FORMATION OF THE RESEARCH COMPETENCE OF FUTURE SPECIALISTS

[1]O'rinov Nodirbek Toxirjonovich, [2]Nabiyev Sherzodbek Nurmuhammad o'g'li, [3]Temirova Zarnigor Alisher qizi

Teacher, Department of Information Technology, Andijan State University[1,2], 2 – year magister of Andijan State University in Information Technology Education[3]

nodirbekurinov1@gmail.com[1], sherzodbekn1994@gmail.com[2], zarnigor-temirova@mail.ru[3]

ANNOTATION

The main difficulties and barriers of students' research activity are identified; organizational and pedagogical conditions for the formation of research competencies are analyzed; обоснованы approaches to the design of educational technologies that contribute to the effective development of research competencies in future specialists are substantiated.

Keywords: research competence, research activity, value and cognitive barriers, needs for continuing education and self-development, intelligence maps, developing situation, individual styles of intellectual activity.

The formation of the creative potential of the future engineer's personality is possible only if the priorities in education are changed – from mastering ready-made knowledge to independent cognitive activity of each student, taking into account their individual characteristics and intellectual capabilities [1]. Research work of students is an important and integral part of the educational process. This work should be carried out from the first days of studying at the university in a specially created research space. In the research space of the university, we include participants in the educational process, organizational and pedagogical conditions for the formation of students 'research skills, software, methodological and technological support for research work, psychological and acmeological support for the development of students' research competencies. Research work encourages students to engage in intellectual activity, promotes the development of creativity, which consists not only in the ability to generate original ideas in the face of new problems, but also to recognize gaps and contradictions, to abandon stereotypical ways of thinking [2]. A distinctive feature of the researcher is the desire to understand and explain the phenomenon under study, to identify the laws and regularities that underlie it. In this regard, the relevance of forming the readiness of technical students for independent research increases. The professional activity of engineers is related to designing, designing, working on drawings, diagrams, and performing technical calculations in research work.

Research work of students is understood as a type of special independent cognitive activity aimed at solving certain problems related to the lack of available knowledge and skills, which is based on updating the individual mental experience of each student, activating individual intellectual resources, stimulating independently organized types of educational activities [1]. Research competence is the ability and readiness of an individual to effectively apply existing knowledge, skills and experience in the course of research activities and in the process of solving educational, cognitive, subject and professional tasks [3].

By learning effective research techniques, the future specialist develops creative work experience, enriches the individual style of intellectual activity, forms logical and creative abilities, develops the need for continuing education and self-development [1]. Developing interest in research work is one of the most important tasks of training a research specialist. The solution to this problem is to form such a student's orientation to educational activities, which is based on intellectual and cognitive motivation, creative thinking,

manifestation of volitional efforts, readiness for long-term hard work associated with independent actions in solving the set goal.

The presence of students ' internal and external motives for intellectual activity is a necessary factor for effective research activities. The internal motivation for research activities can be the satisfaction obtained from the process of finding a solution to a problem, from the independent choice of topics and methods for solving the problem. External motivations can include a variety of incentives: financial remuneration, a scholarship, a successful presentation at a conference, publishing an article in a collection, receiving recommendations for continuing your master's or postgraduate studies, and a high assessment of the results of research work.

The teacher plays an important role in the development of students ' research skills. It consists in organizing and providing methodological assistance, directing the student's search and research activities, ensuring the ability to effectively overcome emerging difficulties, and stimulating intellectual initiative and creativity. At different stages of the work, the teacher's participation will be different. This depends on the following factors: the level of preparation of the student and his level of claims, the relevance and complexity of the research topic, the style of pedagogical interaction, the student's cognitive motivation, and the desire to engage in complex research work. Guidelines, recommendations, and "hints"can serve as one of the tools for managing students' research work. The teacher's reference point can help you find the necessary literature, analyze the source or concept, and their recommendations will be useful when completing your work. Tactfully and competently provided psychological and methodological assistance to the student at a certain stage of work can lead to an original solution to the problem. This makes it possible to transfer the teacher-student relationship to a new level of personality-oriented interaction, helping to increase the student's self-esteem and motivating him for further work, creating positive emotions and feelings of satisfaction [4,5].

