ТЕХНИЧЕСКИЕ НАУКИ И ТЕХНОЛОГИИ

АҚПАРАТТЫҚ ЖҮЙЕЛЕР
ИНФОРМАЦИОННЫЕ СИСТЕМЫ
INFORMATION SYSTEMS

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THE METHOD OF ASSESING ACADEMIC GIFTEDNESS BY ANALYZING THE MENTAL MAP

СТУДЕНТТІҢ АКАДЕМИЯЛЫҚ ДАРЫНДЫҒЫН БАҒАЛАУ ӘДІСІ РЕТІНДЕГІ ОЙ КАРТАЛАРЫН ТАЛДАУ

АНАЛИЗ МЕНТАЛЬНЫХ КАРТ КАК МЕТОД ОЦЕНКИ АКАДЕМИЧЕСКОЙ ОДАРЕННОСТИ СТУДЕНТОВ

Abstract. The article deals with the development of academic talent in the context of the modular concept, and the creation of information conditions for learning in computer science lessons. Today, the authors of the article are developing mind maps, drawing up concepts according to the principle - from the whole to the particular. Mind maps activate creative thinking, which allows students to see important facts in the lesson that traditional analysis missed.

The mind map provides an opportunity for everyone, as this tool is a mirror of thinking. Since the mind map is a product of individual mental activity, the options for compiling and designing the scheme were experimented with the choice of the optimal ones.

Keywords: giftedness, digital technologies, mind map, modular concept.

Аңдатпа. Мақалада модульдік концепция контекстінде академиялық дарындылықты дамыту, сонымен қатар информатика сабақтарында оқыту үшін ақпараттық жағдай жасау мәселелері қарастырылған. Бүгінгі таңда мақала авторлары ақыл-ой карталарын жасауда, тұжырымдамаларды тұтастан жекеге дейін принцип бойынша құруда. Ақыл-ой карталары шығармашылық ойлауды белсендіреді, бұл студенттерге дәстүрлі талдау жіберіп алған сабақтағы маңызды фактілерді көруге мүмкіндік береді.

Ақыл картасы әр адамға мүмкіндік береді, өйткені бұл құрал ойлау айнасы. Психикалық карта жеке адамның психикалық әрекетінің өнімі болғандықтан, оңтайлысын таңдау арқылы диаграмманы құрастыру және жобалау нұсқалары тексерілді.

Түйін сөздер: дарындылық, цифрлық технологиялар, ақыл-ой картасы, модульдік түсінік.

Аннотация. В статье речь идет о развитии академического таланта в контексте модульной концепции, а также о создании информационных условий для обучения на уроках информатики. Сегодня авторы статьи разрабатывают интеллект-карты, строя понятия по принципу – от целого к частному. Интеллект-карты активизируют творческое мышление, что

позволяет учащимся увидеть важные факты на уроке, которые упустил традиционный анализ.

Интеллект-карта дает возможность каждому, так как этот инструмент является зеркалом мышления. Поскольку ментальная карта является продуктом индивидуальной мыслительной деятельности, были опробованы варианты составления и оформления схемы с выбором оптимальных.

Ключевые слова: *одаренность, цифровые технологии, интеллект-карта, модульная концепция.*

Introduction. The problem of the ratio of giftedness, natural inclinations and intellectual development of students is an important issue for today. Until recently, the introduction of IT in education was weakly associated with the long overdue transformation of the educational process. Digital technologies were perceived as just another tool for traditional workflows. By analogy with other areas of the educational process, the reforms provide an opportunity to review and optimize the used sets of information technologies, including modern IT for the technologization of all types of work in the classroom, thereby developing giftedness and talent in the information space of the 21st century. Any modern society needs talented people, and the task of society and the school is to see, understand, support and develop the individuality of each child in a timely manner. The competence-based approach to learning includes the development of a set of personal qualities that are reflected in the formation of functional literacy, a culture of critical thinking, the ability to act in a changing environment, and the social mobility of the student as a whole.

One of the important factors that create the prerequisites for the successful teaching of gifted children by means of computer technology is that such children are highly independent in the educational process, since these technologies provide the skills to process visual, sound and audiovisual objects for the implementation of interdisciplinary connections.

