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ON THE PROBLEMS OF TEACHING MATHEMATICAL DISCIPLINES IN THE ELECTRONIC LEARNING SYSTEM

The article provides a critical analysis of the potential for distance learning in mathematics under contemporary conditions. It points out that significant amounts of money are being expended and many developments are being duplicated, the effectiveness of which remains unproven and is likely to remain so. The segments of mathematics where e-learning is particularly effective are also discussed.

Keywords: mathematics, distance learning, real problems, efficiency.

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О ПРОБЛЕМАХ ПРЕПОДАВАНИЯ МАТЕМАТИЧЕСКИХ ДИСЦИПЛИН В СИСТЕМЕ ЭЛЕКТРОННОГО ОБУЧЕНИЯ

Приведен критический анализ возможностей дистанционного обучения математике в современных условиях. Отмечено, что затрачиваются огромные средства, проводится дублирование большого количества разработок, эффективность применения которых никто не доказал да и вряд ли докажет. Рассмотрены разделы математики, где использование электронного обучения достаточно эффективно.

Ключевые слова: математика, дистанционное обучение, реальные проблемы, эффективность.

Я долго жил среди взрослых. Я видел их совсем близко.
И от этого, признаться, не стал думать о них лучше.
Антуан де Сент-Экзюпери. Маленький принц.

Mathematicians were drawing attention to the problems associated with studying fundamental sciences since late 20th century [1]. Academician V. I. Arnold repeatedly noted that the harm inflicted on civilization by such transformations in the system of mastering fundamental sciences is comparable to the damage from the bonfires of the Inquisition in the Middle Ages. In the 21 st century, the widespread opinion is that distance learning will assist and save education [2]. A large number of publications on this topic are appearing [3], allowing

for clear duplication of programmes and developments, the effectiveness of which is obviously doubtful. An enormous number of regional and international conferences, meetings and symposiums are held. The huge amount of students and auditees are claimed to attend those events, causing one doubting those numbers authenticity. This is shown by the experience of countries where distance education has been actively implemented for quite some time. Media provides specific facts that a large number of students enrol in distance learning courses, especially free ones, but significantly fewer complete them. The idea of distance learning is far from new and previously manifested itself in a variety of ways [4]. In our opinion [5–7], as noted by other authors, a distant leaning approach may still be premature, at least in teaching mathematics. It is clear that the study and serious assimilation of mathematical methods requires quite profound and long reflections on the fundamental concepts and their interrelationships [5; 6]. It assumes solving of a large number of concrete problems using basic methods to hone the skills to a certain degree of automation. Therefore, working with a teacher and independent study of fundamental sciences remains the main option for now. The epigraph to this work implies that, in our opinion, the idea of fully transitioning education to distance form is a clear fixation. Of course, one cannot fully agree with the principle posted on the website http://www.paramult.ru/node/312 *"10 reasons why distance courses (MOOC) are evil"*. However, a number of thoughts outlined there have every right to exist and should be taken into account.

The forced transition to distance learning in 2020 worldwide showed that this methodology solves far from all problems and creates a series of new ones [4; 5]. The actual damage from such a transition will, apparently, be felt for quite a while. Perhaps this was one of the reasons for the issuance of Decree No. 401 by President of the Russian Federation Vladimir Putin on June 27, 2022, "On the Conduct of the Year of the Teacher and Mentor in the Russian Federation". In other countries, too, distance education is considered a forced step.

Naturally, in the 21 st century, in a "digital" society, there needs to be a shift from passive lecture attendance or viewing relevant texts on a computer screen, to the elevation of the share of student's independent work, or, speaking in modern terms: transitioning from knowledge transmission to students to obtaining knowledge from various sources [6], which can occur during students' independent work. In reality, most students cannot work independently in mathematical sciences, many do not see the need for acquiring fundamental knowledge, believing they can find all the necessary information at any time on the internet, without thinking about their meaning and correctness. Instead of a dialogue in the lecture, implying discussion and comprehension, there is a monologue from the lecturer. The issue is exacerbated by the fact that mathematical tutoring mainly takes place in the first and second years for students of technical faculties/specialisations. Unfortunately, it must be stated that many students do not have the necessary level of basic education sufficient for a quality mastery of the curriculum.

Considering the reduction in teaching hours for mathematical subjects in technical universities, future engineers should be more familiar with applied sections of modern mathematics and the possibilities of operating a variety

of mathematical software systems. The latest transformations of curricula in Belarus have once again reduced the volume of teaching hours for mathematical subjects, even for specialists in Information Technology (IT). Quite significant sections have been removed for most engineering specialties [6]. Yet, a large part of modern engineers do not reach the level of mathematics mastery they require. They are taught from textbooks what was necessary for an engineer 60–40 years ago. However, lots of things have changed significantly in the last 50 years: different areas, different applications. Future specialists in information technologies and artificial intelligence need to be taught less continuous mathematics, which engineers were taught in the 20 th century, and more attention should be paid to discrete mathematics, algebra, mathematical logic, and number theory [6].

Mathematics is destined to become a significant segment of the instrumental base of the technological revolution and, moreover, to actively participate in shaping the intellectual potential of modern entities themselves. The times when mathematics was presented purely in a technical-technological manner, as a tool demanded by society for its practical-transformative activities, are in the past. In the current information-rich era, there is a sharply increased demand for a creative, intellectually developed individual. Of course, alongside other skills and expertise, they must possess competencies in the field of mathematics that meet the demands of our era: even in everyday life today, it's practically hard to do without them, though in reality, they are bypassed. Mathematics is not only a universal language for describing and studying engineering objects and processes, but also a factor that shapes the thinking style of a specialist. Mathematics poses problems whose solution requires intellectual effort, persistence, will, and other personal qualities [6; 7].

Rudyard Kipling wrote, "Education is the greatest of earthly goods if it is of the highest quality. Otherwise, it is completely useless."

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