Next Scientists
Journal of Social Sciences and Humanities Research Fundamentals

TYPE Original Research
PAGE NO. 126-130
DOI 10.55640/jsshrf-05-01-22

Check for updates

Developing Students' Research Competence in General Secondary Schools (Based on Natural Sciences)

OPEN ACCESS

SUBMITTED 26 October 2024
ACCEPTED 30 December 2024
PUBLISHED 30 January 2025
VOLUME Vol.05 Issue01 2025

Qaraxonova Lobarxon Musaxonovna

Head of the Department at the National Institute of Pedagogy named after Kari Niyazi, Senior Researcher (PhD), Project Leader, Uzbekistan

Abstract: The implementation of modern technologies and methods in the education system today not only facilitates students' comprehension of subjects but also enables teachers to adopt an individualized approach to their students. Contemporary educational standards, curricula, and textbook content increasingly emphasize the development of students' independent learning skills, encouraging them to prepare practical assignments both in the classroom and outside of it.

In this context, the teaching process of natural sciences directs students toward self-study by allowing them to select topics of personal interest and investigate related issues through small-scale research projects.

Keywords: Teaching natural sciences, engaging students in the learning process, continuous development in education, educational methods, extracurricular activities, independent learning skills, research-oriented learning.

Introduction: The issue of developing research competence in educational institutions has been widely studied by many scholars. The transformation of research skills into competencies is largely determined by the accurate formulation of specific educational goals.

The relevance of fostering research skills in school students through project-based learning technologies remains significant today. It is worth noting that in primary education, the newly introduced "Natural Sciences" subject has replaced the previous "Our Surroundings" and "Natural Science" courses. The core

of this subject is heavily focused on practical exercises, with numerous topics structured as hands-on activities.

Completing practical assignments is not confined to the classroom; students can continue them at home, allowing for independent learning both during and outside of class hours. In this regard, practical activities in lessons serve as a preparatory stage for students' small research projects.

Similarly, in the next stage of education, the subject "Natural Sciences" is also taught in 6th-grade biology classes. Teaching topics in the form of small research projects fosters students' research skills, making biology lessons more aligned with scientific inquiry. Organizing the methodological content of students' research engagement at different grade levels gradually enhances their ability to complete independent tasks and small-scale projects.

The development of high school students' research skills depends on the nature of the research assignments they undertake. Each academic subject, based on its objectives and requirements, aligns with students' interests. Biology, in particular, attracts students in various ways. In the 9th grade, students acquire fundamental scientific knowledge about nature, scientific facts, and their underlying principles.

During the learning process, students carry out the following research-related activities:

- Independently conduct laboratory experiments;
- Carry out small research projects in natural environments;
- Study and observe the lifestyle of animals in the school’s biology corner;
- Write research papers on assigned topics;
- Complete small-scale research projects.

An analysis of the didactic content of 9th-grade biology lessons shows that, along with theoretical topics, the curriculum includes eight laboratory sessions and three practical exercises. This biology course covers theoretical knowledge related to cellular structures, chemical composition and properties of organisms, genetic foundations, metabolism, and individual development of organisms. To facilitate the learning of these topics, teachers increasingly implement innovative teaching methods and tools.

The integration of advanced technologies and methods in the education system today not only helps students assimilate topics more easily but also supports teachers in adopting an individualized approach to students. With the introduction of new educational standards, curricula, and textbooks, greater emphasis is placed on fostering students' ability to work independently, prepare practical assignments in and outside the classroom, and develop their research skills. In this context, biology lessons encourage students to engage in self-directed learning by selecting topics of interest and investigating related issues through small-scale research projects.

This form of small-scale research directly enables students to master modern methods of searching for, processing, and utilizing information. It helps them assimilate certain research methodologies, define their research stance, continue their small-scale research, and, over time, develop research skills to the level of competence.

In educational literature, the concept of competence has been widely discussed by numerous scholars. Competence is the ability to apply acquired theoretical knowledge, practical skills, and expertise to solve both practical and theoretical problems encountered in daily life. Competency (from Latin: competens – capable, skilled) refers to the adequacy of an individual's knowledge, skills, and experiences in fulfilling their social and professional roles, solving problems, and performing assigned tasks effectively [6].

To understand the essence of research competence, various approaches have been proposed by scholars. One group [1] considers research competence as a fundamental component of competence, while another group of specialists [2,6] views it as an integrated set of knowledge and skills necessary for organizing research activities. In this regard, we propose the following working definition for the research process:

Research competence refers to personal skills developed during the research process, which is directed towards independent knowledge acquisition and based on the goals and objectives of solving a chosen problem. The core idea of the research is to engage students in scientific-research activities, fostering their ability to identify, formulate, and solve pressing scientific issues, find innovative solutions, and implement them into practical activities. This process also involves developing a continuous system of innovative training within the framework of research activities.

