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Analysis Of Teaching Methods Aimed At Increasing Students' Cognitive Activity

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ABSTRACT

Introduction / Relevance. In the modern educational process, one of the main indicators of the quality of education is that a learner acquires knowledge not as a ready-made product, but through independent inquiry. This process requires the introduction of teaching methods aimed not merely at increasing students' cognitive activity, but at engaging it in practice. The educational process should not be limited to the transmission of information, but should also shape the learner as a subject of cognitive activity. At present, identifying the scientific and theoretical foundations of methods that activate students' thinking, inquisitiveness, and creativity remains an important scientific and methodological problem.

Methods. The study employed methods of theoretical analysis and interpretation of scientific and methodological literature, scientific dissertations, and articles related to the research topic; comparative and empirical methods; as well as methods of summarizing and analyzing pedagogical experience. At the final stage of the research, methods of logical analysis, interpretation, and generalization were applied.

Results. A systematic analysis of instructional methods aimed at activating students' cognitive engagement revealed both methodological and didactic advantages of such approaches. These include the creation of problem-based learning situations, stimulation of heuristic and reflective activities, and the use of interactive communication tools. Furthermore, methods based on learner-to-learner collaboration contribute to constructing knowledge through personal experience and analytical thinking. These approaches help transform students from passive recipients of ready-made information into active subjects who internalize, process, and generate knowledge. Additionally, their application enhances not only the level of academic achievement but also the structural development of thinking and the formation of competencies necessary for solving complex problems.

Conclusion. Instructional methods oriented toward activating cognitive engagement elevate both the content and methodological quality of the learning process. Through these approaches, the student evolves into an active subject—one who asks questions, analyzes, reasons, and formulates independent conclusions. Such pedagogical strategies foster critical thinking, problem identification and resolution skills, and the ability to articulate well-grounded arguments. Purposeful selection and consistent application of these methods in the classroom not only ensure stable academic outcomes but also facilitate the unfolding of each student's internal intellectual potential. Hence, the systematic integration of these methods into educational practice is considered a pressing scientific and practical necessity.

Keywords: Cognitive engagement, instructional methods, didactic approach, interactive strategies, educational quality, independent thinking.

INTRODUCTION

In One of the priority directions of contemporary education policy is to enhance students' cognitive activity, develop their ability to apply theoretical knowledge in practical activities, and foster skills for independent thinking, inquiry, and creative approaches. Therefore, since one of the main focuses of modern education is to increase students' cognitive activity and cultivate skills to apply theoretical knowledge in practice,

teaching methods that activate students' cognitive processes and encourage independent thinking, observation, and analysis are being introduced into practice. In this process, traditional teaching methods are being combined with laboratory-practical sessions, active and interactive methods, as well as problem-based learning and project-based technologies.

The choice of teaching methods in accordance with didactic goals, taking into account students' age and individual characteristics, is an important factor in activating their cognitive processes, developing their cognitive abilities, and forming competencies for independent analysis and decision-making. A properly chosen pedagogical approach not only limits students to acquiring knowledge but also transforms them into active subjects who can explain, think independently, and apply the acquired knowledge in various situations. For this purpose, scientific and methodological research works of a number of scholars on teaching methods aimed at increasing students' cognitive activity have been analyzed in our country, the Commonwealth of Independent States, and abroad.

Materials and methods. In the modern education system, the selection of teaching methods is primarily closely related to the development of cognitive activity. This necessitates transforming the student from a passive recipient of knowledge into an active subject, shaping their personal thinking style, and fostering analytical and creative approach skills.

In the course of the conducted research, the following theoretical methods Analysis and interpretation of scientific literature were used to examine the current state of the problem related to students' cognitive activity, to investigate the core conceptual framework, and to identify its theoretical and scientific foundations; Comparative analysis was utilized to study and contrast the perspectives of both local and international scholars regarding teaching methods aimed at enhancing students' cognitive activity. This approach enabled a comprehensive analysis of instructional strategies designed to foster cognitive engagement among students;

The empirical methods employed during the study included content analysis of secondary school curricula (using biology instruction as a case study) to determine the extent to which teaching methods aimed at enhancing students' cognitive activity are incorporated within the curricula and thematic plans;

The generalization and analysis of pedagogical experience involved a critical evaluation of teaching methods aimed at enhancing students' cognitive activity, enabling an assessment of their effectiveness and the identification of challenges encountered during their implementation;

In the final stage of the study, logical analysis, interpretation, and synthesis methods were applied to construct a comprehensive overview of the investigated phenomenon, thereby substantiating the scientific and practical significance of the obtained results.

