REASONS FOR STUDENTS' FAILURE IN PHYSICS

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Physics plays an important role in explaining the events that occur in the universe. The development of physics in the 21st century has been extremely successful, as it has also brought great benefits to other fundamental and applied sciences and many useful technologies for human life. Although physics is in every area in our life and facilitate our lives, national and international studies show that success in physics education is lower than other disciplines. The decline of interest in studying physics on the one hand and the lack of interest in taking a physics course at universities or the avoidance of physics is a problem at the national and international level. Very small number in enrollment and graduation rates in physics at all levels has been the case in many countries. Existing research show that the erosion of beliefs and attitude in the subject found to emerge as early as lower at high school to later result in compromising university enrolment. The organization of teaching physics at all levels of general education provides for the readiness and ability of teachers to design the educational process, as well as to vary the methodology based on the needs and interests of students. Modern realities require the teacher to be highly skilled in the methodology of organizing the learning process, which will increase not only their subject knowledge of physics, but also its conceptual understanding, as well as the relationship with the processes and phenomena of the real world. Despite the fact that physics is a compulsory discipline for almost all technical and technological specialties that are taught at universities, a persistent decline in interest and, consequently, academic performance in physics is a generally recognized trend. At the same time, the monitoring of the development of the industrial sector, presented by Headhunter internet recruitment companies, allowed specialists to conclude that the shortage of engineers and personnel with technical education is fraught with stagnation or even a reduction in industrial production.

In order to improve student’s academic achievement, research into science teaching strategies such as Concept Mapping Strategy (CMS), Guided Discovery Method (GDM) and many others have been developed with the aim of making learning more meaningful and less complex [1, p. 19]. As one of the ways to interest students in physics, we can mention the STEM education currently practiced in many countries [2, p. 45], which combines an interdisciplinary and project approach based on the integration of natural sciences into technology and engineering creativity.

One of the most comprehensive definitions of underachievers is “underachievers are students who exhibit a severe discrepancy between expected achievement (as measured by standardized tests, assessments, etc.) and actual achievement (as measured by grants and teacher evaluations)”. The characteristic behaviors of underachieving students were examined in the School Attitude Assessment Survey-Revised (SAAS-R) as the research tool to investigate students with high and low achievements [3, p. 145]. This technique involves the selection of two groups of respondents during the survey: group A - successful students and group B - poorly performing students. The researchers noted interesting statistics of answers to the question “What is the main motive for you to get higher education?” Students of both groups (group A - 73.4%, group B - 67%) noted that the leading motive for studying at the university is interest in the chosen specialty.

As a quantitative tool for studying student achievement, we can mention the Colorado Learning Attitudes about Science Survey [4, p. 010101-1]. The methodology involved the processing of questionnaires on a five-point Linkert scale according to the following categories: the connection of physics with the student's daily life, personal motivation for studying physics, understanding of interdisciplinary and metasubject connections of physics, the ability to solve simple, medium and complex physical problems. The average percentage of positive feedback about a more serious attitude to study of the students surveyed was (52 ± 2) %, standard deviation $\sigma = 6$ %, relative calculation error $\varepsilon = 2$ %. In turn, the final analysis of the results of the methodology indicated the following factors: reasons that depend on the teacher (incorrect construction of the educational process in physics, inability to combine various modern methods of teaching physics, inability to organize communication between the teacher and student and students among themselves). The reasons that depend on the student included insufficient knowledge of basic school courses in physics, a low level of ability to acquire the necessary knowledge, and individual characteristics of the student. In addition, the data of empirical sociological studies of the opinions of teachers of educational institutions in such cities of Ukraine as Kharkov, Zaporizhia and Berdyansk testify to the pragmatic approach of students to learning (70.8% of respondents). Only 16.6% of students are passionate about physics. Interest in physics fell by an average of 28.2% for 3rd year students compared to first year students. The quantitative results of surveys, of course, may vary for different educational institutions, however, the identified trend is beyond doubt.

Teachers of the Department of Physics of Odessa State Academy of Civil Engineering and Architecture, when working with underachieving students, widely use the search for the optimal ratio of methodological techniques with the initial information base of the

student. In particular, the most effective method is the method of partitioning problem laws, concepts and calculations into a finite set of basic primitives (used in the following sections of the general course of physics: electromagnetism, optics, quantum physics) and the method of limiting approximations for analyzing the numerical values of physical quantities (classical non-relativistic and relativistic mechanics). Almost every lecture on physics is illustrated by fragments of articles from scientific journals that are associated with a particular concept, law, ratio. In addition, the educational material is accompanied by relevant fragments from the history of physics (Archimedes, Cavendish, Maxwell, Poisson etc.). This technique, according to the author, makes it possible to arouse interest in physics and its applications in technology. Numerical estimates for different sections of the general physics course are, if possible, carried out both for macro- and microscales. The main relationships and laws are necessarily accompanied by an analysis of the area of their applicability (general gas equation, Coulomb's law etc.). Familiarizing students with the entire range of lecture material, as well as solving problems and performing laboratory work, allows laying the foundation for the competence of a future engineer who is able to cope with numerous tasks and problems that will inevitably arise in his professional activity. The same pedagogical complex, in the opinion of the author, will also make it possible to realize the second task, namely, to reduce the percentage of underachieving students in physics.

The decline in students' progress in physics is a rather complex problem that requires the use of multivariate analysis and a wide range of methodological techniques to solve it. The teaching of physics in educational institutions of a technical profile should include providing students with high-quality physical knowledge, taking into account the current state of scientific achievements; application of effective and active teaching methods; revealing interdisciplinary and meta-subject connections of physics.

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