Педагогічні науки

UDC 378.14

Koval Olga

Senior Lecturer at the Department of Mathematical Physics

National Technical University of Ukraine

«Igor Sikorsky Kyiv Polytechnic Institute»

Коваль Ольга Александровна

старший преподаватель кафедры математической физики

Национальный технический университет Украины

«Киевский политехнический институт имени Игоря Сикорского»

SOME NOTES ON TEACHING MATHEMATICS IN TECHNICAL UNIVERSITY
НЕКОТОРЫЕ ЗАМЕТКИ О ПРЕПОДАВАНИИ МАТЕМАТИКИ В ТЕХНИЧЕСКОМ ВУЗЕ

Summary. *The main problems that students of the first year of study face when studying mathematics in the technical university are investigated in this article.*

Key words: *higher mathematics, school education, mathematical intuition.*

Аннотация. *В статье исследованы основные проблемы, с которыми сталкиваются студенты первокурсники при изучении математики в техническом вузе.*

Ключевые слова: *высшая математика, школьное образование, математическая интуиция.*

For 38 years, the first of September has been the reason of excitement for me, before entering the classroom, where the students of the first year of study are

anxiously waiting for me, a teacher of higher mathematics. And do not believe that over the years the excitement can disappear.

At the outset of my teaching career, my early adulthood was the reason of excitement. I really did not know how to psychologically cope with even a small student audience. On the other hand, I did not expect some other problems to be on the watch. Now, I have gained enough experience to deal with a large student audience, but I am very much familiar with the problems I can face in class, too.

So, I would like to share my impressions and thoughts about the teaching process. I consider them rather subjective, though someone could find them quite challenging and effective.

To be a well-grounded teacher does not only mean to be an experienced scientist. You have to know enough and understand a lot. But you also have to be able to deliver your knowledge, explain the material and make the students get interested in it. The teacher has to be both an actor and a conductor to have a good grip on audience. The teacher is a scientist, a methodologist and a psychologist all in all.

However, teaching mathematics has its own unique features, particularly at the faculties of universities the technical where no External Independent Testing on mathematics is required, and the program on linear algebra, analytical geometry and mathematical analysis is almost similar to that of the other faculties [1, p. 30].

It's no secret that knowledge standards the first-year students have acquired at school are not getting better with every passing year. And the teachers are becoming the hostages to this situation. School reforms have significantly changed the system and level of entrants' educational background.

External independent testing (EIT) results have become a school teacher's work evaluation. Drilling the students to the Testing has forced out the formation of fundamental mathematical knowledge, development of mathematical range

of vision and acquisition of independent creative work skills from school education.

Students' and teachers' catering to EIT, rather than further getting education in a higher education institution, leads to the fact that in the first days of study the majority of freshers experience great problems of self-organization character, both objective and subjective [2, p.43].

My solid experience in teaching higher mathematics brings me back to the years when the entrance examination materials were to be prepared by the university teachers, and they were responsible for checking them. For this reason we always had a feedback: the results showed which sections in elementary mathematics the applicants had mastered and what mathematical skills they had acquired.

Introducing EIT has completely eliminated this feedback just because the points received at the Testing do not contain any information about entrants' problems in mathematics. What do the teachers of higher mathematics need to do in this case? And how? What can really be done and what should we try to achieve?

So, firstly, alleviate the students' fear. The fear of an unknown teacher (out of the absence of margins in an exercise-book or running a mistake through with a pen, etc.), of the subject (at school they have mathematics 4-6 hours a week, at the university they have about 8-10 hours), of an unforeknownable future (examination period: How will it be, or Will I endure?). Studying with fear is unrealistic and has no prospects!

Even the children with low results in External Independent Testing can successfully pass the exam if they are relaxed and have been sturdily working during the term, A smile, a joke, your goodwill, some true stories of great mathematicians - fear will leave, perhaps, not for ever, but, at least, it will start disappearing.

Secondly, it is necessary to immediately clarify the details and explain the

freshers that the higher educational establishment (institute, university, academy) is quite another matter than a secondary comprehensive school. Here, they acquire knowledge, not assessments. This is where the adult life begins and the teachers here are qualified professionals in their spheres, but not the case of a nursary teacher, and while writing a review work a student can demand "Could I ask you a question?" but the teacher's reaction might be "You can surely ask, but don't expect for the answer".

Thirdly, the most important aspect is teaching the subject, namely, mathematics. How to bring the students into the world of higher mathematics, the world of "epsilon-delta" without messing their minds up if the term "trigonometry" causes trembling all over, and logarithms cause a state close to anabiosis?

First of all, I would advise (no matter how difficult it might be) to spend some time trying to eliminate "blind spots" in elementary mathematics. Without removing these gaps, studying higher mathematics sections might seem very difficult for the students. Carrying out additional classes or including some revising hours for the main activity classes helps solve this problem in various higher education institutions. And then it is important to pick out the material the students need to grasp within the program in the timescale available.

Teaching mathematics should be as simple as possible, clear, natural, and keep on a level of rational strictness [3, p. 30].

What does that mean? When considering theoretical issues, preference should be given to simplier ways, and in class, all possible solutions should be considered, so that students can compare them themselves and choose the easiest or the most convenient one. It seems to me that in practice, it is important not to solve more examples, but to show the variety of methods and approaches, even for one task.

In theory, one should choose direct proofs rather than proofs by contradiction, as well as proofs that do not require additional schemes. And when

presenting a lengthy but comprehensible method, students tend to prefer the simplier one, which is not easily learned, despite the benifits of the other method. "To dance after the students whistle" or impose sophisticated but rather artificial methods is a question of methodology and there is no clear answer to that.

Do not reject the role of mathematical intuition, especially at the faculties with non-core mathematics. But do not overestimate it.

It is obvious that mathematics and logic are inextricably linked: mathematics does not exist without logic, but mathematics is not reduced only to logic. It is common knowledge that in practice we do not always use proofs or proved facts. Sometimes the teacher needs to explain some mathematical statements to a student, so that he/she can effectively apply it. And it is no wonder that intuitive methods are justified when they lead to the expected result.

It is mathematical intuition that comes in handy when solving problems that require trigonometry, which is, metaphorically, a mathematical, extremely colorful jungle with many groundbreaking paths. However, sometimes we have to use intuitive methods and it would be better to have a clear mathematical model or general method with a strict proof.

Logical justification of mathematical statements is based not on the rigor of reasoning, but on the objective necessity. Without this, mathematics is impossible. In research intuitive ideas concerning basic concepts are not enough, moreover, the use of these concepts without a strict understanding of their content can lead to direct errors. To my mind, the misconception about complexity of studying mathematics is often a result of its fuzzy intuitive teaching.

Interacting with mathematics is advisible from an early age, playing, laughing and having fun of this process. And then a child falls in love with it or they may become friends.

Conclusions. I am convinced that a teaching methodology can turn almost everyone (children, teenagers, students) towards mathematics. A teaching methodology is, first and foremost, a matter of mathematicians themselves,

provided that others have the necessary reserve of knowledge. And if the latter is not fulfilled, then it is a question of teacher's qualification.

References

1. Rudyk T., Sulima O. Some aspects of teaching higher mathematics at Igor Sicorsky Kyiv polytechnical institute // International scientific journal «Internauka». № 1 (81). 2020. P. 29-30.
2. Rudyk T., Sulima O. To the question of the students' motivation for studying higher mathematics // International scientific journal «Internauka». № 22 (62). 1 v. 2018. P. 42-44.
3. Kudryavtsev L.D. Myisli o sovremennoy matematike i ee izuchenii. M.: Nauka, 1977. S. 112.