The integrated application of the aforementioned methods ensured the methodological rigor and analytical depth of the study, while also enabling a thorough examination of teaching strategies aimed at enhancing students' cognitive activity in the context of modern schooling.

Currently, instructional approaches such as practical games, problem-based learning, interactive pedagogy, the module-credit system, distance learning, blended learning, and skills-oriented workshops are widely acknowledged as innovative formats in contemporary education. However, it is worth noting that one of the main drawbacks of the traditional secondary education system is that the presentation of learning materials is aimed at the average student's level of knowledge and at developing a reproductive style of cognitive activity (Denisova et al., 2021).

The concept of two levels of cognitive development was originally proposed by L.S. Vygotsky. The first level — the actual developmental level (i.e., the learner's existing level of cognitive readiness) — is characterized by the learner's ability to perform tasks independently and completely, without assistance. The higher second level, known as the zone of proximal development, is characterized by what the learner is unable to perform independently but can achieve with minimal assistance (such as guiding questions, explanations, or cues). With such support, the learner can transition to the actual developmental level during the learning process [Vygotsky, 1999, pp. 33-34].

Advocates of cognitive learning theory conceptualize constructivism as an approach that explains learning through internal processes such as comprehension, information processing, perception, and memory, as noted by D.S.Kropf (2013, p.14).

Through empirical research, M.Babaie (2017) found that constructivist teaching methods promote active learner engagement, facilitate knowledge clarification, and foster the development of constructive problem-solving skills. According to M.Babaie, these methods contribute to the deepening of specialized knowledge and the enhancement of independent thinking abilities.

V.B.Tsarkova and co-authors consider that cognitive learning is based on the following five fundamental principles: remembering, understanding, applying, evaluating, and creating. These principles harmonize with students' activities, enhancing their capacity to utilize knowledge and develop

creative thinking skills. Activities grounded in remembering facilitate the retrieval of prior knowledge. Activities oriented towards understanding assist students in analyzing information from various perspectives and developing their abilities to describe and interpret data. Applying is reflected in students' efforts to use their knowledge in practical ways to solve problems. The principle of evaluation involves students developing the ability to assess various types of information according to the context, as a result of analyzing data and making decisions based on it. Creating is the foundation of cognitive learning, helping students adapt to new stimuli, solve problems, and generate new and original ideas (Tsarkova, Belenikina & Vasilyeva, 2020).

As noted by K.C.Powell and C.J.Kalina, the interactions between a novice learner and an expert participant lead to the construction of knowledge within a constructivist learning environment. A key concept in his social constructivist learning theory is the Zone of Proximal Development (ZPD), whereby education functions as a factor that stimulates internal development through collaborative interaction between the individual and the social environment (Powell & Kalina, 2009).

Therefore, we considered it appropriate to begin by investigating the impact of teaching methods and technologies on enhancing students' cognitive activity.

Comprehensive information regarding teaching methods is provided in the textbook "Modern Educational Technologies", co-authored by O.D.Rakhimov and colleagues (Rakhimov et al., 2013).

Currently, there are numerous teaching methods; however, among them, cognitive teaching technologies are considered the most effective (Akhmetova et al., 2024). These technologies are aimed at developing an individual's cognitive abilities and positively impact the learner's performance. They are based on the principles of cognitive psychology, which studies consciousness, thinking, and related mental processes. When defining the content of a lesson, the teacher must not forget that the primary goal of their work is to teach students skills and competencies, especially since students are engaged with non-standard methods of information delivery. The greater the unconventionality of the teaching method, the more actively students engage.

