

Chapter 6

Project–Design Activity as a Condition for the Formation of Research Competence Among Students

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ABSTRACT

This chapter presents a model of research competence, identifies the contradictions in the development of research competence in Russian education and suggests ways to resolve them using the potential of a rapidly developing industry – nanotechnology. The vectors for the development of the problem of introducing nano-technological education into basic and professional schools have been determined. Variants of educational courses are offered, training on which will promote the development of research competence using innovative equipment. The theoretical positions are illustrated by examples from practice.

INTRODUCTION

Modern society puts forward challenges to the educational system of preparing students, who are able to adapt quickly to changing conditions, to be creative in solving problems. Students of the future will become active participants in the country's social and spiritual development. In the conditions of high dynamics of social processes and a huge information flow of the last decades, the task of developing student activity, their ability to independently cognize the world and solve complex life problems becomes urgent.

Deficiency of certain personal qualities, such as the ability to plan work, make non-standard decisions and solve emerging problems, as well as leadership qualities, hinders the competitiveness of the country's economy at the international level and adversely affects the work of specific companies.

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The analysis of the teaching and research work of senior pupils and course works of first-year students revealed the following difficulties: the formulation of the scientific apparatus (86.7%), the setting of the experiment (84.2%), the logic of the research (76.6%), the inability to choose the main thing in the work (74% %), the writing of the work as a whole (87.3%). The revealed shortcomings are explained by the low level of the development of research competence.

In accordance with the Federal State Educational Standard of the latest generation, to achieve the planned results, it is necessary to create an innovative educational environment. It should promote the implementation of the following approaches and directions:

- Increasing the independence of students in the planning and implementation of educational and cognitive activities;
- Organization of educational cooperation of students with teachers and peers;
- The construction of an individual educational trajectory;
- Development of skills in educational, research, project and social activities; Organization of design and training and research activities, taking into account innovative developments, the level of development of science and technology; Use of innovative laboratory equipment; and etc.

The educator using the innovative type of training, aimed at the formation of the qualities and skills that will allow him to create new products, norms, rules, and non-aggressive perception of similar developments of other people can cope with the tasks set.

Analysis of the current situation in the Russian education in the field of development of the research competence has made it possible to single out a number of contradictions: between the requirements of the educational standard regulating the development of research competence and the low level of independence and interest of students in research activities; between the necessity of using a new equipment for design and research work and the lack of sufficient competence of teachers in working with innovative equipment.

These contradictions necessitated the development of the research competence of students and teachers.

In connection with the solution of the tasks of modern education, the content, new forms, methods and means of instruction are sought, which in practice provide ample opportunities for self-actualization, self-development and self-realization of subjects of the educational process.

One of the most important conditions for increasing the effectiveness of the educational process is the organization of educational research activities taking into account the interests of students and the use of modern equipment. In our opinion, nanotechnology has a great potential in the development of research competence.

Nanotechnology in education is an extremely wide range of problems in physics, chemistry, biology, informatics and mathematics, which are fascinating and promising, especially, if teachers and students have modern instruments for studying the Nano world. The use of nanotechnologies and special equipment makes it possible to master interdisciplinary connections, develop an interdisciplinary approach, learn more about modern tasks in the field of natural sciences, etc. Work on modern equipment forms of the system-scientific thinking, increases the motivation of students and the competitiveness of education.

In 2002, Alferov proposed the idea of using an atomic microscope for educational purposes. By 2013, the Educational and Research Laboratory Complex NANOEDUCATOR has been installed in more than 80 universities and 320 schools in Russia and abroad.

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