ALGO-HEURISTIC RESEARCH METHODS AND THEIR APPLICATION IN TEACHING HISTORY

Mnoyan Razmik
Yerevan State Choreographic College,
Republic of Armenia
mnoyan.history@gmail.com
https://orcid.org/0009-0004-7149-5802

Summary

In modern times, the fundamental ideas of heuristic methods and heuristic search systems are being studied, with the aim of their further application in various spheres of human activity, including in the process of training specialists in pedagogy.

Learning using algo-heuristic methods is not limited only to the acquisition of knowledge, skills and abilities, but also focuses on the internal motivations of learning, ensuring the student's self-development and self-education.

Naturally, learning using algo-heuristic methods cannot completely replace traditional learning; however, it can and should be used as a supplement to traditional methods to develop the learner's creative abilities. The learner should be given the opportunity to feel like a full participant in the learning process, when he is not forced to acquire knowledge, but is allowed to acquire it independently, even through trial and error. After all, many great discoveries were made completely by chance.

Learning using these methods is based on certain principles. Personal goal-setting of the learner, selection of meta-subject bases of educational content, teaching productivity, priority of the learner's educational product, situational learning, the ability to conduct effective dialogue, form skills, act in an uncertain situation, set an educational goal, achieve it, draw up a plan and find various tricks for solving problems - that is, the methods of algo-heuristics are a set of logical techniques and methodological rules of theoretical research and the search for truth - methods of teaching and upbringing that contribute to the development of individual ingenuity and activity.

Keywords. Heuristics, algorithmic patterns, methodology, method, technique, algo-heuristic methods.

Relevance of the article. The relevance of this topic is due to the fact that the growth of modern pedagogical and technological resources worldwide requires the use of algo-heuristic methods as a result of heuristic research methods and algorithmic patterns, as well as such important qualities inherent in critical thinking as developed creative and analytical thinking, the ability to achieve goals, initiative, resourcefulness, and the ability to make quick and accurate decisions.

Purpose of the article. In pedagogy, algo-heuristic methods - heuristic research methods and algorithmic patterns - are used to solve problems as an alternative means, therefore, the purpose of the article is to analyze the use of algo-heuristic methods in history teaching, which will significantly contribute to the development of students' abilities to understand and creatively use the ways and methods of effective cognitive activity, to systematize educational information and apply it in heuristic search, to adapt to new conditions of activity and predict their results, which are based on heuristic actions.

Scientific novelty. We have studied and tested the use of algo-heuristic methods are heuristic research methods and algorithmic patterns in history lessons, and we have made certain observations about their effectiveness.

Methodological foundations of the article. Among the variety of teaching methods, a special place is occupied by algo-heuristic methods, thanks to which teachers develop in students a creative approach and the ability to find non-standard solutions to problem situations.

Theoretical and practical significance of the research. As a result of the study of the problem, professional literature was analyzed, and justifications were drawn about the importance of modern applications of algo-heuristic methods.

To theoretically substantiate and experimentally verify the advantages of the applicability of algo-heuristic methods in pedagogy: heuristic research methods and algorithmic patterns, which will not only contribute to the awakening of a creative approach in students, but also facilitate their active participation in solving the problems posed by the teacher.

Synopsis of the main material: Algo-heuristic methods as heuristic research methods and algorithmic patterns, which, by somewhat limiting the search for possible solutions to the problem, reduce the time for solving the problem. The use of these methods (brainstorming, inversion, synectics, etc.) usually leads to many innovative ideas and fundamentally new approaches to solving various problems. Algo-heuristic methods are widely used today, as they stimulate the development of intuitive thinking, imagination and creativity.

Today, in many countries of the world, the problem of creating methodological conditions for the development of heuristic abilities of students is relevant. It should be noted that creative inclinations are inherent in all students, but the difficulty lies in choosing the right approach to their disclosure and development. Students must not only master the material of the school curriculum, but also be able to find a creative solution to any problem. This is possible only as a result of pedagogical activity, which will create the necessary methodological conditions for algo-heuristic teaching methods (2, p. 15).

