Traditions in teaching physics at the regional Kaliningrad University

I P Korneva
Baltic Fishing Fleet State Academy, 6 Molodezhnaya Str., Kaliningrad, 236029, Russia
E-mail: ipk05@mail.ru

Abstract. The article discusses the features of the functioning of the physical education system at the regional University of Königsberg (East Prussia) and the University of the Kaliningrad region. The article discusses the specifics of training physicists at each stage of the University's development. It is shown that the scientific and educational processes are inextricably linked with each other when teaching physics. Participation of the faculty of physical departments of the University in research work and involvement of students in it is the key to successful training of highly qualified specialists. At various stages of the development of the physical education system, special attention was paid to the training of physics teachers. The tradition of teaching physics, laid down in Albertina, is continued at the modern University of Kaliningrad.

1. Introduction
The problems of development of natural science education in general and physical education in particular are the subject of acute discussions at the present stage. Physical education at a regional University requires critical assessment, and therefore serves as a subject of research from the point of view of the history of pedagogy.

The need to rethink past experience in order to develop recommendations for the modernization of physical education is an urgent task. This study analyzes the traditions in teaching physics at a regional University.

2. Main results
For the first time, physics training in the Kaliningrad region (former East Prussia) began at the University of Königsberg – Albertina. Albertina, opened in 1544 with the assistance of the first Duke of Prussia, Albrecht of Brandenburg, was one of the oldest universities not only in Germany, but also in Europe [1-3].

From the moment of the University's formation until the beginning of the XVIII century, physics at the University of Königsberg was part of the natural science, which was taught in one of the four faculties of Albertina – philosophy. At that time, natural science and exact sciences were not given due attention. The faculty of philosophy was considered the lowest among the others.

The age of Enlightenment influenced the development of science and education in Europe. In April 1701, the first position of professor of physics appeared in Albertina. At the same time, the department of physics became a separate division of the faculty of philosophy of the University of Königsberg.
However, systematic training in physics at the University of Königsberg began after the opening of the physics and mathematics seminar – a kind of school, which was headed by mathematician Carl Gustav Jakob Jacobi and physicist Franz Ernest Neumann [4, 5].

The purpose of the seminar was to modernize natural science education at the University, search for effective methods of teaching students of the Königsberg school of physics and mathematics, and train teachers for schools in East Prussia.

As a result, by the middle of the XIX century, the University had a coherent system of teaching physical sciences, which soon became the standard. Three components were harmoniously combined in the training: lectures, laboratory practice, and problem solving. An important feature was the participation of students in scientific research conducted under the guidance of teachers.

As a result, the graduates of Albertina received fundamental theoretical knowledge, mastered the technique of physical experiment. Among the graduates of the seminar were many outstanding scientists: G. R. Kirchhoff, E. Wichert, A. Sommerfeld, T. F. E. Kaluza, A. Klebsch, and others.

The University of Königsberg has existed for 400 years and left behind a rich scientific, pedagogical and cultural heritage. The system of physical education, which was formed in Albertina, had its own peculiarities and principles of work, due to both the peculiarity of the geographical location and political and economic conditions [6].

The formation of the system of physical education in a modern regional University (Baltic Federal University named after Immanuel Kant) has a much more modest time frame – just over 70 years. However, the history of the evolution of physical science and education at Kaliningrad University is full of a large number of events.

In recent years, there have been disputes about the continuity of the Königsberg and Kaliningrad universities. Many researchers and historians consider it possible to count the history of Baltic Federal University named after I. Kant since the formation of Albertina [7]. The Federal University owns some elements of the material and technical base of Albertina: part of the library fund, several buildings, and a botanical garden. The main thing is not the continuity of infrastructure, but “symbolic capital”: spiritual and cultural, scientific and educational.

It is worth noting the influence of the regional component on the peculiarities of the emergence and development of the system of physical education in both universities. The emergence of universities was due to the economic and political needs of the state, corresponding to its time. The primary task was to provide society with educated citizens who are able to perform their function within the framework of professional activity. The second task was the cultural and educational mission of each university within its own time period.

The next strategic goal was to develop science and establish international relations in order to improve the region's economy. Over time, both universities have coped with these tasks and formed their own system of physical education that meets the trends of the time. The University of Königsberg and Baltic Federal University named after I. Kant have become major educational, scientific and cultural centers, well-known for their achievements all over the world.

Let's consider how continuity in the formation of the system of physical education was realized at different stages of its formation.

The first common feature for universities is the immediate purpose for which they were created: educational activities: training of school teachers, researchers, etc.

