BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg

EFFECTIVENESS OF ADAPTIVE (PERSONALIZED) EDUCATIONAL TECHNOLOGY BASED ON ARTIFICIAL INTELLIGENCE IN TEACHING HUMAN ANATOMY: RESULTS OF A PEDAGOGICAL EXPERIMENT

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Doi: https://doi.org/10.5281/zenodo.21963480

Abstract: The article presents a pedagogical experiment evaluating an artificial-intelligence (AI) based adaptive learning platform for the "Human Anatomy" course, which tailors content and question difficulty to each student's performance. The study involved control (n=15) and experimental (n=15) groups. No significant baseline difference was found ($p>0.05$). At the final stage, the experimental group outperformed the control across all dimensions by 13–14% ($t=10.0$; $p<0.001$).

Keywords: human anatomy, artificial intelligence, adaptive learning, personalized learning, individual learning pathway, pedagogical experiment.

Introduction. Artificial intelligence in education allows for the formation of an individual learning trajectory for each student: the system identifies the student's strengths and weaknesses, adapts the material and the complexity of the tasks, and provides real-time feedback. In a large-scale subject such as "human anatomy", this approach personalizes learning and increases efficiency.

The aim of the study is to develop an adaptive learning methodology based on AI and evaluate its effectiveness through pedagogical experimentation.

Literature review. Systematic reviews have noted that AI tools (adaptive feedback, personalized trajectories based on machine learning) improve the acquisition and application of anatomy [1]. It has been experimentally proven that personalized AI platforms significantly increase student acquisition, engagement, and independent learning skills [2]. In medical education, AI is considered a promising tool for adaptive instruction and real-time assessment [3]. The effectiveness of active and digital approaches also supports these results [4; 5]. The use of SI-adaptive methodology in local anatomy education has not been studied — this defines its novelty.

Research methodology. 30 1st-year students were divided into two equal groups (n=15+n=15) according to the "initial - final" cross-sectional scheme.

The control group studied according to the traditional methodology. In the experimental group, an adaptive platform based on SI was used: the system analyzed the responses of each student, provided an individual learning trajectory, adaptive tests and real-time feedback. Theoretical

knowledge, independent learning skills and knowledge application were assessed using standardized tools. The results are expressed as M±SD and tested by Student's t-test ($p<0.05$).

Analysis of research results. At the initial stage, the groups showed similar results (61.0% and 61.5%; $p>0.05$). The distribution of final knowledge levels is presented in Table 1 and the histogram (Figure 1), and the experimental group structure is presented in the pie chart (Figure 2).

1-Table

Distribution of knowledge levels at the final stage (number of n and %)

Education level	Control group, n (%)	Experimental group, n (%)
High	2 (13,3%)	7 (46,7%)
Medium	8 (53,3%)	7 (46,7%)
Low	5 (33,3%)	1 (6,7%)
Total	15 (100%)	15 (100%)

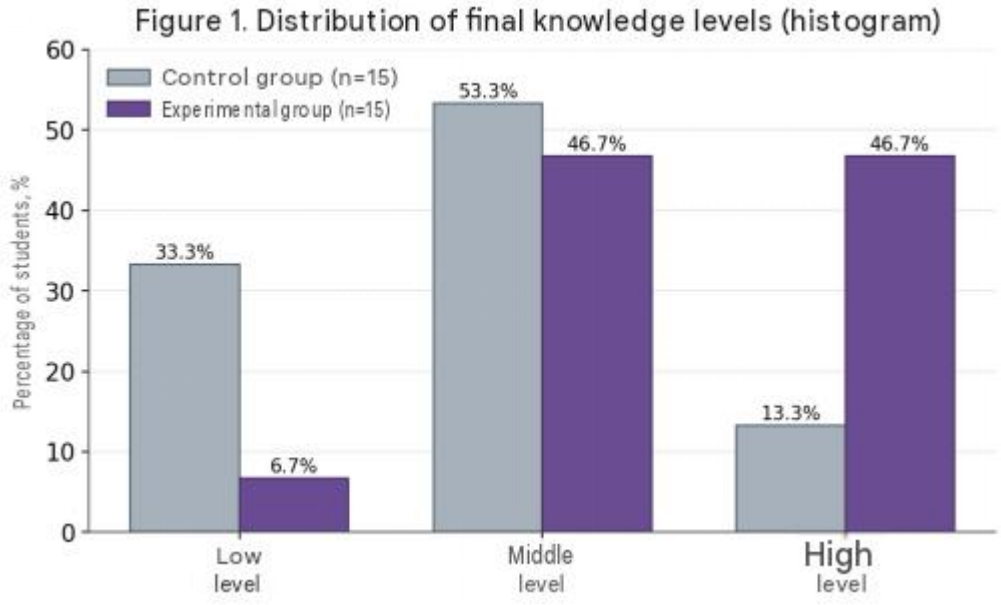


Figure 1. Distribution of final knowledge levels (histogram)