The development of special computer training programs that expand the possibilities of introducing new methods and forms of self-education and self-development, as well as the computerization of knowledge control, will contribute to the implementation of the principle of individualization of education.

Materials and research methods. For the study, the intellect cards of students and the Williams method were used. The model is designed based on the analysis of the mind maps of students. The development of this model is an interactive process, so the Williams method was used in the study.

Results and discussions. When working with gifted students of an academic orientation, information technologies are used in the form of the following types of lessons (Table 1).

Table 1. Types of informational lessons

№	Lesson Types	Primary Target Content
1.	Media lesson	Provides the development of academic, intellectual, creative and personal abilities of children. The lesson depends on how methodologically and technologically competently designed. Media lessons attract the attention of children, develop imaginative thinking and create a constant interest in the subject.
2.	Internet Olympiad in subjects	Online Olympiads in subjects are Olympiads that take place in real time. Participation in the Olympiad takes place on the Internet. A number of advantages: the algorithm of actions is automated. The results can be seen after its completion. Tasks of a high level of complexity.
3.	Internet testing	A convenient method for assessing students' knowledge and abilities
4.	Interactive lessons	Immersion in one topic of the course section using digital educational resources for high school students, which allows conducting trainings in preparation for the exam.

Thus, from the point of view of didactics, the idea of developing academic talent as the creative abilities of each student means providing a variety of activities using information technology. The essence of the concept of "academic giftedness" can be expressed by the formula: motivation + intelligence + creativity = children's giftedness. Such an understanding of giftedness allows us to express our own ideas, which formed the basis for the development of theory and practical pedagogical work on the development of academic giftedness. Gifted students should be oriented towards the following priority areas as the ability to think and be creative (of course, to varying degrees), which are easily seen when analyzing the currently existing Internet resources for gifted children and teachers working with them (Table 2).

Table 2. Priority areas of work with gifted students using information technology

№	Priority directions	Content Purposefulness
1.	Using the Internet	dissemination of information about the specifics of teaching gifted children, methodology, psychology, etc.; access to various target groups of interested readers; creation of network communities of Internet users dealing with giftedness;
2.	Online testing	selection of gifted children
3.	Psychological and methodological counseling	assistance to families in which gifted children receive home education
4.	Remote individual support	support for gifted students by creating a network of specialized sites and portals that tell about scientific research, methodology for organizing and conducting independent and group scientific research.

Thus, the use of innovative technologies by gifted students in educational activities allows them not only to carry out their effective learning, but also to enrich the content of the activity. This is important because, on the one hand, it increases the convenience and efficiency of learning, but also allows students to naturally introduce innovative components into the culture of subjects, which stimulates the study and expansion of the range of knowledge, taking into account new forms and technologies in the educational process, and creating comfort for sensory sensations in the new socio-economic conditions of life. Today's students must be able to act independently, make decisions and adapt flexibly to changing conditions of life.

It is clear that this problem cannot be solved by traditional teaching methods: it is necessary to create an environment at school that provides the following opportunities and is already being created by us:

– involve each student in an active cognitive process;

– work together to solve various problems;

– wide communication with peers from other schools, regions, countries;

– free access to the necessary information in information centers around the world to form their own reasoned opinion on various issues.

The importance of the content of training and its task to teach how to use IT technologies. Therefore, it is already necessary to organize the educational process on the basis of modern information and communication technologies, where electronic means are often used as a source of information, primarily the global telecommunication networks of the Internet.

In recent years, new directions have emerged for the development of academic talent on a modular basis with the creation of an information environment for learning.

Improving the system of didactic orientation of informatization of the educational process in the context of the overall development of talents led us at the beginning to the idea of developing a concept for the development of information competence of students within the

school. At the same time, the development of giftedness is ensured through the development of the individuality of schoolchildren.

At the heart of the modular concept, we have laid the issues of linking pedagogical theory with the practice of orienting the educational process. Optimal decision-making by students in terms of theoretical psychological and pedagogical knowledge requires special competencies from them. Therefore, the system for the development of academic giftedness in children should not only equip them with academic knowledge, but also teach them to apply them in practice, while maintaining psychological comfort.

Full-time forms of child development in our modular concept for the development of academic giftedness make it possible to take into account the specifics of their involvement in the development of their own talent.