Intellectual self-development is promoted by a gradual transition from joint cognitive actions with the teacher to independent ones, from unconscious actions to conscious, purposeful ones [13, 14]. A necessary condition for self-development is the establishment of links between the needs, motives and goals of search work, the complication of the operational side of the activity, the allocation of generalized methods of action, the sequence of operations, the formation of self-regulation skills based on mental reflection.

The most important point of intellectual development training is that thinking as a cognitive activity develops in the process of overcoming value and cognitive barriers. If the barrier is not subjectively experienced as a strain, as a difficulty, then the activity is not developing. R. H.Shakurov argues that external barriers develop thinking only when they are overcome by internal barriers, in this case, intellectual ones [6].

Thus, to improve students ' research activities, it is necessary to study the difficulties they face in the educational process of the university. For this purpose, psychological and pedagogical studies of students ' value and cognitive barriers are of particular importance. Based on the results of such studies, an educational environment can be created that would facilitate the construction of individual trajectories to overcome cognitive barriers, taking into account the uniqueness of the methods of educational work, individual cognitive styles of each student [2,5].

In our study, much attention was paid to how students assess the importance of research activities, the effectiveness of various university academic disciplines for the development of research competencies. According to the results of the survey, the attitude of students to the necessityand importanceof research training was revealed. 85% of the surveyed students recognize its effectiveness, but at the same time, only 17% of them were able to name the types of classes that involve elements of research activities, list the knowledge and skills necessary for successful research, describe the content of the work and its stages.

When asked about the difficulties encountered in the process of research work, the students identified the following difficulties::

- inability to see the problem (83%);
- difficulties in formulating research objectives (56%);
- difficulties in drawing up a work plan and allocating time (70.8 %);
- difficulties in working with information (search, inability to highlight the main thing in the selected material) (73%);
- uncertainty and fear of performing (92%).

As the study showed, many students face not only cognitive, but also meta-cognitive difficulties (difficulties of self-management). Most of the students experience difficulties when they need to independently identify the research problem, set tasks for themselves, draw up a research plan, and evaluate its results. In order to teach students rational methods of mental activity, methods of self-organization and self - assessment of educational, cognitive, and research work, the textbook "Culture of Intellectual labor" was developed (Author-N. P. Goncharuk). The main task of the textbook is to stimulate students ' independent creative activity, form self-education skills, and build an individual trajectory of intellectual activity. A special section of this training course "Goal setting and planning of educational activities" is designed to teach the techniques of goal setting, planning self-organization, self-management, self-assessment, reflection of one's academic and research work [7,9].

At the stage of diagnosing student goals, it is necessary to study the main tasks of educational activity that the student sets for himself (personal, subject, cognitive, creative, meta-cognitive), as well as the motives of learning. Independent setting of cognitive goals contributes to the interaction of educational goals and motives, during which internal motives, cognitive and professional, are formed. The formation of skills for planning your research activities occurs when performing the following tasks: create your own activity plan (indicating the stages, types of work, and deadlines); correlate the intermediate resultsof performing individual steps of the algorithm with the goals set; compare existing approaches to solving similar problems with the use of algorithms.

Along with traditional planning techniques, students are encouraged to create mental maps (intelligence maps). In our study, we developed a methodology for working with smart cards. The intelligence map created at the initial stage of work gradually acquires new associations, connections, and areas of work; goals are set and supplemented. The student records changes, finds out their reasons, and at the end of the work reflects on the work done. The intelligence – map allows you to analyze and evaluate not only what has been done, but also how it has been done; organize current and final reflection; identify the methodological framework of the

implemented intellectual activity. Working with mental maps allows you to ensure the transition to conscious intellectual activity, since detailed meaningful planning of their actions leads to the fact that the student himself directs his thinking, is aware of what is happening, thereby creating an indicative basis for his research activities [4,8].