There is one main feature in teaching algo-heuristic methods, which is the study of educational standards, with which and in connection with which the personal creative activity of the learner changes places. First, the learner independently creates an educational product, and only then should he compare it with the achievements fixed by educational standards. In such cases, the learner has the opportunity to master both the standards and independent creative activity (9, p. 212).

Heuristic research methods. The main principle of heuristic research methods is search, which initially gives the student a desire to search, find possible solutions and achieve a certain result. First of all, this desire manifests itself at the subconscious level of the student: the student "loves the subject", considering it neither difficult nor boring. It is this period that is considered the most favorable for the formation of conditions, personal progress, mastery of the subject and the accumulation of skills. That is, for the student, heuristic learning is a continuous discovery of new phenomena.

Through the use of heuristic research methods, first of all, cognitive and research interest awakens in the student much more actively and quickly. The possibilities for research work among students are enormous. First, it is a powerful stimulus for learning, and then it is a diverse and strong motivation.

Secondly, the study activates the mental processes of the participants in this activity: attention, memorization, interest, perception, thinking. During the search and research work, an intellectually passive child is able to perform work that seems completely inaccessible to him in a normal educational situation.

Research work, which serves as a kind of practice for students to accumulate and use knowledge acquired in the classroom and outside the classroom, helps to develop such skills.

The student's personal learning experience becomes a component of his education, which contributes to the gradual formation of the content of the lesson (8, p. 112). Therefore, these methods allow us to continue working on the development of creative potential using other methods.

When teaching these methods, the most preferred and applicable heuristic teaching methods for developing students' research skills are: (5, p. 18)

Heuristic question method (quintilian) - To find information about an event or object, the following basic questions are asked: who, what, why, where, how, when? The answers to these questions and their various combinations give rise to unusual ideas and solutions regarding the object under study.

Method of semantic vision - Simultaneous focus on the educational object of physical vision and an inquisitive mind makes it possible to understand (see) the main cause of the phenomenon, the idea contained in it, the original meaning, that is, the inner essence of a person or phenomenon, and also, as with the previous method, it requires the formation of a certain mood in the student, consisting of active sensory-mental cognitive activity. Exercises on the targeted application of this method lead to the development of students' cognitive qualities, forming imagination, intuition, and insight.

Brainstorming - The main goal of this method is to collect as many ideas as possible, create a relaxed atmosphere, freeing participants from both inertial thinking and stereotypes. The work is organized in the following nodes: generation and evaluation of ideas, analysis of the problem situation, emergence of counter-ideas.

Synectics method - This method is based on the brainstorming method, various types of analogies (verbal, inverse, personal), inversion, associations, etc. First, the general characteristics of the problem are discussed, analogies are created and developed, the use of analogies to understand the problem, select alternatives, search for new analogies, return to the problem, and primary solutions are proposed.

Morphological box method or multidimensional matrix method - The goal of the method is to find new, unexpected and original ideas by bringing together different combinations of known and unknown elements. The analysis of features and connections obtained from combinations of different elements (devices, processes, ideas) is used both to identify problems and to search for new ideas.

Inversion method or reversal method - When stereotypical methods become unproductive, an alternative solution that is fundamentally the opposite is used.

When conducting research on this methodology of developmental learning, it should be understood that the original answers of students and the creative approach to searching for information on each problem of the lesson topic are an important criterion for the quality of the heuristic task.

Algorithmic patterns methods. Algorithmic patterns methods are also called partial search. Algorithmic patterns are algorithms for intuitively solving problems and are based on process analysis, decision-making, intuition, ingenuity, analogies, and experience. Today, the use of algorithmic patterns in teaching is considered quite effective and innovative. Algorithmic patterns describe a series of steps that must be performed sequentially, that is, they are systematic sequences of steps (actions). The student independently searches for a solution to the problem under the supervision of the

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teacher. These methods are very effective methods based on the complete independence of students. Therefore, the awareness of the need to orient the educational process, the problem of developing methodological conditions in which algorithmic patterns methods can be used, are necessary for the development of students' cognitive, creative abilities, are among the most urgent problems of teaching (3, p. 217).

