



## **TO PROVIDE STUDENTS WITH A SET OF THEORETICAL AND PRACTICAL COMPETENCIES IN THE FIELD OF GENETICS.**

Mirzoeva M.A.

Bukhara State Medical Institute named after Abu Ali ibn Sina

<https://orcid.org/0009-0006-9474-6146>

### **Abstract**

Currently, the problem of teaching genetics through the independent interests of students is one of the most important areas of higher education. In this article, we propose several ways to organize students' independent work on genetics in a multilingual education environment. The course of methodological improvement of biological science is comprehensively studied from year to year, and research results are published. In this regard, the university conducted an analysis of the teaching of biological science and the organization of independent work, which in subsequent years was reflected in the works of foreign and domestic authors. The article presents the experience of teaching genetics at Bukhara State University based on the organization of independent work of students of the future field of biology in a multilingual education. The results of experimental studies aimed at verifying the effectiveness of independent work are presented. Our analysis allowed us to conclude that the methodological training of biology students as an object of pedagogical research should include various aspects of the vocational training system. The process of teaching genetics in English through freelance work encourages students to study the subject and language more deeply.

**Keywords:** genetic education, integrated discipline, gene pool, numerical genetic problem, diversification, integration, heredity, reproduction, meiosis, mathematical modeling, genetic drift, binomial distribution

### **Introduction**

The variety of approaches to the organization of higher education and modeling of its results has led to the need to search for didactically sound and proven methods of educating young people, in particular the field of biology, and preparing them for future professional activities. Despite all efforts, the current situation in the



system of general and vocational education (early career guidance and professionalization, the opening of specialized classes, the creation of specialized vocational education programs at the level of secondary schools, specialized boarding schools, etc.) does not give the desired effect. Metropolitan and regional universities continue to accept motivated, insufficiently prepared or unsure of their choice of applicants for a specific professional activity. Given the contradictory nature of the presented article, we have set ourselves the goal to fully present not only our positions on the organization of genetic education, but also the views of other authors on the problems of the development of genetics, genetic education and ways to solve them based on traditional and modern achievements in this field. In this regard, the article examines the issues of the history of genetic education in Uzbekistan, the main problems of genetic education and ways to solve them in the existing conditions of the educational environment, the importance and specificity of genetics as a branch of knowledge and science.

Historical aspects of the development of genetic education in Uzbekistan

The problems of teaching genetics as an academic discipline have remained in the focus of attention of scientists since genetics as a science "returned" from the category of forbidden fields of knowledge, and especially in connection with the updating of trends in scientific and technological initiatives of the country's development in the modern world. Without studying genetics and its foundations, biological science is like "a huge building whose base is made of clay." It loses important foundations for explaining basic biological laws and their application in practice. M. V. Lomonosov argues that genetics is an integrated discipline that permeates all areas of modern biology. However, it is not enough to know the genetic foundations of biology and even systematically assimilate information.

The founder of the doctrine of the gene pool, the world-famous geneticist, scientist A. S. Serebrovsky drew attention to this. The scientist insisted on the introduction of genetic thinking among biologists of different specialties, and this area has proven its importance and relevance, it corresponds to the trends in the development of genetics and is one of the aspects of our methodological position.

Geneticists believe that in addition to scientific and teaching activities in leading universities of the country, in the field of teaching this discipline there are a number of problems and tasks related to ensuring the visibility of genetic processes in living systems, the role of genetic terms, concepts and definitions:



-formation and development of the conceptual apparatus of science and students' thinking;

- the logic of studying genetic material;

- requirements for the content of in-depth, basic and Optional material;

- areas and scope of genetic tasks;

- effective methods of conducting practical and laboratory classes are very important.

Genetics remains one of the most difficult subjects for teachers and biology students all over the world, it is recognized that many students and even biology teachers do not fully understand the basic rules of genetics, facing difficulties in solving numerical genetic problems.

### **The Main Part**

The principles and methods, laws and patterns of teaching genetics as a separate academic discipline were improved, on the one hand, in accordance with the development of didactics, including the didactics of higher education, on the other hand, they were studied and formed simultaneously with the development of genetic research.

So, he wrote that one of the basic principles that make up education is a combination of in-depth study of the general scientific foundations (biological) disciplines of study in the initial courses (from 1 to 2) followed by professional specialization in 4-5 courses. This approach is implemented on the condition that the experimental base of research institutions is used, where students undergo pre-graduate and diploma practice.