Pedagogical technologies, as noted by V.V.Guzeev, constitute an element of the integral model of the, pedagogical process, emphasizing the shift from merely expressing learning outcomes to the process of their acquisition (i.e., process-oriented technologies). Below are presented the forms of practical application of these technologies:

–   In the form of research – posing problems, formulating and testing hypotheses, generating ideas and other related activities, including project activities;

–   In a communicative-dialogical, argumentative form – identifying and comparing viewpoints, clarifying positions, selecting and applying evidence.;

–   In the form of games and modeling — within the subject-content scope, i.e., simulation games and socio-psychological role-playing games (Guzeev, 2004, p. 20).

According to V.V.Guzeev (2004), interactive methods are considered among the most effective pedagogical strategies for fostering students' interest in learning. These methods are grounded in purposefully structured group and intergroup activities that focus on both personal development and educational outcomes. They promote mutual exchange of ideas and influence among participants, facilitate the coordination of learning and developmental processes with individual communication styles, and incorporate reflective analysis within an intensive, learner-centered educational environment.

I.Ya.Lerner (1981) and M.N.Skatkin (1986) classified teaching methods into five groups. These methods are presented in a sequence that corresponds to the increasing potential to develop students' qualities such as initiative, independence, and creative approach:

1.   In the explanation and demonstration method, students receive educational information in a "ready-made" form through textbooks or screen-based guides. In this case, students remain within the scope of reproductive thinking.

2.   The reproductive method is a teaching approach based on examples or rules, where the learning activity is carried out in an algorithmic manner.

3.   In the problem-based learning method, before presenting the topic, the teacher formulates a problematic cognitive task and demonstrates ways to solve problems by comparing different perspectives and providing evidence through the use of various sources and resources.

4.   The inquiry-based or heuristic method involves active exploration aimed at solving cognitive tasks in the learning process. This activity is carried out under the guidance of the teacher or based on heuristic instructions.

5.   In the research method, once the goals and tasks are outlined in the form of brief instructions, students independently study relevant literature and perform scientific research activities such as observation and measurement.

R.Safarova, in co-authorship, identified the following

methods as those that activate students' learning activities in situations involving the perception and comprehension of knowledge:

1. The method of introducing innovations into educational content involves incorporating engaging and relevant information into the learning material. Making educational content more vivid, interesting, and conceptually rich helps enhance students' existing knowledge and promotes deeper understanding.

2. The method of enriching the content of educational materials fosters students' interest in uncovering the meaning of learned words, concepts, terms, and information. It contributes to understanding the main ideas presented, establishing interdisciplinary connections, and developing students' imagination.

3. The method of emphasizing the significance of the learning material involves the study of content deemed essential, where the importance is determined by the biological, socio-economic, or practical relevance of the information being presented (Safarova et al., 2013, p.8).

According to several analytical studies, active teaching methods can be conditionally classified into the following groups: methods of individual work with students; group-based teaching methods (practical exercises, lectures); simulation methods (case studies, business games, etc.); non-simulation methods (collective intellectual activity, debates, seminars, lectures); distance learning methods; active academic methods; and others (Goeva & Mironov, 2016; Oshchepkova, 2013; Golubnichaya, 2014; Morozova, 2015; Bakharev & Dragunova, 2014).

M.A.Gofurova argues that, in order to develop students' cognitive activity, it is essential to integrate non-standard problems that require reflective reasoning into the educational content, as well as to implement logical tasks that foster creative competence (Gofurova, 2022, p. 25).

The project-based learning method involves solving a specific task, which requires the application of various approaches on one hand, and, on the other hand, ensures the integration of knowledge and skills from creative fields as well as from science, technology, and engineering disciplines. Therefore, M.M.Rakhimov argues that if the learning process requires solving creative or research tasks, applying research-based methods, or utilizing interdisciplinary knowledge from various fields, it is necessary to employ the project-based learning method (Rakhimov, 2017, p. 381). These methods are applied in the process of planning and executing progressively complex practical tasks that present knowledge to students step by step.

L.I.Govorkova states that in such a process, students' cognitive activity and creative skills develop, critical thinking abilities are formed, and their capacity for independently constructing knowledge and navigating the information landscape is enhanced (Govorkova, 2008).