Thus, the University of Königsberg was founded in order to strengthen the state by citizens who have a high-quality education. The system of physical education arose in it as the evolution of scientific knowledge itself, and, having originated here, became exemplary.

The purpose of the first higher education institution in Kaliningrad, Kaliningrad state pedagogical Institute, the predecessor of the Kaliningrad University, was also to provide educational institutions in the young Soviet region with highly qualified teachers [8]. Together with the Institute in 1947, the system of physical education was born and began to develop. In a short time, in the difficult post-war years, offices and laboratories were organized for physical practice, and the educational process was
established. The personnel issue was very acute throughout the work of the pedagogical Institute [9]. Teachers from other regions came to the newly formed Kaliningrad region with great difficulty.

Nevertheless, Kaliningrad state pedagogical Institute annually produced physics specialists not only for the Kaliningrad region, but also for other regions of the Soviet Union. In their work, physics teachers, as well as in Albertina, used a system of teacher training that combines theoretical training with laboratory practice, during which experimental skills and abilities were formed.

However, the pedagogical Institute noted problems with the conduct of research work by teachers due to their overload of methodological and educational work.

Research activity is one of the characteristic features of higher education institutions. This criterion of the system of physical education is inherent in the University functioning at all historical stages. This is due to the fact that the formation of Russian universities is directly related to the establishment of educational communications between the Russian state and Europe (especially Germany) [10]. In Albertina, as we know, Russian subjects also studied, and the research spirit inherent in physical education was strong in German universities and passed to Russian ones.

In 1967, the pedagogical Institute was transformed into Kaliningrad state University. The primary task assigned to the University was to organize training according to University curricula, conduct classes with students at a high scientific and methodological level, organize and conduct research, and train scientific and pedagogical personnel for the region. Scientific research has come to the fore, and at the same time the traditions of the pedagogical Institute for training highly qualified physics teachers have been preserved.

Scientific research was organically included in the educational process: students of the faculty of physics performed experimental and theoretical work as part of the course and diploma design, as well as participating in state-funded and contractual works, grants and various types of projects. University research has reached an international level.

In 2010, the University became Baltic Federal University named after Immanuel Kant. At this time, much attention was paid to improving the effectiveness of the educational process, which was reflected in the creation of new-generation educational materials using information technologies, the development of international communication and mobility of students and teachers.

There was an increase in scientific research associated with the participation of physicists in various Federal and international programs and competitions. The University was included in the program of increasing the competitiveness of Russian universities. At the Federal University, there is a trend in development of natural science and mathematics profiles. There are new physical directions of training students at different levels of education, there is a variety of educational services provided by the University.

However, teacher training for general education schools and secondary educational institutions has taken a back seat. In a few years, the region will increase the staff shortage among physics teachers due to objective reasons related to the age of working teachers. Therefore, the priority task at the present stage is the development of human resources in regional educational institutions. Kaliningrad and Königsberg universities have always made a huge contribution to the development of the personnel reserve of the exclave territory.

The quality of the teaching staff that provided the educational process for the development of physical sciences at all stages of the formation of the physical education system corresponded to a fairly high level. Physics teachers at all times at the University were distinguished by their deep knowledge of the subjects taught, high demands on all participants in the educational process, and great dedication. All this ultimately affected the level of development of physical education in the region.

Another important criterion for the effectiveness of the University is the demand for graduates. Graduates of the regional University have always been in demand in the labor market: both physics teachers and physics engineers. The demands of society for training of specialists at times exceeded the capacity of the University.

The system of physical education in different years had shortcomings. One of the problems at all stages of physical education was the unpopularity of the profession among young people. Young people
preferred to study at more prestigious faculties. The exception is the modern Federal University, where applicants are subject to increased requirements, there are competitions for admission to physical training areas.

3. Conclusion
The system of physical education at the regional University has been formed over time and has acquired all the characteristic features of the educational system. Between physical education at the University of Königsberg and the regional University of Kaliningrad, there is a continuity in the form of “symbolic capital” [7].

Albertina's physical education system was widely known in Europe, including through the Neumann-Jacobi physics and mathematics seminar. As a result of the policy pursued by the University's management, scientific physical schools at Baltic Federal University have reached the world level and achieved certain results.

Both universities carried out educational and scientific reforms in the light of political, social and other events taking place in the country [11-12]. All this ultimately influenced the development of the physical education system. There are new areas of training for physicists, graduates began to feel confident in the labor market.

Currently, Baltic Federal University named after I. Kant, having its own vector of development, strives to preserve and increase the cultural, scientific and educational heritage of Albertina in physics.

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