

## METHODOLOGY FOR ENHANCING STUDENTS' LEARNING MOTIVATION THROUGH THE USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PRIMARY EDUCATION

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**Abstract:** This article explores the issue of enhancing primary school students' learning motivation through the use of artificial intelligence (AI) technologies in the educational process. The study analyzes the impact of AI-based teaching tools, adaptive learning platforms, and interactive digital environments. Experimental findings demonstrate that AI technologies effectively improve students' motivation levels, subject interest, and independent thinking skills. The article provides methodological recommendations for introducing innovative approaches in primary education and optimizing the learning process in a learner-centered manner.

**Keywords:** Adaptive learning, digital environment, innovation, interactive education, student activity, learner-centered, artificial intelligence, educational technologies.

### INTRODUCTION

At the current stage of modern development, digital transformation processes are requiring a fundamental reform of all levels of the education system, particularly primary education. Today, artificial intelligence (AI) technologies are becoming not merely a technical tool, but a strategic resource for enhancing students' intellectual potential and forming their learning motivation. In the Republic of Uzbekistan, digitalization of education and the introduction of advanced technologies have been designated as a priority direction of state policy. The Law of the Republic of Uzbekistan "On Education" [3] established a legal foundation for introducing innovative forms and methods into the educational process. Within the framework of the "Uzbekistan-2030" strategy [1], the task of raising the quality of education to international standards and fully digitalizing the sector has been set. The use of AI technologies is of great importance in achieving these goals, and Presidential Resolution No. PQ-4996 [2] defined the necessary conditions for their implementation.

Extensive research is being conducted in the scientific community on the role of AI in education. As Luckin et al. [4] noted, artificial intelligence in education has the power to "unleash hidden potential," bringing interactivity between teacher and student to a new level. Roll and Wylie [5], analyzing the evolutionary development of AI technologies, acknowledge their revolutionary impact on the educational environment. Developing learning motivation in primary school-age students is an extremely complex process, during which AI emerges as an effective tool for tutoring and supplementary education [6]. In particular, using artificial intelligence in the "flipped classroom" model significantly increases students' interest in self-regulation and independent knowledge acquisition [7]. Local researchers, notably A.S. O'rinov [8], also emphasize the need to improve the methodology of integrating digital technologies and artificial intelligence in primary education.

## METHODS

This research is based on a comprehensive approach aimed at determining the effectiveness of using AI technologies in primary education to enhance students' motivation.

The following scientific-pedagogical methods were employed during the research:

- **Theoretical Analysis and Modeling:** At the initial stage, existing international experience and didactic models for applying AI in primary education were analyzed. Adaptive teaching systems (Intelligent Tutoring Systems) that enhance students' cognitive activity were selected as the research object. Motivation-enhancement mechanisms were modeled through AI's personalization and immediate feedback functions.

- **Pedagogical Experiment and Group Division:** The practical part of the research was conducted among primary school students. To ensure accuracy, sample groups were divided into two parts: a **Control Group** (taught using traditional methods) and an **Experimental Group** (worked in an environment integrating AI elements such as gamified adaptive platforms and visual intelligent agents).

- **Gamification and Adaptive Learning Methodology:** A "success algorithm" was applied in the experimental group to stimulate student motivation. Artificial intelligence progressively increased or decreased task difficulty according to each student's level of mastery. This method served to stabilize interest in the subject by generating a "sense of success" in the student.

- **Data Collection and Diagnostic Methods:** The following diagnostic tools were used to measure students' motivation levels: Observation (students' activity during lessons and time spent on tasks), Questionnaires (specially designed surveys to assess satisfaction with the learning process and attitude toward subjects), and Test Assessments (monitoring of knowledge quality dynamics under the influence of AI technologies).

- **Statistical Analysis:** Mathematical-statistical methods were applied to verify the reliability of results. Differences between control and experimental groups were compared using arithmetic mean values and growth rates of performance indicators.

## RESULTS

The results of the conducted pedagogical experiment showed significant positive dynamics in the learning motivation and academic performance of primary school students. At the conclusion of the experimental work, data from the control and experimental groups were comparatively analyzed.