Although transforming students' skills into competencies may seem challenging, acquiring research competence occurs gradually. During small-scale research projects, students engage in independent study, analysis, literature review, and the selection of internet sources under the teacher’s guidance. Since this process involves the teacher’s direct collaboration, students often require their teacher’s moral support and attention.

In this context, it is worth noting that research skills may not be common among all students in a classroom. However, there will always be those who have a strong interest in a particular subject and a desire to conduct research. If the teacher provides proper guidance throughout the learning process, students can develop not only subject-specific knowledge and skills but also initiative, collaboration abilities, teamwork skills, communication skills, critical thinking, information filtering, and data utilization abilities. As highlighted earlier, skills, when reinforced through learning and experience, gradually evolve into competencies.

Research competence, as a structural component of competency, directly contributes to its effectiveness. It enhances students' critical thinking and creative abilities, ultimately serving as the foundation for transforming their intellectual, communicative, and project-based skills into competencies.

In general secondary education, integrating research-oriented mechanisms into high school biology lessons represents a unique pedagogical approach.

In this regard, the formation and development of research competence in students can be assessed through the following seven key indicators:

- The ability to define the objectives of an activity;
- The ability to identify subjects, tools, and actions necessary to carry out the activity;
- Reflection and analysis of activity outcomes (comparing achieved results with initial objectives);
- The ability to independently acquire new knowledge;
- The ability to transfer acquired knowledge to new contexts;
- The ability to apply knowledge in planning one's actions, developing and implementing interdisciplinary research projects;
- Proficiency in information and communication technologies, including searching for information and ensuring safe use of ICT tools and the internet.

In our opinion, research activities organized for high school students have a transformative impact on research competence and serve as a significant outcome of research activity. These activities enable students to align the knowledge they acquire in the field of biology with their future career choices. Consequently, by orienting students toward research, we also contribute to the development of their career selection skills and guide them toward their professional paths. Based on this premise, a system of directions will be developed to enhance the research competencies of high school students in general education schools. We will examine the engagement of students in research activities through several examples.

The first stage of this process (which corresponds to September of the academic year) involves identifying students' aptitudes and abilities. This means assessing their involvement in research activities during their lower grades up to the present stage of education, as well as determining whether they have the motivation to undertake small projects. Following this, students are provided with explanations regarding the types of research activities they can participate in either as part of the general education curriculum or independently, including:

- Preparing research projects;

- Participating in academic subject-based months within the school framework;

- Attending national-level conferences;

- Preparing and publishing articles on a specific issue they are studying;

- Taking part in various national and international competitions.

To transform the research skills of 9th- to 11th-grade students into competencies, they are directly involved in conducting small projects, which begins with biology teachers introducing research topics. At the initial stage, students study and analyze recommended materials related to their chosen topic. This analysis differs somewhat from higher-level research analyses, as it is carried out in collaboration with a teacher. This is because scientific analysis may present certain difficulties for high school students. Therefore, the teacher's involvement helps guide students in the right direction. Over time, their ability to work independently improves through practical engagement.

After topic selection and individual work with the teacher, students present their research topics to an audience, where they outline the objectives and tasks of their future projects and explain their research plans. Such activities contribute to the psychological development of students, fostering the formation of a well-defined sense of self and cultivating an interest in showcasing their achievements.

To properly guide students into research, project topics should be chosen in advance, considering their personal interests and capabilities while aligning them with potential career pathways. In this regard, it is necessary to develop students' ability to carry out research work and instill a sense of responsibility in them. Teachers continuously monitor students'

progress in executing their projects and observe the development of their research skills.

Based on the selected topics and their results, an individual plan is developed for each student. According to this plan, students must locate, study, and analyze necessary biological literature with the teacher's assistance, organize experimental work, understand laboratory safety requirements, conduct experiments, record observations and findings, and document their research outcomes. Additionally, biology teachers guide students in writing essays and articles, gradually introducing them to research methodologies.

Weekly meetings are organized to review each student's progress according to their individual research plans. Research activities are integrated into students' extracurricular activities and club participation as outlined in the curriculum. However, given that orienting students toward scientific activities is currently one of the most pressing tasks, it is advisable to allocate specific hours for research activities and properly evaluate and encourage teachers' efforts in working with gifted students.