The modular concept assumes a rigid "prescription" of all components of the didactic system and stages of the educational process, structuring and consistent presentation of the content of training, algorithmization of the design of mind-maps aimed at managing the educational and cognitive activities of students.

The modular component of the concept is the organization of individual work by regulating monitoring changes in the growth of students and the development of their knowledge, but with a careful selection of the content of theoretical knowledge, individualization of giftedness and psychology of giftedness in the educational process.

Today, we do not deny that the processes of informatization in modern society are closely connected with reforms in the education system. With the introduction of such changes, the positions of the competence-based approach were revealed, which raises the question for us: how to form educational and cognitive competencies of the academic orientation of the giftedness of students in the learning process?

There are many modern information technologies for learning, ways to form universal academic learning activities in computer science lessons for gifted children. And this, in our opinion, led to the idea to connect academic talent with work on the culture of informational thinking through mind maps, which is based on the research of Tony Buzan.

Drawing up a mind map is an unusual type of activity, a game, and we can say that this is a universal way of working with information, where a student can draw a mind map on a variety of topics in an introductory lesson, consolidation, generalization of knowledge gained.

Presenting a new mind map module in the form of an information diagram, the teacher makes changes to the set of skills for using diagrams and pictures in the test, which makes it easier for students to translate, understand and remember the meaning of new terms and concepts.

Therefore, the process of studying the topic is not tiring, as students will be able to experiment, invent different forms of mental maps, their symbols, pictures.

The developed set of features of working with mind-maps in our study will reveal the normative side of students' logical thinking based on the content of the subject area "Culture", "Logic", because:

a) logic as a science as a whole is relevant, since it contains knowledge about concepts and categories, any areas of knowledge and ways of thinking in the field of human activity.

And this turned out to be important in describing the mind map as a graphic expression of the thinking process and is characterized by the main features and properties (Table 3).

Table 3. The main features and properties of the description of the mind map

№	signs	properties

1.	visibility (it can be seen with one glance; the whole problem with numerous sides and faces is right in front of you);	attractiveness (bright, colorful, so that it was not only interesting to consider it, but also pleasant);
2.	informative (mind map helps to identify the lack of information);	creativity (stimulates creativity, helps to find non-standard ways to solve a problem).

There are rules for creating mind maps developed by Tony Buzan. The very process of creating a mind map stimulates the creativity of students, because both the right and left hemispheres of the brain are actively involved in its creation, which does not happen when working with ready-made schemes. It is important to note that the mind map is, first of all, a thinking technique, and not a way to fix the result, i.e. the most important thing is the process of obtaining new knowledge. Drawing up a mind map can be called visualization of thinking.

In order for the logical diagram to be filled in correctly, before starting work, students are given an algorithm for filling out a mind map on this topic and an understanding of its advantages (Table 4).

Table 4. The main features and properties of the description of the mind map

№	Steps	Description of the mind map
1.	Step 1: Definition of the key concept.	time saving ease of filling in information
2.	Step 2: Getting to know the concepts of the topic being studied, which should be included in filling out the mind map.	development of logical, creative and associative thinking;
3.	Step 3: Determining the number of sectors in relation to the concepts of the first level	visibility of the structure and logic of the relationship
4.	Step 4: Filling the first sector with content I; II; III order according to the plan of the topic under study	focus on the main idea and the secondary visual vividness of perception in a clear structural order

The mind map allows students to build cognitive learning activities in a certain order (Table 5).

Table 5. The structure of cognitive actions

№	Mind map steps	Structure of cognitive actions
1.	Step 1: key concepts.	independent selection of terms and concepts of the topic; creation of activity algorithms for solving problems of a creative and exploratory nature.
2.	Step 2: Topics included in the mind map	independent selection of terms and concepts of the topic; creation of activity algorithms for solving problems of a creative and exploratory nature.
3.	Step 3: first level concept	structuring terms and concepts; building a speech statement and a language statement in the form of an oral and written response;
4.	Step 4: Topic Content Sector	reflection of the ways and conditions of action, control and evaluation of the process and results of activities.

Based on this, in our study we determined the main directions for assessing the development of children's creative, academic abilities: the development of the qualities of creativity in thinking. The assessment of the first level of academic giftedness includes a number of tasks aimed at developing the ability to work with the content and form of information: for example, create a presentation using PowerPoint, or an educational film made in Movie Maker with audiovisual accompaniment.

