Fashioning of Students' Research Competence Through Technology of Project Activities

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Abstract: *Objective*: The authors provide justifications for changing the current education system, updating the teaching and methodological approach in school specialised education. The paper investigates the issue of fashioning students' research competence through the technology of project activities.

Background: Project activity has become widely used since it combines the theoretical and practical parts of the science under study, which allows to set up a connection between its components. Research competence is an integral feature of a student's personality, which manifests itself in a willingness to take an active research position.

Method: The authors conducted an experiment to study the problem of improving the quality of students' knowledge upon studying biology in senior school. The participants in the experiment were 120 students of the 10th and 11th years of a specialised school for children with psychological disorders.

Results: The authors developed a methodology for the fashioning of research competence. The results of the conducted pedagogical experiment confirmed the validity of the initial assumptions regarding the influence of the use of research teaching methods in biology lessons aimed at improving the quality of biological education.

Conclusion: Through project activities, students with intellectual disabilities learn to work in a team. Despite the fact that teamwork is uniting, each of the students learns to independently set the purpose and tasks of the study, analyse the sources presented, present the results of their activities to others. The main signs of project activity include the fact that students learn the technique and technology of working with the project. Project activity allows for the fashioning of students' research competence during the lesson, thereby enabling students to unleash their potential.

Keywords: Educational systems, cognitive skills of students, project technology, educational courses, specialised education.

INTRODUCTION

In updating the content of education, an important part is played by the functional literacy of students. In terms of training for an updated program, the development of functional literacy is the main goal of education. This means that, as a result of training, functional literacy must be formed in each academic subject. We can verify the maturity and development of functional literacy among students through tasks of creative content, cognitive, research nature. Tasks of an economic, historical nature, practice-oriented tasks can also help in determining the formation and development of functional literacy of students.

The above indicates that changes occurring in the world and in the global economy demand changes in the current education system, i.e. there is a need to update the content

of school education, i.e. transition from a knowledge paradigm to a competence one. The issues of the competence-based approach and the formation of research competence were covered by scientists from Kazakhstan, Tajikistan, Russia, and other countries.

The problems of the competence-based approach in education were studied by scientists from the Kazakhstan Academy of Education. In their works, scientists M. Dzhadrina, N.N. Nurakhmetov, S. Mukanova, S. Khalikov, R.A. Suleimenova provide their custom definition of the concept of "competence". Proceeding from a competence-based approach and investigating the content of the concept of "competence", they expressed their opinion on basic and key competences. According to the presentation of scientists of the Kazakhstan Academy of Education, it is necessary to factor in the readiness of students for adulthood, for solving life problems. Proceeding from this, they determined the willingness of students to fulfil their duties in adult life, to be a citizen of the Republic of Kazakhstan, the desire to continue to receive education throughout their lives as basic competence. The ability of a student to solve problem situations to mobilize their potential opportunities, which include educational, life opportunities, were referred to as key competences. Key competences include the child's desire to employ its knowledge, skills, and experience to achieve certain goals.

The works of Tajik scientists pay a lot of attention to new methods and forms of the educational process in secondary schools, the development of intelligence and creative abilities of students, which, of course, will contribute to the fashioning of students' research competence. The works of many Tajik scientists-teachers cover certain aspects of the subject matter: Kh.S. Afzalov, S.Sh. Bazarov, B. Rakhimov, H. Buydokov, U.Z. Zubaidov, B. Kodirov, K.B. Kodirov, M. Lutfulloev, A. Nurov, A. Pakhlavonov, T. Radjabov, S. Tabarov, A. Khamrokulov, T.A. Shukurov and others.

S.Sh. Bazarova in her work "On fashioning intelligence: the role of knowledge in the development of personality" (2011) emphasizes that the quality of education affects the future of a person and the potential of the society at large. In these conditions, fashioning of an intellectual personality is of no small importance. Russian scientists turned their attention to such aspects as the problems of fashioning and development of students' research competence (Alexandrova 2011; Garmashov 2013; Krivenko 2006; Nikitina 2014; Skarbich 2006; Ushakov 2008; Fedotova 2010; Feskova 2005; Forkunova 2010).