Indeed, young researchers in general education schools will continue their studies in vocational colleges, academic lyceums, and higher education institutions. Therefore, it is essential to establish a solid foundation for research competencies during classroom instruction, extracurricular sessions, and independent studies, ensuring that students acquire comprehensive knowledge and skills. Under such conditions, guiding students toward science not only stimulates their participation in Olympiads, multi-stage competitions, and academic contests but also teaches them to use their free time productively.

From the above points, it can be concluded that the development of students' research competencies fosters their participation in various competitions, helps them acquire the right motivation in the learning process, and equips them with the ability to independently search for, collect, process, and utilize information. It also enables them to assimilate innovations through unique methodologies and, ultimately, defend their ideas independently, making it a key factor in their academic growth. It should be noted that conducting research within small projects helps students independently search for information, analyze it, and interpret it to acquire new knowledge. This marks the beginning of their scientific journey and the gradual transformation of research skills into competencies.

At the initial stages of research, students are taught and trained in presentation skills, asking and answering questions during specially organized sessions.

Experimental work has shown that independent research and its defense, carried out under the guidance of teachers, can be a complex process for students. Therefore, allocating sufficient time for skill development is essential. Initially, students should analyze research with the teacher; in the next stage, they should present their preliminary research findings in discussions with classmates. Subsequently, senior students should develop skills in presenting their research preparation results to their peers.

Another critical step in developing the research competencies of high school students is training them in writing research papers. This begins with introducing them to the basics of writing small academic articles based on their research results. The methodology for involving students in research activities facilitates the acquisition of research skills, the ability to present their work, and, ultimately, self-regulation and the ability to demonstrate their acquired knowledge and skills effectively.

As part of developing and refining students' research competencies in biology, a didactic system is devised to support their research outcomes within the framework of scientific activities. That is, conditions are created for students to carry out research within the existing educational structure of general secondary schools. To sustain students' interest in research and ensure its continuity, their achievements and research findings should be regularly showcased in competitions, presented as exemplary work, and acknowledged by school administration and teachers.

Indeed, by developing students' research skills into competencies at the general education school level, we can confidently state that their engagement in scientific research at subsequent educational stages will significantly increase.

REFERENCES

Qарахонова Л.М. Electronic educational resources and biology educational process efficiency in general educational schools // Eastern European Scientific jornal. Ausgabe 5-2018. 273-275.

Qарахонова Л.М. Разработка и внедрение цифровых ресурсов в непрерывном образовании // ж Узлуксиз таълим. –Тошкент, № 6. 2018. 59-62.

Qарахонова Л.М. Биологиядан электрон таълимий ресурслардан фойдаланиш имкониятлари // Гармонично развитое поколение – условие стабилного развития Республики Узбекистан/ Сборник научно-методических статей. УзНИИПН. 2019. Част 3. –С. 512-514.

Qaraxonova Lobarxon Musaxonovna, ., & Ximmatov

Elmurod Xayitovich, . (2023). ISSUES OF IMPROVING TEACHING OF INFORMATION LESSONS TO STUDENTS IN GENERAL SECONDARY SCHOOLS. CURRENT RESEARCH JOURNAL OF PEDAGOGICS, 4(11), 126–131. https://doi.org/10.37547/pedagogics-crjp-04-11-22

Shernazarov, I., Karakhanova, L., Tilyabov, M., Elmuratova, D., & Saidkhanova, N. (2023). METHODOLOGY OF USING INTERNATIONAL ASSESSMENT PROGRAMS IN DEVELOPING THE SCIENTIFIC LITERACY OF FUTURE TEACHERS. SPAST Abstracts, 2(02).

Karakhanova, L., Makhmudova, D., Shernazarov, I., & Khujanov, E. (2024). Biotechnology Breakthroughs: Shaping the Future of Health, Agriculture, and Industry. In BIO Web of Conferences (Vol. 141, p. 04003). EDP Sciences.

Musaxonovna, Q. L., & Mashxura, N. (2024). UNIQUE OPPORTUNITIES OF USING ELECTRONIC EDUCATIONAL RESOURCES IN BIOLOGY LESSONS. European International Journal of Pedagogics, 4(01), 97-101.

Eshtemirovich X. U., Musaxonovna Q. L. THEORETICAL AND METHODOLOGICAL ISSUES OF USING SOCIAL ECOLOGY IN EDUCATING NATURE CONSERVATION SKILLS IN STUDENTS AND YOUTHS //European International Journal of Pedagogics. – 2024. – Т. 4. – №. 08. – С. 26-31.