Algorithmic patterns contain the following properties and requirements:

Discreteness - The features of an algorithmic pattern should consist of separate simple actions that follow each other - steps, and these intended steps should be selected sequentially and correctly, which will lead to the required result.

Specificity - Based on historical data, there should be certain, sequential, understandable, user-interpretable steps of algorithmic patterns, and after each step it should be indicated what the next step will be.

Clarity - Each step of algorithmic patterns should be clear and unambiguous, with only one possible meaning; otherwise vague instructions will lead to inaccurate results. One of the most important tasks of algorithmic patterns is the analysis of the resulting database.

Algorithmic pattern methods contain transformation (transformation) operations that increase the probability of finding the main idea of solving a problem and make it possible to reduce its solution using algorithms. The technique of these patterns is the basis of creative solutions to any problem (7, p. 37).

In our opinion, algorithmic pattern methods should be understood as a kind of generalized algorithm that contains steps on the possible choice of actions, after which only the decider can identify and implement connections in a problem situation.

The instructions of these patterns serve as a guide in the process of solving problems; therefore they should be considered as methods of organizing activities for solving a certain class of problems.

Russian educational psychologist L. M. Fridman (11, p. 185) believes that, depending on the nature of the actions, the basis of the steps of the actions can be represented by special algo-heuristic steps. Algo-heuristics consists of a system of instructions and guidelines with the help of which a person, when faced with a problem, can draw up a plan for its solution or even algorithms for solving all problems of this class.

Teaching algo-heuristic methods can combine both creative and cognitive activity. The teacher should not give the student ready-made knowledge, providing the material - for example, a historical event, a natural phenomenon, modeling material, etc. On its basis the student should create the result of his activity, for example, a hypothesis, a mind map, a text, a model, a diagram. The result of the student's creative activity, as a rule, can be completely unpredictable; it depends on the student's personality. Only then, with the help of the teacher, should the learner compare the result with known achievements in this field (analogs in the natural sciences) and reinterpret it (4, p. 355).

In the process of applying algo-heuristic methods, it is necessary:
- stimulation of students' creative abilities,
- creation of motivation (motivation) for independent work,
- introduction of algo-heuristic methods into the educational process with a gradual complication of tasks.

In the operation of algo-heuristic methods, organizational, psychological, methodological and other processes ensure both creative and cognitive activity (6, p. 3).

The founder of Russian educational psychology, Pyotr Kapterev (1849 - 1922), was also a supporter of heuristics. He believed that in secondary schools it is necessary to use a heuristic form of teaching, that is, to organize the educational process in such a way that students themselves discover and develop knowledge: *"Do not teach children general concepts, general rules, general laws and formulas dogmatically. Instead, force them to compare objects on their own, to find similar and different features between them and, based on the similarities and differences discovered, to group them into types, to form concepts and definitions about them. Force them to observe the connections and relations of objects and to express the constant relations observed between them in general formulas and laws. Do not tell them these formulas and laws yourself, but only follow their correct development, guide them so that they do not deviate from the straight path"* (10, p. 215).

Currently, algo-heuristic methods are understood as:

• a system of learning through leading questions

• a set of logical techniques and methodological rules of theoretical research and truth-seeking. Teaching methods that contribute to the development of ingenuity and activity.

The task of algo-heuristic methods is a form of presenting educational information, which, together with a given condition and unknown data, contains instructions and requirements for students for their heuristic educational activities aimed at obtaining a personally significant educational result. Most of the tasks of these methods are communicative in nature and provide effective creative activity for the student.

The general structure of the task includes two groups of elements: main and components.

The main elements - the main structural components of the task of algo-heuristic patterns are:

• the name of the task,

• the condition and the requirement for its implementation.