In foreign pedagogics, some matters of fashioning the research competence were investigated in the works of many scientists. Foreign scientists studied aspects such as the organization of independent activities of students in secondary schools (Baer 2014; Helmke 2014); competence-based approach to organizing education in a general education school (Helmke 2009; Schiersmann and Thiel 2014). Even though many scientists investigated the matters of fashioning the students' research competence, some aspects of this issue still remain understudied.

TECHNOLOGIES OF PROJECT ACTIVITIES IN THE FORMATION OF EDUCATIONAL SYSTEMS

To determine the content of the concept of "research competence" it is necessary to consider the essence of research activity. Currently, there are various approaches to the interpretation of the concept of "research competence", we shall elaborate on some of them:

–L.A. Golub, V.S. Lazarev, T.A. Smolina, from the standpoint of a systematic approach, consider research competence as a component of professional competence;

–From the standpoint of the process and technological approach, A.V. Khutorskoy understands research competence as "the person's possession of appropriate research competence". Under research competence, he suggests understanding knowledge that is the result of a person's cognitive activity in any field of science. In addition, in the content of the concept of "research competence" A.V. Khutorskoy considers methods, research

methodologies that a person must master to implement research activities, motivation and researcher's position, their value orientations [1].

In competence-based education, the components of research competence must be consistent with the components of research. V. A. Slastenin shares this opinion. The integrity of theoretical and practical research skills forms a model of students' research competence [2]. Many scientists associate research competence with research activity, i.e. they consider it as the result of properly planned work. For research activities, we can include writing scientific projects, setting up an experiment and analysing its results. In her works, S. I. Osipova focuses on the transformative nature of research competence. She sees it as an integral quality of the personality, which can be manifested in the desire and ability of the individual to master and obtain new knowledge independently. To create research competence in the lesson, the teacher must determine the right effective teaching technologies.

In pedagogical science, there are various educational technologies that are used in lessons at a general education school, one of which is the technology of project activities. It provides ample opportunities for unleashing the students' individual abilities. Project activity has become widely used, since it combines the theoretical and practical parts of the studied science, thereby allowing to set up a connection between its components. Various seminars and trainings are held at teacher's advanced training institutes for the implementation of project activities in a general education school.

Design technology as a global problem uniting the social, personal, cultural principles in the life of a particular person was reflected in the works of the following scientists: V.P. Bespalko [3], V.I. Zagvyazinsky [4], B.T. Likhachev [5], S.L. Rubenstein, V.A. Slastenin [2] and others. Problems of project activities from a pedagogical standpoint are considered in the works of Yu.P. Azarov, N.K. Baklanova, E.N. Karpov and others. According to the abovementioned researchers, project activity is a flexible model for the organization of the educational process, focused on personal fulfilment of students' personality, the development of intellectual capabilities, creative abilities in the process of implementing a scientific project within the framework of studying the subject.

The technology of project activities can also be used in conducting elective courses. Elective courses can also aid in developing students' research competence. Elective courses should be provided in an amount that allows the student to make a real choice. Courses should help students assess their potential in terms of educational perspectives. Courses should help to create a positive motivation for learning on the planned profile. Upon determining the content, they should determine the usefulness of this course for the student with regards to making an informed choice of the profile of education in high school. As a result of studying elective courses, the student should be ready to answer two questions: "What do I want in my immediate educational future?" and "Can I, am I ready to continue training in the chosen direction?".

The courses should help students learn about the specific types of activities that will be leading for them should they make a choice (biologist, historian, philologist, economist, designer, etc.). That is, they should influence the choice of a student in the field of professional activity. The main motives of choice that should be considered when developing and implementing elective courses are as follows:

−the acquisition of knowledge and competencies, the development of methods of activity for solving practical, life problems, the departure from the conventional school "academism";

−opportunities for a successful career, promotion in the labour market;

−curiosity;

−career guidance;

−integration of existing ideas into a holistic picture of the world.

MATURITY OF THE RESEARCH COMPETENCE IN THE DESIGN ACTIVITIES OF STUDENTS

Within the framework of the subject "Biology", elective courses help students learn about the most important ways and methods of applying knowledge in practice, building an individual educational path, developing their interests and career-oriented aspirations.

