HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

THE EFFECTIVENESS OF DEVELOPING STUDENTS' COGNITIVE ACTIVITY BASED ON HEURISTIC LEARNING TECHNOLOGIES

Tursunbekov Xurshidbek Raxmatjon o'g'li
Master's student, Kokand State University

Abstract. The article examines the effectiveness of developing students' cognitive activity based on heuristic learning technologies through experimental research. The study was conducted as an online pedagogical experiment involving first-year pedagogy students of Kokand State University. A total of 41 students participated, divided into an experimental group (20) and a control group (21). During the formative stage, case studies, a system of heuristic questions, partial inquiry and mini-projects were applied with the experimental group. The results showed that the cognitive-activity indicators of the experimental group were on average 12 percent higher than those of the control group across all four criteria, empirically confirming the effectiveness of heuristic learning technologies and the research hypothesis.

Keywords: heuristic learning, cognitive activity, case study, heuristic questions, partial inquiry, mini-project, pedagogical experiment, analytical thinking, reflection.

Introduction

One of the main tasks facing modern higher education is to transform students from passive recipients of ready-made knowledge into independent, inquiring and creative thinkers. In practice, however, the predominance of the traditional, teacher-centred approach, the unsystematic use of heuristic methods, and the insufficiently developed criteria for assessing cognitive activity hinder the development of students' cognitive activity. This very contradiction determines the relevance of the topic.

The theoretical foundations of developing cognitive activity have been studied extensively by international and CIS scholars. L. S. Vygotsky's cultural-historical theory and the concept of the “zone of proximal development” [2], J. Piaget's theory of stage-based cognitive development [3], and J. Bruner's concept of “discovery learning” [4] form the theoretical basis of heuristic learning. G. I. Shchukina distinguished reproductive, search and creative levels of cognitive activity [5]. The theory of heuristic learning was developed in the works of A. V. Khutorskoy [6] and V. I. Andreev [7], while problem-based learning was substantiated by M. I. Makhmutov [8]. In Uzbek pedagogy, N. Saidakhmedov [9] and O'. Q. Tolipov and M. Usmonboyeva [10] have studied modern pedagogical technologies adapted to the national educational context.

The aim of this article is to reveal, on the basis of experimental research, the effectiveness of the formative impact organised through heuristic learning technologies (case studies, a system of heuristic questions, partial inquiry and mini-projects) on the development of students' cognitive activity.

Research methods

The study was carried out with first-year students of the pedagogy programme at the Faculty of Pedagogy and Psychology of Kokand State University. A total of 41 students were involved, divided into an experimental group (20 students) and a control group (21 students). The experiment was organised as an online pedagogical experiment via the Google Forms platform and conducted in line with the diagnostic, formative and control stages established in pedagogical research.

To diagnose cognitive activity, a questionnaire consisting of 12 items was developed and assessed using a five-point Likert scale. The questionnaire measured cognitive activity across four

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

criteria — cognitive interest, analytical thinking, inquiry activity and reflection — with three items per criterion. Based on the scores obtained, cognitive activity was classified into low, medium and high levels.

During the formative stage, a system of methods grounded in heuristic learning technologies was applied in the experimental group: case studies (analysis of a real problem situation), a system of heuristic questions (Socratic guidance), partial inquiry (independent search tasks) and mini-projects (a substantiated solution plan with reflective tasks). In the control group, instruction continued in the traditional manner. The data obtained were processed using mathematical-statistical methods (mean score, percentage indicators and comparative analysis).

Results

The initial diagnostics conducted at the ascertaining stage showed that students' cognitive activity was at the boundary of low and medium levels (overall index ~48.6%). The weakest indicators were recorded in the cognitive-interest and reflection criteria. These results provided the basis for determining the specific directions of the formative stage.

After the formative impact was completed, the level of cognitive activity in both groups was measured again using the same questionnaire (control stage). To compare the control-stage indicators by criteria and to express the difference between the groups quantitatively, the results are presented in the following chart (Fig. 1).