Integrated education, by its nature, reflects a learner-centered approach, focusing not on the mere formation of students' knowledge, skills, and competencies, but rather on the comprehensive development of their personality. I.I.Tuychieva emphasizes the following aspects of the learner-centered approach in the organization of integrated education: the enrichment of educational content with materials and tasks related to essential, practical knowledge, which motivates learners to solve problems and acquire new knowledge; the congruence of the educator's personality, understood as the alignment of their behavior with their emotions and thoughts and the authentic expression of their true self, which alleviates students' stress and psychological defense mechanisms, allowing them to behave naturally and fully realize their potential; unconditional understanding and acceptance of the child, which leads to the creation of a favorable psychological environment and fosters a positive attitude towards the learner; reliance on the learner's self-activation, identifying and manifesting their internal potential during the educational process, and encouraging personal growth (Tuychieva, 2020, p. 19).

Kh.E.Abdulshehidova conceptualizes the structure of project activities as an interrelated system comprising the following components: motivational (interest in cognition and positive attitude), cognitive (the formation of knowledge and skills), operational-creative (independence and readiness for creative activity), and emotional-behavioral (the attitude towards self-organization and self-analysis, as well as the manifestation of positive emotional experiences) (Abdulshehidova, 2018, p. 19).

As V.I.Zagvyazinsky emphasizes, "independent work facilitates the deepening, expansion, and systematization of knowledge, fosters the motivation to learn, cultivates a persistent desire in the learner to continuously supplement and update their knowledge, and teaches the effective and rational use of time under certain conditions" (Zagvyazinsky, 1990).

The methodology for developing cognitive activity among school students encompasses a combination of game-based and research-oriented situations within the lesson process, the execution of information projects by students, and the use of workbooks designed to facilitate the acquisition of knowledge, skills, and competencies at various levels in the study of the theory and practice of academic subjects. This methodology is based on a lesson planning model for teachers, developed in accordance with the principles of the akmeological approach (Glinsky, 2007, p. 10).

A.Akhmetova recommends using the following teaching methods to develop students' memorization abilities:

"In Search of the Truth": students are provided with a brief historical text containing missing words or inaccuracies. They are tasked with correcting and completing the text, thereby demonstrating their historical knowledge.

"Perceive the Date": dates, images, riddles, or other coded forms are presented to students. By deciphering the codes, they learn to memorize important dates.

"Naughty Numbers": students receive various sets of numbers from which they must construct historical dates. This activity promotes the development of memory and familiarity with dates.

"Black Box": cards containing historical dates, events, or key terms are drawn from a box. Students are required to explain the significance of the information, making this exercise aimed at testing memory..

"Competitions to Write Down Timelines": students are challenged to write as many historical dates as possible on the board from memory. This active memorization activity helps reinforce educational material (Akhmetova et al., 2024).

M.Babaie considers data collection (activity) during laboratory sessions and data analysis (discussion) after the sessions as interconnected and inseparable practical processes. This teaching method involves the cognitive process related to learning, understanding, and processing information, as well as the comprehension of cognitive domains in students' assimilation of educational material. It also emphasizes the development of knowledge and skills, alongside the formation of a positive attitude towards a specific academic subject, which holds significant importance (Babaie, 2017).

According to S.N.Utkina, the primary method of activating students' cognitive processes lies in engaging them in laboratory-practical sessions and solving educational-cognitive tasks that incorporate elements of research and modeling techniques. For this type of activity to be effective, it should include the following stages.:

1)   collecting evidence related to the phenomenon under study;

2)   formulating a scientific hypothesis;

3)   designing and conducting experiments to test the hypothesis;

4)   analyzing the obtained results, comparing them with

similar phenomena and outcomes, and drawing conclusions (Utkina, 2007, p. 17).

L.Alfieri proposes the use of the Socratic method of question-and-answer to cultivate students' interest in acquiring knowledge. This heuristic approach, he argues, enables learners to assimilate scientific knowledge effectively within the educational environment .(Alfieri et al., 2011).

Research-based teaching methods enable students to engage in reasoning aimed at applying theoretical knowledge to solve practical problems. S.Quigley argues that students actively participate, ask questions, and attempt to explore the causes behind scientific phenomena only when the subjects are engaging and interesting to them. The significance of the subject in students' career choices (Quigley, 2014), combined with teachers' readiness to implement research-based instructional methods (Babaie, 2017), emerges as a fundamental factor influencing educational outcomes.