Defining the problem of scientific research is one of the most important stages of scientific research. The correct formulation of the research problem determines the choice of methods and approaches, helps to anticipate the results and establish guidelines, and helps to plan and organize the research process. The formal attitude of students to the choice of a research problem leads to further difficulties in setting goals, planning and organizing project activities. Much attention is paid to the problem statement and formulation of specific tasks of scientific research in lectures and seminars on the course "Culture of intellectual labor" [7, 9].

In the process of research work, it is necessary to create developing situations that make it possible to identify the problem, formulate it and outline a plan for solving the problem [4,10,11]. Training in skills related to identifying and setting problems can take place during a specially organized dialogue. Motivational dialogue is effective in the individual form of work and is a system of questions and tasks that stimulate the student's intellectual activity and develop creative thinking. At the stage of problem formulation, the teacher gradually leads to its formulation, builds a logical chain to new knowledge, i.e. leads to "discovery", insight.

At the same time, the introduction to new knowledge can be carried out both from the problem set, and without it. Motivational dialogue consists of statement questions and answers that help students see and formulate the problem. At the stage of finding a problem and solving it, the teacher encourages the student to put forward and test hypotheses, i.e. provides" discovery " of knowledge through trial and error. At the same time, a true understanding of the material is achieved, because it is impossible not to understand what you personally thought up.

Together with the students, some possible algorithm of the research process related to the problem statement and planning the stages of its solution is built. As an example, we will give one of these algorithms built by students, which represents several basic "rules of the researcher". According to this algorithm, first of all, each researcher needs to remember about the stereotypical nature of their own thinking and the need to overcome it; secondly, it is necessary to consider the problem from different positions, aspects, and sides. Third, it is important to know thata well-formulated questionguides your thinking; fourth, it is necessary to doubt, make new assumptions, and use different search paths, methods, and techniques. Finally, the fifth rule is that after analyzing your own path of successful search, you can each build your own algorithm for research work [4,16].

Structured, ordered problems form a catalog that makes it possible to analyze the causes of problems, assess their relevance and urgency, and determine the relationship of this problem with other problems. It is stored at the department in electronic form and is used by students in further research activities. It can become the basis of questionnaires and surveys.

Students have a lot of difficulties working with a large amount of information. Information barriers arise when information is redundant or insufficient, when it is necessary to separate relevant information from

irrelevant information and structure it, to form a whole from the selected information. Creative understanding involves, along with the extraction and translation of meaning, the generation and design of a new meaning, the search for a new text, sign, and symbolic form [10]. This is a special state, recorded as confidence in the recreated representations of the content, a sense of internal coherence, organization, orderliness of the phenomena under consideration.

To overcome this barrier, it is necessary to organize search activities in such a way that the acquired knowledge rebuilds the previously acquired ones, transferring the acquired knowledge to new knowledge, thereby performing not a reproducing function, but a transforming one. Understanding and assimilation of information is provided through the use of such methods of educational and cognitive activity, which are aimed at identifying key concepts of the educational material, essential connections and relationships between concepts, as well as mastering the skills to interpret information, systematize, structure, classify and group objects. With the help of graphical systematizers, you can draw the structure of knowledge and see how new information is integrated into what is already known [12]. So, the following methods of constructing cognitive schemas have proven themselves positively: frames, scenarios, flowcharts, networks, matrices, and intelligence maps.

In order for knowledge to be mobile, a future specialist needs to be able not only to extract it, but also to be able to process the accumulated knowledge, be able to use it in their practical activities, and be a kind of knowledge engineer. An example is the Internet search routers designed by students: they are designed in the form of an intelligence map and resemble a network. By structuring the search directions, the students compiled a list of websites and torrettesthat can be used to quickly and successfully find the necessary information. The systematization of sites resembles a library catalog, allowing you to delve into individual areas.

The works of M. A. Kholodnaya emphasize the need to identify not only cognitive mechanisms of information processing, but also meta-cognitive mechanisms of intellectual self-regulation in the process of intellectual development. According to the author, the psychological basis of regulating effects in the work of intelligence are special mental structures that form meta-cognitive experience. One of the components of meta-cognitive experience is the willingness to use methods of stimulating and tuning the work of one's own intelligence, the ability to effectively mobilize one's intellectual forces to solve emerging problems [13, 16].

