexivity was upheld by systematic memo-writing in order to record coding choices and emergent interpretations. Peer debriefing and review sessions were conducted regularly to refine and validate the themes, ensuring internal coherence, distinctiveness, and depth of analysis.

The final analysis resulted in five overarching themes: (1) conceptualizing sustainable AI, (2) perceived AI benefits in education, (3) equity and access challenges, (4) ethical concerns, and (5) conditions for sustainable AI implementation. These themes emerged through iterative coding, categorization, and refinement processes, as described above.

3.5 Trustworthiness

The following measures were taken to enhance the trustworthiness

- Credibility was ensured through member checking with 12 participants.
- Thick descriptions provided context for transferability.
- Dependability was guaranteed through an audit trail of coding decisions.
- Conformability was enhanced through researcher reflexivity notes

3.6 Ethical Considerations

The study was performed while following these ethical standards. The researcher explained the objectives of the study before interviewing the respondents. Informed consent was obtained from the study participants prior to data collection. Data were anonymized to protect identities, and participants had the right to withdraw at any stage.

4. RESULTS AND DISCUSSION

4.1 Results

The findings demonstrate how stakeholders perceive sustainable AI and how these interpretations influence educational practice in Russia. The results are presented under five themes, including (1) conceptualizing sustainable AI, (2) perceived AI benefits in education, (3) equity and access challenges, (4) ethical concerns, and (5) conditions for sustainable AI implementation.

4.1.1 Conceptualizing Sustainable AI

The respondents reported different views about sustainable AI. According to some of the respondents, sustainable AI meant the technology that promotes long-term educational objectives without gratifying social, ethical, or pedagogical agendas. One teacher from a secondary school described Sustainable AI as follows: “Sustainable AI does not merely mean efficiency; it must assist students to learn more efficiently without replacing the instructor (Teacher, urban school). The others focused more on sustainability as a set of equity, accessibility, and data-use responsiveness. Some respondents emphasized that AI must not replace human teachers and should always align with current pedagogical practices. **“**Artificial intelligence must be used to support educators and not to make the process of education fully automated; education still requires a human relationship”. (University lecturer).

Policymakers defined sustainable AI by relating it to national strategic priorities, especially to digital sovereignty and long-term innovation. According to policymakers, sustainable AI implies “autonomy, stability, and capability to create our own educational technologies”.

Developers emphasized user-centered design, characterized by fewer demands on computation and more focused on usability. According to AI developers, “we try to optimize models in such a way that they are not energy-intensive and can be easily used by teachers (AI developer).

4.1.2 Perceived AI Benefits in Education

Regarding the responsible and sustainable use of AI in the educational field, participants pinpointed several advantages. The flexibility of AI to facilitate individual learning was also appreciated, especially by teachers: "AI helps me to understand and see the individual learner needs and weaknesses, and enables me to tailor my instruction accordingly, rather than doing the same for all learners” (School teacher).

Faculty members shared that “AI lessened the administrative workload, including grading and scheduling, and facilitated us to engage more with teaching and research”. “Automated grading has saved working hours, and I am now able to devote proper time to course design and student mentoring” (University faculty). Artificial intelligence-based analytics is helpful in timely identification of at-risk students, as according to administrator, “through AI technology, the system notified us about students’ risks and when students start falling behind, that helps us to intervene before the situation gets serious”

The participants also highlighted the role of AI-based tutoring in schools located in rural and under-resourced areas, where there is a lack of specialized teachers, “In small towns, AI tutoring is the sole supplementary assistance for students at times” (Regional education officer). It is also reported that interactive AI systems enhanced student engagement, particularly with mathematics and foreign language courses with real time feedback and adaptive exercises.

4.1.3 Equity and Access Challenges

Participants repeatedly reiterated inequality between urban and rural areas. It was said that the digital infrastructure and professional development opportunities were higher in schools in big cities. “The urban schools can experiment with AI, but rural ones are usually unable to do so, thus usually struggle to maintain internet access (School principal).

Lack of connectivity, outdated technology, and inadequate investment have been mentioned as some of the major obstacles to fair AI implementation. Educational inequalities between students were also observed by teachers, especially in relation to their access to personal devices at home: “The fact that not

all students have access to a computer or a good internet connection at home is the reason why they are unable to use AI tools at home" (Teacher).