Mind maps can make it possible to work both individually and as a team. Revision of mind maps after a certain time will help to learn the topic of the lesson as a whole, remember new terms and concepts that helped to activate the processes of memory and thinking. But, for this, in our modular concept, the stages of development of academic talent have been developed (Table 6).

Table 6. Stages of development of creative abilities

Stages of development of creative abilities	Kind of activity	Performance results
Preparatory	Imitation, imitation	Mastering the standards of creative activity, technologies, means, methods of sensory, emotional experience
Basic	Transformations	Application of mastered by step-by-step actions, taking into account creative needs
Final	Alternative	Individualization and the formation of a creative style

For the manifestation of creative abilities as a type of academic talent, one type of environment is needed - a creative academic environment, characterized by the following features:

- optimal motivation, taking into account the average level of motivation for success (York-Dodson's law: the text was reproduced at a moderate level) and the lack of a competitive spirit and the lack of motivation for social approval;

- a calm atmosphere, characterized by the absence of threats and coercion, the acceptance and motivation of any idea, free action and the absence of criticism.

This creative environment is a complex (non-linear) educational environment. The non-linear educational environment provides a positive dynamics of cognitive, creative students at the stage of self-realization.

This creative educational environment is a complex (non-linear) creative academic environment. A non-linear educational environment will ensure the positive dynamics of the processes of cognition, creativity, self-knowledge, self-actualization shown on the table 7.

The structure of personality self-development can be represented by the following components:

Table 7. The structure of personality self-development components

Self-development of personality				
Self-knowledge	self-definition	self-control	Just-realization	Self improvement
↓	↓	↓	↓	↓
method	goal	activity	facilities	conditions

The creative educational environment is connected with practical creative technologies by the state of affairs and has the characteristics of academic creativity in its characteristics, but there are also differences: it relies on visual-figurative and visual-effective components of think-

ing.

The very process of technical creativity is reflected in the invention, design and its products - mechanisms, structures that meet the needs of practice, its rationality and usefulness.

Thus, creative technology as a form of activity and creativity, as a constant set of properties, contributes to the search for a new, original, atypical and ensures the promotion of social development.

The problem of diagnosing the level of growth of students' creativity – academic giftedness includes a certain set of mental and personal qualities that contribute to creative self-expression, emphasizing the possibility of using open-type tasks to assess the level of forced creativity.

Thus, to assess the level of development of creative abilities in the study, we propose to use the criteria for assessing learning tasks based on the most typical indicators of creativity according to the Williams test.

The Williams test is intended for a comprehensive diagnostics of creativity in children and adolescents from 5 to 17 years old and evaluates both the characteristics associated with creative thinking and personal-individual creative characteristics. The test consists of three parts:
– divergent (creative) thinking test;
– test of personal creative characteristics (questionnaire for children);
– Williams scale (questionnaire for parents and teachers).

The optimal group size for diagnosis is 5-35 people, i.e. no more than one or two classes.

At the stage of diagnosing a student, conditions are created for monitoring the growth of academic talent - creativity of thinking. The methodology evaluates 8 qualities of creativity (fluency, flexibility, originality, elaboration, curiosity, imagination, complexity, risk-taking). We took 5 for the study.

Testing was forgiving in three blocks:
1. Test of divergent thinking (conducted in a group);
2. Measurement of personal creative qualities (multiple choice tasks);
3. Expert evaluation of the child by the parent or child.

Description of the level of creativity of thinking as the ability to create and find new original ideas, deviating from the accepted thinking patterns at the stage of using the intelligence map in the learning process, allows us to present the object of study through a system of methods, taking into account the degree of their generalization.

Before obtaining experimental data, it was necessary to define the general concept of "Giftedness". The influence and interrelation of the concepts "Creativity" and "Intelligence" are studied.

On average, all formed groups of gifted students correspond to the average, and deviations occur due to some insignificant factors. As a recommendation, according to the study, more attention should be paid to the development of creative knowledge and creativity, because information education cannot be created by "creative breath" alone.

Research shows that mastering the material using mind maps requires basic theoretical knowledge, which can then be multiplied and turned into skills and abilities.

This made it possible to systematize a set of logical methods, operations and actions that make up the scope of logical thinking as separate properties.