The final stage of research activity is the presentation of the work,presentation to the audience, whichcauses fear and uncertainty in some students. In the course of joint conversations, the purpose of which was to reflect on the past experience of presentations and presentations of students, the difficulties encountered by students were investigated, as well as the causes of such problems. Our research shows that successful presentations are hindered by the following cognitive barriers and mental states: fear of a failed performance, dependence on the opinions of other people, excessive suspiciousness, stereotyped and stereotyped behavior, fear of questions from the audience, disorganization, dependence on the prepared text of the speech. Dependence on the text, the fear of "losing the readable line" is easily overcome by replacing the linear text of the report with an intelligence map. The advantages are noted by the students themselves: the entire presentation is on one sheet and gives confidence, freedom of speech. Emerging associations as catalysts for ideas, the ability

to make timely changes to the report contributes to the self-organization of thinking and, in general, gives the speaker the freedom to be himself in front of the audience.

It is fairly stated that creativity has two main enemies: first, fear and, secondly, psychological inertia (rigidity, stereotyping) of thought. The teacher needs to make the learning process psychologically comfortable for each student, create a positive emotional background for intellectual work, and also try to remove old stereotypes of thinking. Students admit that there are situations when the fear of an exam or performance deprives them of the ability to think, leads to strong excitement. It is necessary to help the student understand the reason for the fear of public speaking or an exam. This can be a low level of self-organization and self-management of academic work, dependence on the opinions of other people (fear of looking worse in the eyes of another than you want), laziness and disorganization. Another reason is suspiciousness, when a student feels that everyone is evaluating him and thinking only about his shortcomings.

Obviously, high self-esteem doesoms you to great difficulties, and you have to win the appreciation of your listeners. It is necessary to provide students with psychological support. These can include recommendations on self-regulation, psychotherapy dialogues, and special self-management trainings. For example, the self-regulation memo we developed for students само регуляцииemphasizes that the main thing is to " concentrate on completing the tasks set, on achieving the goal of the speech, because thinking about the case-forgets to be afraid. It is very important to switch your attention away from danger, learn to manage your attention, and remember that when you are worried, your attention is "scattered" [15].

Reflexive dialogues are built individually or in a group, taking into account personal characteristics. Students share their techniques of psychological regulation. After each completed work, students answer the following questions: "What changes have occurred in your knowledge and skills on this issue?"; " What have you learned new?"; " What new methods of self-regulation of cognitive activity have you learned?"; " How to assess the correctness of solving this problem?» Such questions allow us to move on to the reflection of our own methods of constructing cognitive learning strategies, heuristics, i.e., to conscious meta-cognitive activity.

Of course, the willingness to put forward original ideas and use non-standard methods of activity implies a high level of formation of all components of mental experience. Nevertheless, the direct source of intellectual creativity is individual intentional experience. Therefore, promoting the expression of preferences, beliefs, and guesses is one of the most effective methods of intellectual self-development.

Intellectual self-regulation is the ability to arbitrarily manage one's own intellectual activity and, most importantly, purposefully build the process of intellectual self-development. For this purpose, mechanisms of involuntary and voluntary intellectual control, a special type of meta-knowledge regarding the foundationsof intellectual activity and their individual intellectual characteristics, as well as readiness to work in an open cognitive position should be formed in the structure of their mental experience [13, 18]. The formation of an open cognitive position is largely facilitated by the dialogical nature of training, which teaches you to perceive and respect alternative opinions, take into account personal experiences, doubts, emotional assessments, guesses and feelings of the opponent, defend your point of view and accept the point of view of another, and forms the experience of teamwork.