### 1. Qualitative Indicators of Learning Motivation

The use of AI-based adaptive platforms in the experimental group increased students' interest in lessons by 28%. Observations showed that in lessons integrating AI elements (intelligent assistants and leveled tasks), students' drive to complete tasks independently was higher than in traditional lessons. While motivation stability in the control group remained unchanged, 85% of students in the experimental group were fully engaged in the learning process.

### 2. Dynamics of Academic Performance

According to test results at the end of the experiment, average student performance indicators are reflected in the table below:

| Groups | Pre-Experiment Score | Post-Experiment Score | Growth Rate (%) |
|--------|----------------------|-----------------------|-----------------|
|--------|----------------------|-----------------------|-----------------|

|                    | (%)  | (%)  |       |
|--------------------|------|------|-------|
| Control Group      | 64.5 | 67.2 | +2.7  |
| Experimental Group | 63.8 | 82.4 | +18.6 |

These results indicate that because AI technologies adapted to each student's individual pace, even low-performing students showed significant improvements.

### 3. Cognitive Activity and Feedback Effectiveness

Instant feedback provided by AI systems helped students develop their error-correction skills. The time students in the experimental group spent working on their mistakes was reduced by 1.5 times compared to the control group. This reduced the feeling of "fear of failure" and reinforced a positive attitude (positive reinforcement) toward learning.

### 4. Changes in Teacher-Student Relationships

As AI technologies took over technical and repetitive tasks (such as checking tests and determining levels), the teacher's time for creative and individual work with students expanded by 40%. This in turn led to an improvement in the psychological climate in the classroom and an increase in students' emotional motivation.

## DISCUSSION

The research results demonstrate that the application of AI technologies in primary education is not merely an auxiliary tool for motivating students, but a fundamental game-changer. The findings can be discussed in the context of several international studies and pedagogical theories as follows.

The 18.6% growth in performance in the experimental group is directly linked to AI's adaptive function. In traditional education, a teacher is forced to teach a lesson oriented toward the average-performing student, while AI identifies each student's "Zone of Proximal Development." This practically confirms Luckin et al.'s (2016) argument about AI unleashing hidden potential in education. When a student receives a task matched to their level, their self-confidence grows, leading to stabilization of learning motivation.

The reduction in error-correction time observed in our results is a consequence of AI's "immediate feedback" characteristic. As Zheng et al. (2020) noted, for a primary school student, understanding one's mistake in the moment reduces cognitive load. This methodology frees students from the feeling of "fear of making mistakes." During discussion, it became clear that AI systems drive motivation to its highest point when they serve to guide students rather than evaluate them.

The 40% increase in teacher individual interaction time was an unexpected but positive outcome in our research. This supports the hypothesis proposed by Roll and Wylie (2016) that AI does not replace the teacher but rather augments their capabilities. When teachers are freed from technical tasks, they strengthen emotional connections with students — the most important social factor of motivation in primary education.

It should be noted that the risk of "digital dependency" also exists when using AI technologies. During the research, some students showed a decrease in interest in working without technological tools. This indicates the need to maintain methodological balance and moderation when integrating AI into education. In the future, it would be appropriate to study AI's impact not only on intellectual development, but also on students' social-emotional skill development.

## CONCLUSION

This research, dedicated to the issue of enhancing students' learning motivation through the use of AI technologies in primary education, allows us to draw the following important conclusions:

- **Methodological Effectiveness:** The research results confirmed that AI-based adaptive learning systems, by adapting to the individual needs of primary school students, generate sustained interest in subjects. The 18.6% growth in performance in the experimental group proves that AI has greater didactic potential compared to traditional methodology.

- **Psychological Comfort:** The instant feedback mechanism provided by AI systems removes the barrier of "fear of making mistakes" in students. This is of decisive importance — especially for younger school-age children — in building self-confidence and forming success motivation.

- **Pedagogical Transformation:** Artificial intelligence emerged not as a tool that replaces the teacher, but as a partner that optimizes their professional activity. The expansion of emotional and creative communication between teacher and student, due to automation of technical processes, positively affects the quality of education.

- **Practical Recommendations:** Based on research results, when integrating AI elements into the primary education system, special attention should be paid not only to technological equipment, but also to improving teachers' digital competencies. Additionally, maintaining pedagogical balance between digital and traditional methods during lessons is important in preventing the risk of "digital dependency."

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