This is evidenced by the levels that form the results and the criteria for evaluating the results shown on the table 8.

Table 8. Scheme of results and criteria for evaluating results

Expected Results	Criteria for evaluating results

Increasing the level of motivation for creative activity	The popularity of the subject among students in grades 7-9 based on the results of monitoring
	The level of mastering the educational program in the subject based on the results of monitoring
Development of the creative potential of schoolchildren	The number of schoolchildren attending associations of additional education and courses of extracurricular activities of a technological orientation
Development of creative abilities in the interests of personal development	The number of participants and the effectiveness of creative competitions and Olympiads in the subject
Creative self-realization	The results of diagnostics of creativity
	a guide to choosing a profession related to technical creativity

After analyzing the results of the Williams diagnostic technique, a high level was detected in 4 students (40%) of the 7th "A" and in 5 students (43%) of the 8th "B" class. These students successfully coped with all types of tasks, while allowing a minimum number of errors. The average level corresponds to 6 students (59%) of the 7th grade "A" and 4 students (57%) have 8 "B". The study was conducted on the basis of the Nazarbayev Intellectual School of Chemistry and Biology in Ust-Kamenogosk.

	A	B	C	D	E	F	G	H	I
1			Factors						
2	№	Name and Surname	fluency	flexibility	originality	development	title	Total	Level
3		Grade 7A							
4	1	Student 1	12	10	30	22	18	92	Hіhg
5	2	Student 2	11	11	29	27	17	95	Hіhg
6	3	Student 3	10	11	29	27	17	94	Hіhg
7	4	Student 4	11	11	20	26	17	85	Average
8	5	Student 5	12	10	29	27	16	94	Hіhg
9	6	Student 6	12	11	18	23	15	79	Average
10	7	Student 7	11	8	25	27	14	85	Average
11	8	Student 8	10	11	23	27	10	81	Average
12	9	Student 9	10	9	29	27	11	86	Average
13	10	Student 10	11	7	21	27	17	83	Average
14		Grade 8B							
15	1	Student 1	12	11	28	26	16	93	Hіhg
16	2	Student 2	11	11	29	27	17	95	Hіhg
17	3	Student 3	11	9	29	28	19	96	Hіhg
18	4	Student 4	11	10	25	26	19	91	Hіhg
19	5	Student 5	12	9	31	27	18	97	Hіhg
20	6	Student 6	12	11	18	23	15	79	Hіhg
21	7	Student 7	11	8	25	27	14	85	Average
22	8	Student 8	10	11	23	27	10	81	Average
23	9	Student 9	10	9	29	27	11	86	Average
24	10	Student 10	11	7	21	27	17	83	Average
25	11	Student 11	12	11	24	26	21	94	Hіhg
26	12	Student 12	11	10	26	21	24	92	Hіhg
27									

Figure 1. Research results

When calculating the points to determine the level of development of creative potential on the scales, the following indicators were used.

Table 8. Estimated normative table

Rating scale	Low level	Average level	High
Fluency	1-7	8-10	11-12
Flexibility	1-5	6-8	9-11
Originality	1-21	22-26	27-36
Development	1-13	14-18	19-36
Title	1-22	23-26	27-36

These students coped with most of the tasks using mind maps, but in each type of tasks they made some mistakes.

Most of the errors were in the task of selecting a pair of new terms and concepts by analogy; it was difficult for students to analyze the connection between pairs of example words. The re-

sults of 6 students (28%) of the 7th "A" class and 5 students (23%) of the 8th "B" correspond to the low level indicators. These students could not cope with most of the tasks presented, made many mistakes in each type of tasks.

As a result of systematic work on the use of the mind map, students develop their own style: freedom of speech, flexibility, originality, development. And also the ability to create images using this style, while simultaneously developing your ability to think, perceive the world, your memory, academic. giftedness.

The mind map in teaching schoolchildren gave a positive result in our study and helped to systematize knowledge, activate cognitive interest in the study of any subject. The analysis allows us to draw conclusions about the reliability and validity of the proposed method for assessing the level of academic giftedness through open problem systems. Let's note one more important aspect. An analysis of solutions and answers to open-ended tasks made it possible to say with confidence about the level of creativity of students, covering a certain set of mental and personal qualities that contribute to creative manifestation.

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