In our research, we have developed psychological and pedagogical support for the development of students ' intellectual competencies, aimed at helping students overcome barriers and difficulties in research activities. Special attention is paid to ways to overcome cognitive barriers, which include the following: poor knowledge of the stages and mechanisms of creative activity, methods and techniques of research work, lack of skills to use them competently in practice. Among the meta-cognitive barriers, we note the following: difficulties associated with setting goals and planning research, choosing the problem and appropriate methods for solving it, difficulties in predicting the results of solving the problem using the chosen methods.

To help students overcome numerous problems of research activities, the textbook "Organization and conduct of research work of students in the learning process"was developed. By the authors of the textbook G. S.Sagdeeva and R. R. Khaydarov, together with students, created a selection of addresses of the foundation's Websites, where you can find offers of grant programs and foreign internships. A matrix for drawing up a grant application is proposed as an indicative basis. Competently prepare documents for participation in a grant, master program, ability to write a motivation letter, resume about yourself – an important part of research work. This manual introduces the methodology of research and development, technologies of research activities, contains rules and requirements for the design of literature in accordance with GOST [15].

Awareness of the obstacles to successful search, perception of information, and psychological barriers guarantees the success of research work. The student, realizing his difficulties, translates them into the rank of a task, consciously chooses the trajectory and method of cognitive activity based on personal experience. The algorithm of actions is built in interaction with the teacher, taking into account the motivation and individual abilities of the student. Training should be structured in such a way that it adapts to the individual cognitive capabilities of the student, the pace of development of his personality and intelligence, and helps to identify and structure mental experience. The variety of types of intellectual activity that should be formed in students in the course –of research work requires the use of various methods of intellectual development training that contribute to the development of the main components of cognitive and meta – cognitive experience [2,11,13,17].

The use of interactive methods allows you to organize a dialogue at various levels of interaction and involve all students in the work. The technology of the case method is the process of forming the information field, activating it, organizing information communications, colliding positions, replenishing the field with information and using the information accumulated in it. The intellectual field, which consists of thought forms created by students and teachers, serves as a fertile environment not only for learning, but also for personal education. The very presence in a developed information field, "living" in it from the origins to the solution of the problem, is beneficial for the individual, who is "imbued" with information, diverse feelings, and clearly feels the methods and techniques of mental activity. In the process of learning, situations are created that involve the process of generating ideas. An idea developed by one student is analyzed and mastered by other students, discussed, appropriated and experienced. Situation analysis provides consideration of behavioral options in a certain situation and implementation of research results in life. Creating research-initiative situations and typical situations that a specialist will most often encounter in his professional activity allows stimulating thinking, reflection, and motivating students to search for information and structure it. In a playful, interactive way,

students form a creative thinking style, experience working in a team, analyzing the situation and making quick decisions [16, 17].

The formation of research skills, mastering the methods of scientific work, along with the academic research work of students, is carried out by including them in active extracurricular research work in student scientific circles, in the preparation and defense of research papers at student conferences, conference courses. The effectiveness of this type of work lies in the possibility of individualizing learning and building an individual development trajectory, taking into account mental experience, as well as stimulating cognitive activity, involving it in various types of intellectual search activities [5,13,19].

To encourage intellectual self-development, it is necessary to ensure that students can choose a research topic in accordance with their individual mental experience. It is important to vary the problem levels проблемности, complexity, and difficulty of the topic. To understand the chosen topic and draw up a work plan, it is necessary to organize reflection. This is facilitated by situations in which the student needs to think through the following questions: "For what purpose was this topic chosen?»;

"What do you want to find out?"; " What results do you predict?"; " How do I check the validity of the results?» The search for answers can be carried out individually, and a collective search for solutions is also possible [16, 17]. This type of work helps to improve mutual understanding and cooperation, increases self-esteem, and stimulates self-knowledge and self-improvement.

The ability to work in a team is a necessary quality of a modern specialist. During collective work, microgroups are formed based on interests. In the future, these microgroups can work on a large topic, each participant develops a separate question, collects a file and bibliography of sources, a glossary of terms and concepts on the topic. If a student is responsible only for himself / herself in individual work, then working in a group, he / she is responsible for the team. Moreover, there is an awareness of a common goal, an appropriate distribution of responsibilities, the ability to hear and stand up for the point of view of others, the ability to resolve conflict situations, and stress tolerance. In such work, the experience of working in a rapidly changing organizational structure is formed, which is necessary for a future specialist in professional activity.