Administrators emphasized that the implementation of AI does not only need the installation of software but also continuous technical and institutional backing. "The lack of trained IT personnel means that schools can hardly find it easy to troubleshoot AI systems or to put them into meaningful use in instruction" (Education administrator).

4.1.4 Ethical Concerns

Ethical issues were raised by all the stakeholder groups. The teachers often raised concerns about the privacy of student data, especially in regard to systems used to track learning behaviors. "We have a lot of student information, and it is not always evident who has access to it or what security measures are in place" (Teacher).

One more significant issue was the absence of transparency in algorithms, and the participants shared that they have limited knowledge about how AI systems come up with decisions, which was limited. "Sometimes we get recommendations from the system, and we do not know how they came up" (University lecturer). Automated proctoring systems were highly disapproved by the leaders of the university and viewed as stressful and even unjust. "Such systems may misinterpret legitimate student behavior as misconduct, and this makes students more anxious" (University administrator).

Developers admitted that it is dangerous to use AI models when training data are not diversified, and cautioned against using AI to monitor people. Some teachers also warned against excessive reliance on AI, as they expressed that excessive AI utilization has a detrimental impact on the critical thinking of students. According to them "higher dependency on AI will result in lack of critical thinking and struggling in students," (Secondary school teacher).

4.1.5 Conditions for Sustainable AI Implementation

Respondents found that a number of requirements would be needed to integrate AI into education. Teacher training became one of the key requirements. Teachers were more confident and motivated when some structured guidelines, hands-on workshops, and constant technical support were offered. "Training makes a big difference. Replacing teachers with AI tools is unsafe and uncooperative" (Teacher trainer). Moreover, the respondents discussed the necessity of context-specific AI products since most systems are created in the Western educational framework and will have to be adapted to the Russian curriculum, language, and culture. "Foreign-made AI tools do not fit our assessment techniques" (Curriculum specialist).

Also, the respondents emphasized the necessity of specific ethical codes and data protection standards, which should be adopted at the national level to ensure consistency and responsibility. In addition, trans-sectoral cooperation between schools, universities, policymakers, and technological developers was the key to sustainable AI implementation. "When teachers and developers collaborate, AI technologies will become more realistic and helpful. (Policy advisor)

4.2 Discussion

The research offers nuanced insights into the perception and implementation of sustainable artificial intelligence (AI) in Russian educational institutions. The analysis reveals tensions among technological innovation, moral accountability, and fairness of access, situating the findings within the relevant theoretical framework and the current literature.

4.2.1 Complex and Multidimensional Conceptualizations of Sustainable AI

The focus of the participants on the long-term, fairness, and alignment with educational objectives indicate internationally accepted definitions of sustainable and responsible AI in education. Notably, the respondents from different stakeholder groups have reiterated the idea that AI is supposed to complement human abilities, which is only supposed to be applied at the expense of a teacher, which supports a human-centered pedagogical approach. The difference in understanding of sustainability, as presented in the Results section, supported the theoretical stance that sustainability is a multidimensional construct that includes ethical, environmental, social, and pedagogical aspects (Pratt & Zhang, 2025).

Teachers cared more about the relevance of their instruction, policy-makers focused on the national development and digital sovereignty, and developers cared more about technical efficiency and environmental concerns. These disparities, from a sociotechnical perspective, explain how AI systems are incorporated into larger institutional, cultural, and political environments (Williamson & Piattoeva, 2022).

4.2.2 Opportunities and Educational Benefits of AI

In this research, teachers noted that the AI-facilitated personalization gave them an opportunity to support individual learning needs in a more effective manner, and university faculty indicated that AI-enabled personalization relieved them of administrative workload, including grading and scheduling, and provided them with time to teach and carry out research. The perceived benefits of AI expressed by the participants are consistent with research evidence indicating that AI has the potential to aid in personalized learning, student engagement, and administrative efficiency in education (Sverdlova & Orlova, 2024). The respondents also emphasized the usefulness of learning analytics based on AI in the timely identification of students' risk, which enables them to address students' risks at the earliest stage. AI-based tutoring systems were considered especially useful in rural and under-resourced schools, in which specialized instruction is inaccessible. Interactive AI platforms were also linked to the promotion of student participation, particularly in mathematics and foreign languages, through adaptive tasks and real-time feedback.