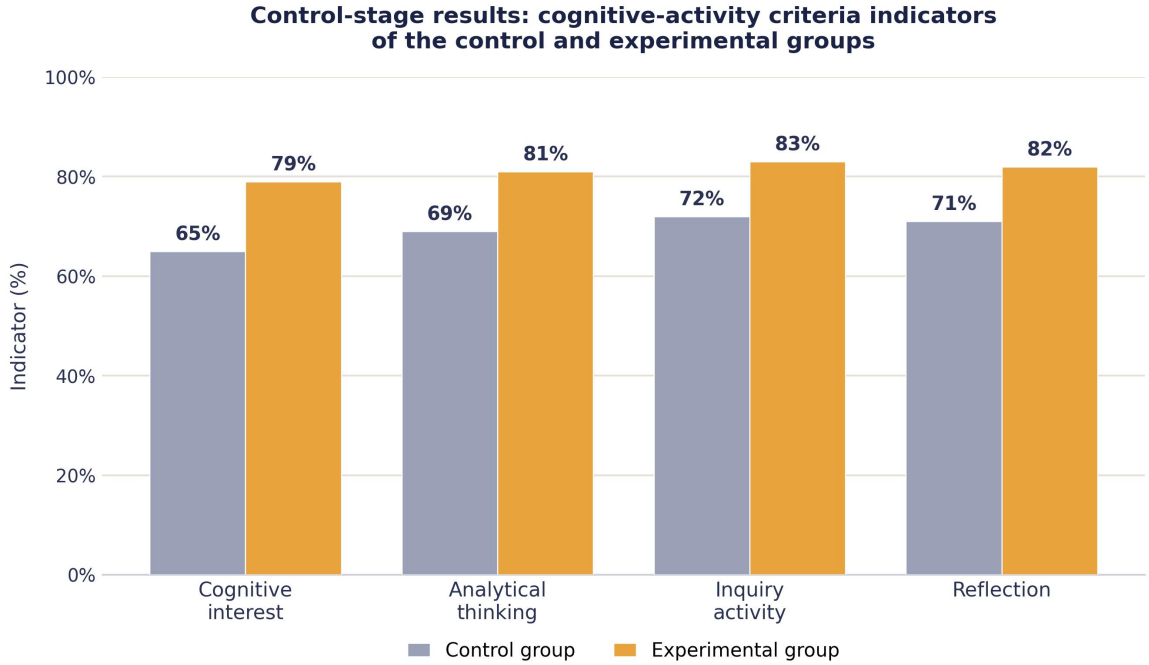


Fig. 1. Control-stage indicators of the control and experimental groups by cognitive-activity criteria

Table 1

Control-stage indicators of the groups by cognitive-activity criteria

No.	Criteria	Experimental group (20), %	Control group (21), %	Difference (%)
1.	Cognitive interest	79	65	+14
2.	Analytical thinking	81	69	+12

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

No.	Criteria	Experimental group (20), %	Control group (21), %	Difference (%)
3.	Inquiry activity	83	72	+11
4.	Reflection	82	71	+11
	Average indicator	**81.25**	**69.25**	**+12**

As can be seen from Fig. 1 and Table 1, at the control stage the cognitive-activity indicators of the experimental group were higher than those of the control group across all four criteria. The largest difference was recorded in cognitive interest (+14%) and analytical thinking (+12%), while in inquiry activity and reflection the difference was +11%. Overall, the average indicator of the experimental group was 81.25%, and that of the control group was 69.25%, with a difference of +12% between them.

Discussion

The results obtained empirically confirm the effectiveness of heuristic learning technologies in developing students' cognitive activity. The growth observed in the experimental group can be explained through G. I. Shchukina's theory of levels of cognitive activity [5]: the formative impact helped to raise students step by step from the reproductive-imitative level to the search-performing and creative levels. Case studies activated cognitive interest through problem situations, the system of heuristic questions developed analytical thinking, partial inquiry increased inquiry activity, and mini-projects together with reflective tasks formed self-assessment skills.

The relatively modest change in the control group (average 69.25%) reflects the limited capacity of traditional instruction to develop cognitive activity. The 12-percent difference between the experimental and control groups is therefore interpreted as the result of the didactic impact of the system of heuristic methods. These findings are also consistent with the results of other researchers indicating that cognitive activity can be developed through active and inquiry-based learning [14].

Conclusion

The results of the experimental work showed that the formative impact organised on the basis of heuristic learning technologies (case studies, a system of heuristic questions, partial inquiry and mini-projects) significantly develops students' cognitive activity. The average indicator of the experimental group was 12 percent higher than that of the control group, which practically confirmed the research hypothesis.

The research results can be used by pedagogy students of higher education institutions in lectures, seminars and practical classes, as well as by teachers of general secondary education institutions. In future research, it would be advisable to test this methodology with students of various specialities and on a larger sample.

References

1. Mirziyoyev Sh.M. Erkin va farovon, demokratik O'zbekiston davlatini birgalikda barpo etamiz. – Tashkent: O'zbekiston, 2016. – P. 14.
2. Vygotsky L.S. The History of the Development of Higher Mental Functions // Collected Works: in 6 vols. – Vol. 3. – Moscow: Pedagogika, 1983.
3. Piaget J. The Origins of Intelligence in Children. – New York: International Universities Press, 1952. – 419 p.
4. Bruner J.S. The Process of Education. – Cambridge: Harvard University Press, 1960. – 97 p.

HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

5. Shchukina G.I. Activation of Students' Cognitive Activity in the Educational Process. – Moscow: Prosveshchenie, 1979. – 160 p.
6. Khutorskoy A.V. Didactic Heuristics: Theory and Technology of Creative Learning. – Moscow: MSU Publishing, 2003. – 416 p.
7. Andreev V.I. Heuristics for Creative Self-Development. – Kazan: Kazan University Publishing, 1994. – 247 p.
8. Makhmutov M.I. Problem-Based Learning: Fundamental Issues of Theory. – Kazan: Magarif, 2016. – 367 p.
9. Saidakhmedov N. New Pedagogical Technologies (Theory and Practice). – Tashkent: Moliya Publishing, 2003. – 172 p.
10. Tolipov O'.Q., Usmonboyeva M. Applied Foundations of Pedagogical Technologies: a study guide. – Tashkent: “Fan” Publishing of the Academy of Sciences of Uzbekistan, 2006. – 261 p.
11. G'oziyev E.G'. General Psychology. – Tashkent: O'qituvchi, 2008. – 280 p.
12. Zimnyaya I.A. Key Competencies – a New Paradigm of the Result of Modern Education // Higher Education Today. – 2003. – No. 5. – P. 34–42.
13. Dewey J. Democracy and Education. – The Pennsylvania State University, 2001. – 275 p.
14. Abdugopirova F.A. The Role of Cognitive Activity in the Development of 6–7 Year Old Students in Preschool Educational Organizations // European Journal of Education and Applied Psychology. – 2023. – No. 4. – P. 130–135.