Thus, the research work of students is an important factor in the professional training of future specialists. Complicating the problems of research conducted by students and increasing the requirements for the quality of work performed contributes to the intellectual self-development of students.

LITERATURE

1. Goncharuk N. P. Intellectualization of engineering education. Kazan: RIC "Shkola" Publ., 2008, 160 p. (in Russian)
2. Goncharuk, N. P. Development of intellectual competence and professional mobility of scientific and pedagogical personnel in the conditions of the information society. - Kazan: Publishing House of the Ministry of Education and Science of the Republic of Tatarstan, 2011. - 224 p.
3. Shestak, V. P. Formation of scientific research competence and "academic writing". / V. P. Shestak, N. V. Shestak // Higher education in Russia. - 2011. - No. 11. - pp. 115-119.
4. Goncharuk, N. P. The use of psychodiagnostics in the process of intellectual and developmental learning. / N. P. Goncharuk, G. S. Sagdeeva // Bulletin of the Kazan Technological University. -2010. - No. 12. - pp. 107-111.

5. Goncharuk, N. P. Psychological and pedagogical problems of the formation of intellectual structures / N. P. Goncharuk. - Kazan: Publishing house of Kazan State Technol. un-t, 2006 – - 188 p.
6. Shakurov, R. H. Emotions. Personality. Activity. / R. H. Shakurov. - Kazan: Center of Innovative Technologies, 2002. - 180 p.
7. Goncharuk, N. P. Culture of intellectual labor: A textbook. / N. P. Goncharuk. - Kazan: Publishing House of the Ministry of Education and Science of the Republic of Tatarstan, 2011. - 224 p.
8. Buzen T. and B.Supermyslenie / T. and B.Buzen.–, 5th ed. - Minsk: "Potpourri", 2008. - 304s.
9. Goncharuk, N. P. Intellectualization of the innovative educational process: a textbook / N. P. Goncharuk. Kazan: RIC "Shkola" Publ., 2008, 196 p.
10. Serikov, V. V. Education and personality. Theory and practice of designing pedagogical systems. / V. V. Serikov-M.: Logos, 1999. -272 p.
11. Goncharuk, N. P. Formation of professional mobility of future engineers in the educational process of the university./N. P. Goncharuk, E. I. Khromova // Bulletin of the Kazan Technological University. - 2012. - No. 13. - p. 274-279.
12. Halpern, D. Psychology of critical thinking. / D. Halpern-St. Petersburg: Piter Publishing House, 2000. - 512 p.
13. Kholodnaya M. A. Psikhologiya intellekta [Psychology of intelligence]. Paradoxes of research. / M. A. Kholodnaya – St. Petersburg.:St. Petersburg, 2002. - 272 p.
14. Vygotsky, L. S. Myshlenie i rech [Thinking and Speech]./ L. S. Vygotsky, Moscow: Labyrinth Publ., 1996, 415 p.
15. Sagdeeva, G. S. Organization and conduct of research work of students in the learning process: A textbook / G. S. Sagdeeva, R. R. Khaydarov. - Kazan: Publishing house of Kazan State Technol. un-t, 2009. - 60 p.
16. Sagdeeva, G. S. Developing situation as an important condition of self-development / G. S. Sagdeeva// Materials of the international conference "Actual problems of the development of modern society" - Saratov: IC "Nauka", 2010. - pp. 107-110.
17. Sagdeeva G. S. Ways of constructing an intellectual-developing situation by means of educational and subject activity.Sagdeeva//Pedagogical education and science. Moscow, 2011, no. 8, pp. 56-61.
18. 18. Sternberg, R.J.& Grigorenko, E.L. (2000):Teaching for successful intelligence. Arlington Heights, IL: Skylight.
19. Glaser R. (1984) Education and thinking: The role of knowledge.// Amer. Psychologist. – V.39 (2). – P.93-104