These results are in line with the findings of Hasan & Khan (2023), who reported that interactive AI improves students' motivation, engagement, and performance. Although these results support positive views on the role of AI in education, the discourse has been updated to reflect the fact that the mentioned advantages depend on having proper infrastructure, training educators, and long-term institutional support. As the previous literature notes, the ability of AI to minimize regional differences is contingent upon responsible, context-sensitive implementation rather than technological deployment (Godheja & Samani, 2023).

4.2.3 Persistent Equity and Access Challenges

Respondents were always contrasting urban schools that were well-equipped, while rural schools have a lack of stability in internet connectivity, challenges of reliable hardware, and fail to receive enough funding, resulting in uneven use of AI. As the findings show a consistent digital divide in the Russian educational setting related to inequality in access to AI technologies. The differences in the access of students to personal devices and the level of digital literacy also increased disparities; it meant that AI-based learning was less efficient when it came to socioeconomically disadvantaged learners.

Administrators insisted that effective AI implementation takes more than just a technological infrastructure, and that continuous technical support and trained staff are more directly associated. These results indicate that AI could further contribute to current disparities rather than reduce them, unless a specific policy intervention is implemented upon its adoption. According to the previous studies, equity-

oriented AI application needs to be focused on investment in digital capacity, teacher training, and specific provision of underserved schools (Emtsov, 2025).

4.2.4 Ethical Considerations in Sustainable AI Adoption

The issue of ethics emerged as a common concern among all participant groups, reflecting the global debate on data privacy, transparency, discrimination, and algorithmic bias in AI-mediated education. The findings of Zawacki-Richter et al. (2019) are in line with these findings, who reported ethical challenges, specifically related to data governance, transparency, decision making, and surveillance as critical issues in the implementation of AI in education. Educators were especially concerned about the systems that gather extensive information on students' behavior and the lack of transparency in the production of AI-informed decisions.

Automated proctoring technologies have been criticized by university administrators as anxiety-inducing and possibly unfair, a finding consistent with other studies on the adverse psychological impact of technologies that rely on surveillance to support education (Roberts & Logan, 2023; Siau & Nah, 2024). Developers recognized the risk of biased results if AI systems are trained on non-diverse data and advised against the misuse of AI for excessive monitoring. The participants also warned against excessive use of AI, noting that overreliance on AI would erode students' ability to think critically and learn independently. These findings present these concerns more clearly in the Russian context, with the problem of data sovereignty and institutional accountability endangering ethical stakes (Holstein et al., 2019; Ebner & Holzinger, 2021). In conclusion, the results underscore the importance of informing sustainable AI implementation with robust ethical regulations.

4.2.5 The Need for Context-Sensitive and Localized AI Systems

The high focus on using AI tools depending on context, as the participants quote the sociotechnical theories that emphasize placing technology in the local educational, cultural, and linguistic context (Fraillon et al., 2020). There are numerous AI systems used in Russian education today, and most of them are developed abroad and must be adapted to national curricula, assessment traditions, and linguistic peculiarities.

4.2.6 Towards a Framework for Sustainable AI in Russian Education

Summarizing the research results with the theoretical framework, the paper suggests a number of interconnected principles of the sustainable AI roadmap in the Russian educational setting:

- Human-AI cooperation: AI should not replace the educator, but assist them in realizing pedagogical objectives.
- Ethical governance**:** The country policies should focus on transparency, equity, and reasonable utilization of information.
- Equity-based implementation: The infrastructure investment is to focus on the under-resourced areas.
- Teacher capacity building: There is need to have continuous professional growth on AI literacy, AI ethics and pedagogy.
- Localized AI design: AI systems have to be culturally, linguistically, and curriculum-wise adjusted.
- Constant review: Educational institutions need to constantly review the long-term impacts of AI on learning and equity.