In other studies, the impact of prior knowledge and heuristic teaching methods on students' cognitive engagement has been investigated by C.Liu and W.Chiang. According to the research findings, collaborative heuristic teaching—which involves peer interaction and discussions based on existing knowledge, as well as the exchange of ideas between students and teachers—ensures that learners become informed about new theories and concepts (Liu & Chiang, 2014).

O.V.Shchelkunova's proprietary technology, aimed at enhancing students' personal activity effectiveness, is based on the algorithmization of the lesson process (Shchelkunova, 2012).

N.V.Gafurova argues that problem-based and developmental education create the necessary conditions to enhance students' intellectual activity and are therefore essential for modeling the pedagogical process aimed at students' intellectual and personal development. One of the most significant aspects of problem-based and developmental education is its focus on fostering students' activity and "sense of autonomy" (samost). The student's agency as a subject facilitates the assimilation of educational content and cognitive methods, as well as the establishment of relationships with others and social groups, thereby promoting both intellectual and personal qualities (Gafurova, 2005, p.17-18).

As a result of the teacher's activity aimed at segmenting and clarifying the educational material in the textbook, students begin to engage in deeper reflection on the acquired knowledge and develop critical thinking about the learned content, prompted by the emergence of more questions. The main methods utilized in the effective organization of this process:

1) Problematic situations are created by posing problematic questions, which stimulate students' curiosity, intellectual engagement, emotional uplift, eagerness to learn, deeper acquaintance with phenomena and objects, and foster their intrinsic motivation for knowledge acquisition.

2) Through the investigative method, students are provided with tasks to independently solve; they conduct experiments, make observations, and analyze information obtained from scientific literature.

3) The heuristic method is aimed at enabling students to solve new problems based on their existing knowledge.

4) Using the scientific discussion method during classroom debates, students learn to substantiate and justify their decisions and conclusions [Safarova R. et al., 2013: 9-10].

Y.Morozova and O.Rozhnenko recommend the following technologies to stimulate students' active cognitive engagement in the processes of receiving, processing, understanding, and applying information (cognitive activity):

1) Multimedia learning resources: presenting information in diverse formats using images, sound, animation, and video.

2) Interactive platforms (such as Moodle, Google Classroom, Quizlet): facilitating the organization and assessment of students' independent work.

3) Visualization tools like brainstorming, mind maps, and clusters to structure knowledge systematically.

4) Virtual laboratories and simulators: providing laboratory sessions that approximate practical experience (Morozova & Rozhnenko, 2021).

S.N.Kaznacheyeva and D.I.Gritsenko have included the following among modern methods for developing students' cognitive activity:

1. Multimedia tools activate emotional-personal engagement with the studied material and contribute to the development of professional thinking.

2. The case method teaches students to independently extract and analyze problems from information presented in the form of cases.

Electronic Educational Resources (EER) — a set of software, informational, technical, and organizational tools, as well as electronic publications, which facilitate finding a natural way to transform students into active participants of the learning process (Kaznacheyeva & Gritsenko, 2015).

The instructional tools employed by Y.G.Yudina—including the student workbook, exercise sheets, creative notebook, and the diary titled "My Class and I"—have facilitated students' conscious and independent mastery of academic tasks, thereby supporting the development of their individual educational trajectories and the formation of personal knowledge. The researcher has demonstrated that guiding students toward age-appropriate and age-independent types of activities — engaging them in academic research during lessons, involving them in presentations at clubs, including them in the development of initial group projects through game-based processes, and analyzing their activity experiences via the "My Class and I" diary — helps students select activities based on their own motivation and contributes to the emergence of each student's individual educational trajectory (Yudina, 2005).

S.N.Utkina proposed activating students' cognitive processes by engaging them in laboratory-practical tasks and solving educational-cognitive problems through mastering elements of research and modeling methods. The researcher developed requirements for selecting educational materials and presenting them during lessons with the aim of fostering students' cognitive development:

1. Constantly organizing the transition from graphical language to symbolic and verbal language, and vice versa.

2. Distinguishing the key features and characteristics of concepts within the subject matter.

3. Establishing logical relationships between concepts, including categories such as genus and species.

4. Developing skills to analyze, compare, generalize, and formulate and solve interrelated problems based on the presented material.