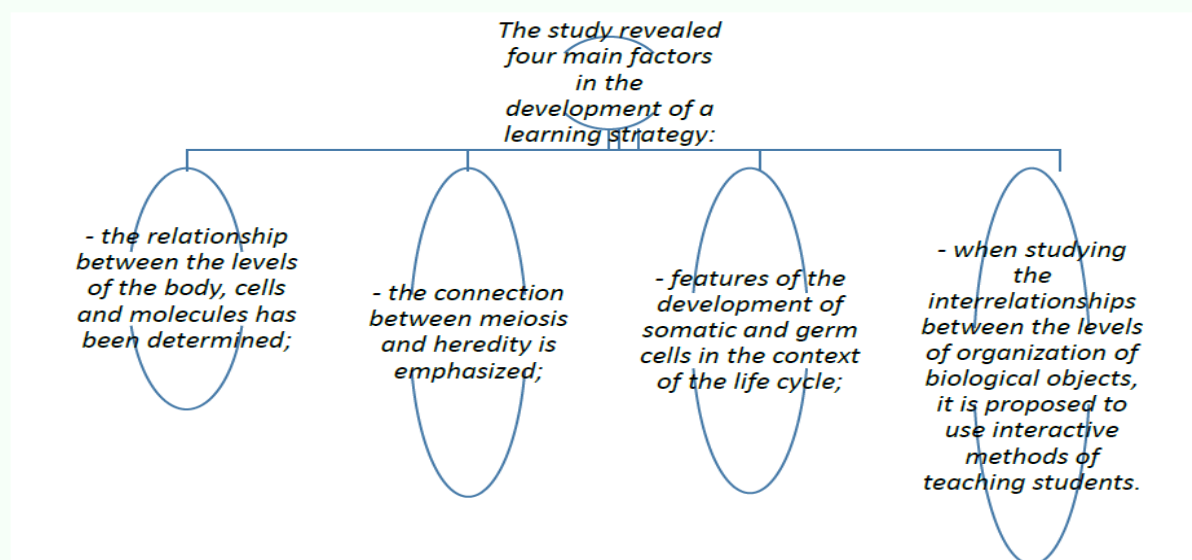
In our opinion, the most generally accepted system of genetic education today is based on the use of a traditional approach to obtaining a university diploma. S. G. Inge-Vechtomov and I. S. Buzovskina argued that teaching genetics led biology to the exact sciences at the beginning of the XX century, and argued that it, that is, genetics, is forever "doomed" to become a borderline discipline. The authors write that the general biological significance of genetic science determines the specificity of the education system and some principles that must be taken into account when training future specialists. It can be said that the main role in genetic education is played by the course "General Genetics". It should initially have all subsequent special courses for students. The scientific, practical and theoretical significance of

university education and genetic education in particular is the unity of scientific and pedagogical work in which students participate in research groups, work in laboratories and thematic groups. S. G. Inge-Vechtomov and I. S. Buzovsky writes that the choice of such a common problem is a tradition of the scientific school, which serves as a kind of compass in the conditions of diversification and integration of sciences.

Drawing attention to the importance of biological and genetic knowledge, we consider important the idea of the need to develop and implement national, regional and international projects and programs in the field of genetics, deepen and develop cooperation, promote the integration of specialists and scientists of Uzbekistan into world science.

A common understanding of the role of genetics in the development of the fundamentals of biology and applied research has led to changes in the teaching of genetics at the undergraduate level in recent years in many ways, with broader content and teaching using new teaching methods based on educational research and based on the principles of active learning and reverse engineering.

**Analysis and results.** The problems of education related to the abstract and complex nature of genetics as a branch of science are studied in detail. In particular, in the curriculum, the separation of heredity, reproduction and meiosis explains the abstract nature of genetics, while different levels of biological organization contribute to its complex nature.





In the modern world, interactive teaching methods are widely used in the study of genetic sciences [11]. Practical exercises are successfully applied and the range of biological objects is expanding [12], new approaches are constantly being studied and the methodology of teaching genetics is being improved, as well as the quality of methodological material [13; 14]; research is being conducted on the use of mathematical modeling, including on the features of binomial distribution to study genetic drift, [15]. The American Genetic Society (GSA) has developed "online resources for teaching genetics," including mendelweb and Geneed. The organization of regular short-term training courses is recommended to review the established content of genetics courses, develop new teaching methods and prepare educational materials to improve the knowledge base of teachers [7]. Teachers are given the opportunity to improve their practical skills in using molecular genetic methods [16].

In the modern world, genetics is important in almost all aspects of human life, including various scientific and practical fields. The achievements of genetics and genetic technologies are successfully applied in medicine, veterinary medicine, criminology, microbiology, virology, agriculture and forestry, etc. This gives it the status of a trans-scientific discipline, promising and attractive from an investment point of view. According to world experts, by 2027, the volume of investments in genome editing aimed exclusively at the CRISPR-Cas9 technology market will reach \$ 10 billion, which means jobs and decent wages for those who work in this direction. Children who are now in high school are entering adulthood in a new genetic era – with new services, professions and jobs. Future professions, which are expected to emerge by 2030, will be related to genetic technologies and will include a genetic consultant, a canine geneticist, a molecular nutritionist and a specialist in personalized medicine.

Against the background of the tasks set, genetic and biological education at the present stage is recognized as one of the strategic vectors for the formation of an innovative model of education in the work "the role of genetic education as the main link in the training of biologists" (S. K. Imankulova et al.), attention was drawn to the fact that in the modern world it is especially important to introduce into practice higher professional education completely new forms of education. They should be aimed not only at the formation of fundamental knowledge, but also at achieving a high level of professionalism, competence, mobility, the ability



to independently make the necessary decisions and implement them in certain conditions. Along with multidisciplinary universities, pedagogical universities of the country play a major role in the training of specialists, since they train specialists who subsequently develop and implement scientific and educational programs.

### **Conclusion**

Genetics, one of the most developing biological sciences, refers primarily to sciences that form a natural scientific worldview and provide an educational basis for mastering a number of important and innovative professions not only of the present, but also of the future. To these problems, we can add a number of equally noticeable ones - this is the low scientific and educational motivation of schoolchildren, applicants and the bulk of students. This is due to a social and personal underestimation of the importance of genetic and biological education in general for the realization of personal cognitive needs and motives. This is due to the fact that most of the general and vocational education programs are overloaded with outdated content, imperfect methodological and evaluation materials, insufficient scientific and practical orientation of genetic education, lack of conditions for familiarizing students with modern methods of genetic research of various aspects of human life, as well as the lack of virtual laboratories with high professional quality and maximum information content. Touching upon the problems of a substantive nature, it should be noted that the content of genetic education is constantly becoming outdated due to the rapid development of science, and for the training of future specialists it becomes formal and detached from the realities of life. In many cases, the educational needs of future geneticists are not sufficiently taken into account.

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