And the constituent elements include:

• educational object,

• known data about the object,

• desired educational product,

• technological requirements.

Algo-heuristic methods of teaching imply the rejection of specific ready-made knowledge, as well as its reproduction, everything is based on the extraction and search of any information, which in the conditions of modern life and scientific and technological progress very quickly becomes obsolete (1, p. 114). Accordingly, the student is presented with new requirements for personal and professional development; therefore, students must develop qualities that can help them meet the requirements of society, in particular, initiative, the ability to make quick but correct decisions, which are impossible without the ability to creatively approach work.

The basis for the successful assimilation of the material for students in any academic subject, including history, is a cognitive need, which is based on the emotional perception of the surrounding world and the attractiveness of the process of activity itself. The study of history is a particularly fertile field for research.

Algo-heuristic research methods used in teaching history help students to best realize their own creative self-development abilities. Algo-heuristic methods require

methodological skills and high training from the teacher. Simply posing the initial problem during a lesson with complex content is not a sufficient condition. The ability to effectively conduct a lesson using algo-heuristic methods in order to fully understand the essence of the problem is an indicator of the teacher's cooperative learning and professionalism.

The task posed to the students defines the main logical direction in which the lesson conducted using algo-heuristic methods proceeds.

A history lesson we taught in high school, during which

"The speeches of Marcus Junius Brutus and Mark Antony in Rome, and the study of speeches after the assassination of Julius Caesar" methods of heuristic research and algorithmic patterns - Heuristic Questions and Heuristics Inversion (Reversal) - were applied to the topic, which were aimed at the learner's creative self-realization and individualization of the learning process.

Lesson Objective: In order to correctly understand the material, with the help of selected facts, the teacher clearly outlined the logical process: interpretation, idea, assessment, conclusion, and stimulating the students' thinking, formulated the main important content element of the lesson, the algo-heuristic task, which, on the one hand, was "open" and did not have a single solution, and on the other hand, was "based" on the educational standard and program of the subject.

Task I.	Task II.
The students, discussing **Marcus Brutus' speech,** applied the properties of certainty and **discreteness of algorithmic patterns,** analyzed the course of events, emphasized the sequential steps in the speech, and substantiated their points of view.	The students reflected on **Mark Antony's** emotional speech, used the **inversion method of heuristics,** conducted a discussion-analysis, and expressed various opinions.

Students, dividing into two groups, exchanging opinions, clashing them, and choosing arguments, developed the skills and abilities to formulate and defend their own position, listen to the opinions of the opposing group, and be patient with different assessments.

During the discussion, their own reflections, selecting and comparing facts, forming an idea about the given era, historical figures, their characteristic features, activities, and contradictions, under the guidance of the teacher, the students divided the problem into small tasks containing mental operations, through sequential steps, searching for patterns and based on the initial data of the problem, separating unimportant parts, expressed various opinions and viewpoints. Their answers and their various combinations gave rise to unique ideas about the event and historical figures under study.

The use of algo-heuristic methods during history lessons significantly helped students not only maintain interest in the material being studied, but also, by strengthening their creative and self-development foundations, achieve the desired result in solving the problem related to the given event.

Conclusion

School age is an age of inquisitive thinking, insatiable desire for knowledge, searches and energetic activity. All schoolchildren, without exception, love collective forms of performing tasks, which are based on joint and diverse actions.

Currently, the primary goal of general education is to create conditions for the self-realization of the student's personality. Therefore, the basis of the ideology of education is the idea of development, the implementation of which is associated with the improvement and intellectualization of the educational process.

Algo-heuristic methods make it possible to achieve a solution to a number of educational problems in the field of pedagogy, to create conditions for free, talented, physically healthy, knowledge-enriched, conscious labor activity and moral behavior of students. Algo-heuristic methods belong to the category of active methods. The main idea of using these methods is the acquisition of new experience and cognitive activity aimed at finding a non-standard solution to an existing task or problem. Therefore, the ultimate goal of learning using algo-heuristic methods is not the acquisition of specific knowledge, but the creative self-realization of the learner.