The course "Methodology of scientific research in biology" is focused on developing the ability of high school students to carry out personal self-education, to design a further educational route and a professional career in the field of such a science as biology. The course content is also aimed at the formation of students' research competence, which will allow students to master the methods of scientific research in the field of biology. Proceeding from this, we can say that project activity is the field of teaching methods used within the framework of a particular subject.

The basis of project activity underlies the development of creative and critical thinking, cognitive skills of students, the ability to apply the acquired knowledge and skills upon solving specific problems, or, in other words, is the path of knowledge development. Accordingly, project activity is a way to achieve a didactic goal through the development of a problem, completed with a certain result. The project activity is focused on the independent work of students (individual, work in pairs, in groups), who perform it within a certain period. The solution to the problem, on the one hand, lies in the use of various methods and means of training, on the other hand – in the use of knowledge, skills and abilities, and understanding of how to apply them.

Independence in project activities concerns not only the setting of goals and aims, decision-making, but also the implementation of the project itself. Students should command creative (transform various ideas, find several ways to solve the problem, predict the consequences of the decision made), communicative (the ability to listen and hear the interlocutor, conduct a discussion, clearly state their thoughts, give arguments in favour of resolving the problem, etc.), intellectual (summarize, draw conclusions, work with text, etc.) skills [6].

Depending on the problem, the subjects of projects may vary. It can be of a theoretical nature, to deepen any material, or practical, requiring knowledge of not just one science, but from different disciplines, thereby developing research skills and creative thinking. Therefore, the integration of acquired knowledge occurs. The results of the completed project activities should be provided in the form of a presentation, publication, etc. Comprehension of project activities is of foremost importance for the formation of students' thought process (a source of new knowledge, activation of students' creative abilities, intellectual development).

The maturity of students' research competence in the process of studying the elective course or the implementation of the project can be estimated by means of the scale for assessing the level of formation of students' research competence. Proceeding from the contents of Table 1, we can estimate the maturity students' research competence at the following levels: high, medium, low.

Table 1. The scale of assessment of the maturity of students' research competence

Level	Level grade score	Level description
High	3	Students obtain high results in carrying out research activities and have mature research competence.
Medium	2	Students situationally obtain high results in the process of carrying out research activities. In some cases, there may be a gap in operations, such as the performance of certain actions.
Low	1	Students show that they have frequent and ongoing difficulties in performing research activities. They have insufficiently formed research competences

The scale for assessing the maturity of students' 'research competence helps to identify the maturity of a specific research competence (Table 2).

Table 2. Data on the levels of specific research competence

No.	Research competences	Research competence Levels
1	Ability to analyse and synthesize	High, medium, low
2	Ability to use methodological concepts	High, medium, low
3	Ability to correctly use various research methods	High, medium, low
4	Ability to correctly carry out various research procedures	High, medium, low
5	Ability to think critically	High, medium, low
6	Research focus	High, medium, low
7	Ability to use information technology	High, medium, low
8	Ability to collaborate with different participants	High, medium, low
9	Ability to work productively in a team	High, medium, low

From the standpoint of teaching methods, the result of project activities is defined as certain competencies and skills mastered by students. By carrying out interesting, and at the same time relevant projects, schoolchildren find application of the acquired knowledge, skills in practical activities, learn to work with the presented information. For example, upon working with a scientific paper in a journal or collection, selecting the relevant material for the project, working with a bibliographic catalogue, etc.

CONCLUSIONS

Thanks to project activities, students learn to work in a team. Such a quality as tolerance towards each other is manifested. Students learn to work in groups, in pairs, and individually. Despite the fact that teamwork is uniting, each of the students learns to independently set the purpose and tasks of the study, analyse the sources presented, present the results of their activities to others. Today, project activity is considered the technology of the 21st century, as it is conducive to meeting the requirements of the educational process in secondary schools, including the achievement by students of relevant knowledge, skills, and abilities.

The main signs of project activity include the fact that students learn the technique and technology of working with the project. Further they perform analysis, learn to predict, and plan their activities. The advantages of project activities are that students learn to work independently, since this method of work involves the individual participation of each student in the learning process of a school subject. Project activity allows the formation of students' research competence during the lesson, thereby enabling students to unleash their potential.

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