5. CONCLUSION AND RECOMMENDATIONS

This study explored how a purposively selected sample of educators, policymakers, and technology developers in Russia perceive and use AI within their respective educational contexts. The findings from this sample suggest that participants often viewed AI not merely as a technological tool but as a value-oriented approach that requires balancing innovation with ethical considerations, fairness, and contextual relevance. Across stakeholders, AI was viewed as a form of aid, not capable of replacing human teachers, but rather aligned with existing pedagogical goals. Although the respondents recognized the potential of AI to improve individual learning, reduce administrative workload, and support learners in underserved settings, the benefits were perceived as unevenly distributed. Infrastructure and digital limitations still affect equal implementation due to institutional capability especially in rural regions. Also, issues concerning data privacy, transparency, and algorithmic bias became key concerns, and clear governance and ethical protections were necessary. The study also emphasizes the relevance of context-sensitive design, teacher education, and cross-sector partnerships among schools, universities, policymakers, and developers. The participants stressed that successful AI implementation must be accompanied by investments into the local capacity building and infrastructure, as well as national standards that facilitate accountability and public trust. Overall, the study contributed to the broader international discourse on responsible AI in education by providing an empirically based assessment of the situation in Russia. It highlights the fact that relevant educational innovation relies not just on technological progress but also relevant, inclusive, ethically knowledgeable, and socially accountable application designs.

5.1 Limitations

This research is limited in several ways. First, the sample was small and not completely representative of the whole regions and stakeholder groups in Russia, because not all educators and institutions were able to be sampled. Second, the use of self-reported interview data can introduce bias in how participants perceive things or in their affiliation with the institution. Third, the research was based on qualitative research and lacked any quantitative measures, which would have a bigger picture of trends in the country. Lastly, not all institutions and technology developers were accessible to the document analysis. Irrespective of these limitations, the study provides valuable insight on sustainable AI practices in Russian education.

5.2 Theoretical Implications

This study enhances existing research in the field of AI in education by expanding theoretical knowledge on sustainable and responsible AI. To begin with, the results expand the definition of sustainability in AI and reveal that in the sphere of Russian education, sustainability is not merely a technological or ecological concept, but rather a socio-ethical and pedagogical one informed by equity, the long-term availability, and the responsibility of the institutions. This grounded the current theoretical formulations on the perspectives of the stakeholders and institutional practice.

Second, the study reinforces the equity-oriented theory of AI by demonstrating that when adopting AI ethically, it is structurally limited because of digital disparity, uneven infrastructure, and disparities in teacher preparedness. Equity, therefore, becomes a contextual condition rather than an abstract principle, focusing on the significance of access and institutional capacity when it comes to responsible AI implementation.

Third, the results are empirical evidence of the sociotechnical systems theory, illustrating that the adoption of AI is a consequence of interactions between technology design, policy priorities, cultural norms, and human agency. These views underscore the fact that sustainable implementation will entail the alignment in the educational, institutional, and technological areas.

Combinely, all these implications make AI context-sensitive, ethically competent, and socially integrated educational innovation, and provide a more polished framework for future research on sustainable and responsible AI in education.

a) Practical Implications

The results have a number of practical implications for educational institutions, policy makers, and AI developers in Russia. The findings underscore the need for educators to build confidence and competence in using AI tools through continuous professional development and practical training. AI literacy should be incorporated in teacher education so that teachers can approach AI critically and be able to apply it in the classroom intelligently.

The policymakers have emphasized that dedicated funds must be allocated to digital infrastructure, particularly in the rural parts of the country that lack resources. The national guidelines and ethical standards should be clear to promote transparency, fairness, and the responsible application of AI in educational institutions. The implications to AI developers are that the tools need to be context sensitive, designed and tailored to the Russian curriculum, language, and cultural standards. It is advisable to collaborate with educators during the design and deployment phases to ensure that usability, pedagogical relevance, and suitability for the educational goals are met.

In conclusion, these implications focus on the necessity of a coordinated strategy that provides the alignment of technological innovation with human values and the long-term goals of education.

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Conflict of Interest

The authors assert that they are not aware of any competing financial interests or other personal relationships that would have influenced the work reported in this paper.

Data Availability Statement

The data that justify the findings of this study can be obtained from the corresponding author on reasonable request. The information is not made public due to the privacy and confidentiality concerns of the students and the institutions involved.

Use of AI Tools

The only use of AI-assisted language support was to enhance the manuscript's grammar, word processing, readability, and clarity. It was not utilized to produce research data, statistical analysis, results, or to

substitute the scholarly judgment of the authors. The authors revised, edited, and approved the final manuscript and have absolute responsibility for its contents.

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