АЛГО-ЭВРИСТИЧЕСКИЕ МЕТОДЫ ИССЛЕДОВАНИЯ И ИХ ПРИМЕНЕНИЕ ПРИ ПРЕПОДАВАНИИ ИСТОРИИ

Мноян Размик
Ереванский государственный хореографический колледж,
Республика Армения.
mnoyan.history@gmail.com

Аннотация

Краткое введение. В современную эпоху исследуются фундаментальные идеи эвристических методов и эвристических поисковых систем с целью их дальнейшего применения в различных областях человеческой деятельности, в том числе и в процессе подготовки педагогических кадров.

Обучение истории с использованием алгоритмо-эвристических методов не ограничивается приобретением знаний, навыков и умений, но и фокусируется на внутренних мотивах обучения, обеспечивая саморазвитие и самообразование учащегося.

Естественно, обучение алгоритмо-эвристическим методам не может полностью заменить традиционное обучение, однако его можно и нужно использовать как дополнение к традиционным методам для развития творческих способностей обучающегося. Обучающемуся следует предоставить возможность почувствовать себя полноправным участником процесса обучения, когда его не заставляют приобретать знания, а позволяют приобрести их самостоятельно, пусть даже методом проб и ошибок. В конце концов, многие великие открытия были сделаны совершенно случайно.

Обучение этим методам основано на определенных принципах: личностное целеполагание обучающегося, выбор метапредметных основ содержания образования, продуктивность обучения, приоритетность образовательного продукта обучающегося, ситуативное обучение, умения вести эффективный диалог, развивать навыки, действовать в незнакомой ситуации, ставить образовательную цель, достигать ее, составлять план и искать различные приемы решения задач, т.е. методы алго-эвристики представляют собой совокупность логических приемов и методических правил теоретического исследования и поиска истины – методов обучения и воспитания, способствующих развитию индивидуальной изобретательности и активности.

Ключевые слова: эвристика, алгоритмические закономерности, методология, метод, техника, алго-эвристичекие методы.

ԱԼԳՈ-ԷՎՐԻՍՏԻԿ ՀԵՏԱԶՈՏԱԿԱՆ ՄԵԹՈԴՆԵՐԸ ԵՎ ԴՐԱՆՑ ԿԻՐԱՌՈՒՄԸ ՊԱՏՄՈՒԹՅԱՆ ԴԱՍԱՎԱՆԴՄԱՆ ԸՆԹԱՑՔՈՒՄ

Մնոյան Ռազմիկ

Երևանի պարարվեստի պետական քոլեջ,
Հայաստանի Հանրապետություն
mnoyan.history@gmail.com

Ամփոփում

Համառոտ ներածական: Արդի ժամանակաշրջանում հետազոտվում են էվրիստիկ մեթոդների հիմնարար գաղափարները և էվրիստիկական որոնման համակարգերը՝ նպատակադրվելով դրանց հետագա կիրառմանը մարդկային գործունեության տարբեր ոլորտներում, ներառյալ մանկավարժության մասնագետների պատրաստման գործընթացում:

Ալգո-էվրիստիկ մեթոդներով ուսուցումը չի սահմանափակվում միայն գիտելիքների, կարողությունների և հմտությունների ձեռքբերմամբ, այլ կենտրոնանում է ուսուցման ներքին շարժառիթների վրա՝ ապահովելով աշակերտի ինքնակրթությունն ու ինքնազարգացումը:

Բնականաբար, ալգո-էվրիստիկ մեթոդների ուսուցումը չի կարող ամբողջությամբ զբաղեցնել ավանդական ուսուցման տեղը, սակայն այն կարող է և պետք է օգտագործվի որպես ավանդական մեթոդների լրացում՝ սովորողի ստեղծագործական կարողությունները զարգացնելու համար: Սովորողին պետք է հնարավորություն ընձեռվի զգալու որպես ուսումնական գործընթացի լիարժեք մասնակից, երբ նրան ոչ թե ստիպում են ստանալ գիտելիք, այլ թույլ են տալիս ինքնուրույն ձեռք բերել այն, թեկուզ փորձի ու սխալի միջոցով: Ի վերջո, շատ մեծ հայտնագործությունները բոլորովին պատահական են կատարվել:

Այս մեթոդների ուսուցումը հիմնված է որոշակի սկզբունքների վրա՝ սովորողի անձնական նպատակադրում, կրթության բովանդակության մետատարրայական հիմքերի ընտրություն, ուսուցման արտադրողականություն, սովորողի կրթական արտադրանքի գերակայություն, իրավիճակային ուսուցում, արդյունավետ երկխոսություն վարելու, հմտություններ ձևավորելու, անոնց իրավիճակում գործելու, կրթական նպատակ դնելու, դրան հասնելու, ծրագիր կազմելու և ինդիրների լուծման տարբեր հնարքներ գտնելու կարողություններ, այսինքն՝ ալգո-էվրիստիկայի մեթոդները տեսական հետազոտության և ճշմարտության որոնման տրամաբանական տեխնիկայի և մեթոդական կանոնների մի շարք են՝ ուսուցման և դաստիարակության մեթոդներ, որոնք նպաստում են անձի հնարամտության ու գործունեության զարգացմանը:

Բանալի բառեր ՝ *Էվրիստիկա, ալգորիթմային օրինաչափություններ, մեթոդաբանություն, մեթոդ, տեխնիկա, ալգո-էվրիստիկ մեթոդներ:*

References

1. Andreev V. I. "Heuristics for creative self-development". Kazan, 1994. - p.237
2. Bakulevskaya S. S**.** "Formation of intellectual and creative activity of high school students in the process of solving heuristic problems". [Text]: author's abstract. dis. candidate of ped. sciences: / S. S. Bakulevskaya; Volgograd State Pedagogical University. Volgograd, 2001. - p.23
3. Voronin V. N. "Integration of heuristic and technological approaches to designing didactic complexes in a university". [Text] Mir, Tolyatti. 2003. - p. 274

4. Vygotsky L. S. "Psychology of child development". [Text] / L. S. Vygotsky. Eksmo-Press, Moscow. 2003. - p.512

5. Khutorskoy A. V. "School of free development". Noginsk. 1995. - p.196

6. Khutorskoy A. V. "Heuristic learning as a technology of creative self-realization of students and a prerequisite for their success in life". [Electronic resource] // Internet journal "Eidos". http://www.eidos.ru/journal/2006/0829.htm (date of access: 03/18/2018). 2006.

7. Khutorskoy A. V. "Heuristic model of activity formation". [Text] / A. V. Khutorskoy // Additional professional education of a teacher: experience and development trends: Proceedings of the interregional scientific and practical conference: part II. Ekaterinburg. 1998. - pp. 31-43.

8. Khutorskoy A. V. "Heuristic methods as a tool for innovative learning". [Text] / A. V. Khutorskoy // Innovations in comprehensive school. Teaching methods. Collection of scientific papers / ed.-in-chief A. V. Khutorskoy. GNU ISMO RAO, Moscow. 2006. - pp. 108-118.

9. Khutorskoy A. V. "Heuristic learning: theory, methodology, practice". [Text] / A. V. Khutorskoy. - International Pedagogical Academy. Moscow.1998. - p.266

10. Kapterev P. F. "Heuristic form of teaching in public school". [Text] // Anthology of pedagogical thought of Russia in the second half of the XIX – early XX centuries / P. F. Kapterev. Pedagogy, Moscow. 1990. - 307 p.

11. Friedman L. M. "Psychological handbook of the teacher". [Text] / L. M. Friedman, I. Yu. Kulagina. Education, Moscow. 1991. - 288 p.