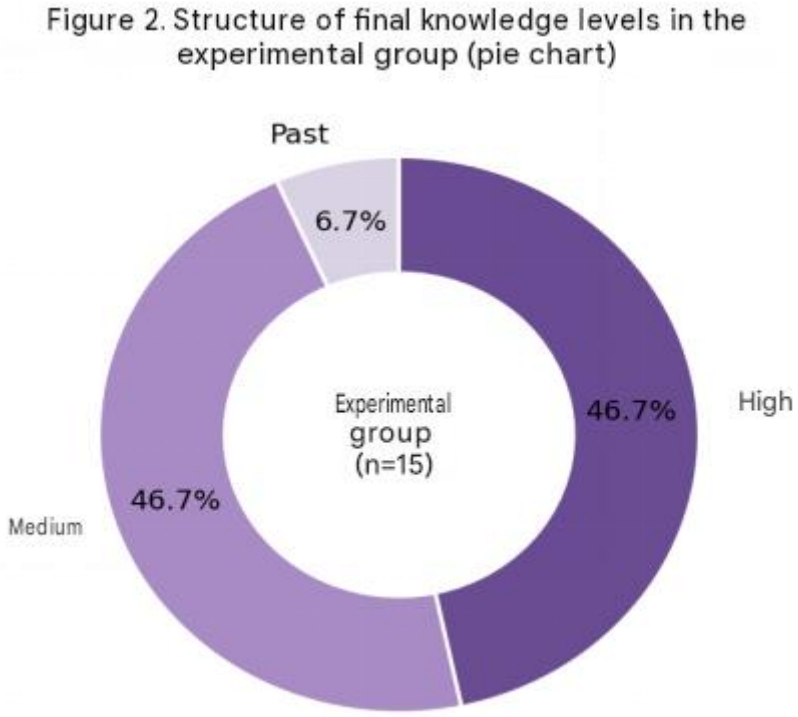


Figure 2. Experimental group structure (pie chart)

The integrated indicators for the five directions are summarized in Table 2 and the radar diagram (Figure 3).

2-Table

Integral indicators and statistical analysis results

Indicator	**Control (M±SD)**	Experience (M±SD)	Difference / p
Theoretical knowledge, %	70,8 ± 3,9	84,0 ± 3,3	+13,2; p<0,001
Quality of knowledge, %	66,7	93,3	+26,6 f.b.
Independent learning skills, %	65,0 ± 4,3	78,0 ± 3,8	+13,0; p<0,001
Application of knowledge, %	67,0 ± 4,1	80,0 ± 3,6	+13,0; p<0,001
t-criterion (final)	t = 10,0	t jadval = 2,05	p<0,001

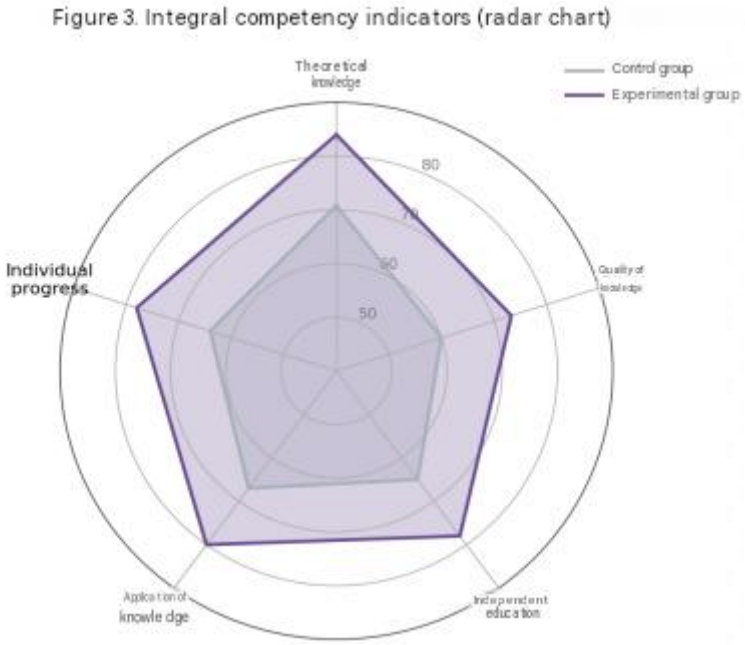


Figure 3. Integral competency indicators (radar chart)

The results show that the experimental group is superior in all areas by 13–14%; the empirical t-test (10.0) is significantly greater than the tabular value (2.05), confirming the high reliability of the difference ($p<0.001$). This is consistent with international studies: SI-adaptive platforms increase mastery, engagement, and independent learning [1; 2].

Conclusion. The pedagogical experiment confirmed the effectiveness of the adaptive learning methodology based on SI: the experimental group's indicators are 11–14% higher than the control group, the proportion of students with a high level of knowledge has significantly increased, and the difference is reliable ($t=10.0$; $p<0.001$). The use of the SI-adaptive approach in combination with traditional methods is a promising direction for personalizing anatomy education.

This article was written within the framework of the innovative project No. AM-PZ-2019062031 entitled "Creation of multimedia textbooks for bachelor's and master's students in the disciplines of "Nuclear Energy", "Nuclear Medicine and Technologies", "Radiation Medicine and Technologies".

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