5. Linking educational content with experiential meaning — conducting laboratory work and providing examples that demonstrate the practical application of the subject (Utkina, 2007, p. 19).

H.Soatova emphasized that the application of active methods such as innovative problem-based inquiry, small-scale research, debates, discussions, heuristic conversations, and collaborative work in small groups serves to develop students and further enhance their abilities. She emphasized the importance of organizing the learning process based on students' existing knowledge, skills, competencies, and experiences, with particular focus on creating an environment that fosters their engagement, critical thinking, and creativity (Soatova, 2022, p. 482).

A.Z.Khairulaeva and L.M.Buskaeva classified the objectives

of using interactive methods as follows: didactic objectives (broadening worldview; applying knowledge, skills, and competencies in practice; shaping learning motivation and interest in the subject); educational objectives (developing independence, willpower, approaches, positions, moral, aesthetic, and worldview values; fostering cooperation, teamwork, and communication); and developmental objectives (enhancing thinking, memory, attention, speech, comparison, contrast, and analysis skills; developing creative abilities, reflection, and motivation for educational activities) (Khairulaeva & Buskaeva, 2016).

Analysis of the results. The purposeful application of didactic methods and the implementation of tasks aimed at stimulating cognitive activity within the educational process demonstrated a significant intellectual developmental impact on enhancing students' cognitive engagement.

I.F.Kharlamov (2004, p.113) emphasizes that in order to develop students' cognitive activity, it is appropriate to create problematic situations, analyze provided examples and facts, identify the most important rules and questions, compare studied facts and examples, and enrich educational materials with interesting details and sharp aphorisms. These tasks should be designed and implemented in lessons using visual and technical teaching aids.

The results of studies by C.Liu and W.Chiang (2014) experimentally demonstrated that collaborative heuristic learning—which involves interaction and discussion among students based on their existing knowledge, as well as the exchange of ideas between students and teachers—ensures their awareness of new theories and ideas.

It confirms the high effectiveness of technologies and methods that stimulate active cognitive activity aimed at processing, understanding, and applying information in practice to enhance students' cognitive engagement. These results correspond to the scientific conclusions of Y.Morozova and O.Rozhnenko (2021), who emphasized the purposeful use of multimedia resources, interactive platforms, visualization tools, and virtual laboratories to develop cognitive activity. Furthermore, the approach proposed by S.N.Kaznacheeva and D.I.Gritsenko (2015), which involves the integration of the case method and electronic learning resources into the educational process to guide students toward independent knowledge acquisition and the analysis of problem situations, was validated during the research.

Moreover, the active learning methods proposed by H.Soatova (2022) — such as debates, inquiry-based activities, heuristic conversations, and small-group collaboration — proved to be significant factors in increasing students' learning motivation, ensuring their active participation, and fostering creative abilities. The overall findings indicate that modern technologies and active teaching methods positively influence the transformation of students into active participants in the learning process, promote deeper assimilation of knowledge, and support the formation of individual educational trajectories.

Conclusion. The systematic study of teaching methods aimed at enhancing students' cognitive activity demonstrates that this approach shifts the educational process from passive knowledge transmission to active learning, thereby fostering the development of the student as an active subject of cognition. Methods that develop cognitive activity are not merely pedagogical techniques, but didactic mechanisms designed to activate an individual's intellectual activity. Such methods are built on learner-centered educational principles, fostering the student not as a passive recipient of ready-made knowledge, but as an active seeker and creator of knowledge.

From an analytical perspective, such methods can be categorized based on problem-based learning, research-oriented approaches, interactive communication tools, heuristic, and reflective methods. Each method aims to develop students' abilities for independent thinking, problem comprehension, and solution finding. Particularly, activities based on student-to-student collaboration (such as clustering, role-playing, case method, brainstorming, etc.) socially and psychologically support cognitive engagement.

Selecting and applying teaching methods based on such functional criteria not only enhances educational effectiveness but also ensures personal development. Thus, teaching methods aimed at activating students' cognitive engagement should be regarded as one of the most crucial factors in consolidating knowledge, skills, and competencies within the educational process.

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