

THE ROLE OF RTU STUDENTS' SURVEY IN ENSURING THE QUALITY OF MATHEMATICS STUDIES

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Abstract. In the current process of change around the world, questions concerning the improvement of the efficiency and quality of the education system are very appropriate. The quality of higher education needs to be developed and improved for the benefit of students and other beneficiaries of higher education [1]. The authors' research is dedicated to finding ways of improving studies in Mathematics at Riga Technical University on the basis of surveyed students' opinions and suggestions.

Keywords: higher education, study process, students' survey, mathematical subjects

Mathematics Subject Classification: 97B40, 97C30, 97D50, 97D60.

1 Introduction

In a changing world, society's thoughts and understanding about education are transforming, and people's needs for education are changing. Therefore, everywhere in the world, questions about improving the education system, about improving the quality of education, are very appropriate and important. A special place in the education system is given to higher education because its task is to develop creative thinking personalities. In response to the rapid changes, the higher education institutions in Latvia are improving the content of study programs and the quality of studies by ensuring the modernization of the education system and significantly improving the basis for acquiring modern knowledge and qualifications. This means that changes are also taking place in the higher education system.

In the 2011 EU Council conclusions on modernizing higher education, the member states were invited "to promote the systematic development of effective strategies, to provide access to education for under-represented groups and to step up efforts to reduce early school leaving rates, by improving the quality, usefulness and attractiveness of training courses, in particular, regarding student-centred learning, and in the support, advice and consultations provided to students after joining a higher education institution" [3]. Changes in education are needed for a new quality in teaching, which is formed in the development of society and manifests itself as an ongoing process [2].

2 The origins of the research

Taking into account that the educational needs of students nowadays are changing and the nature of knowledge has changed, becoming more universally accessible, we wanted to analyze our own learning process, and ask ourselves what it is that we want to provide? We thought about various forms of learning, such as lectures, exercises, consultations, structured knowledge, practical knowledge, seminars, discussions, effective learning approaches, discussion management and innovative thinking strategies. Although each student takes these steps differently, each student has an important place in the learning process, and our job is to offer optimal support to everyone. The learning path is precisely determined. The information is selected by the lecturer, prepared and offered. The ability to orient oneself in the information environment, in fact, is one of the most important skills that must be learned today. We are focused particularly on the students who are seriously searching for their paths in education and their future profession. We try to restructure our teaching time in order to effectively use the components that make up our learning process.

Since the 2007/2008 academic year Riga Technical University (RTU) has used the ORTUS portal, a unified e-learning system, which is based on the MOODLE (Modular Object-Oriented Dynamic Learning Environment) e-learning program. In Latin the word "ortus" means "a new beginning". The RTU ORTUS portal (www.ortus.lv) facilitates the life of every RTU student who wants to make his/her teaching process faster, modern and more efficient. This ORTUS portal is available anywhere and at any time via internet access. In the ORTUS portal, the Study Department of RTU, in cooperation with the Information Technology Service, has implemented the Student Questionnaire System, which conducts regular, once per semester, student surveys on the quality of the content of acquired studies and on the quality of the teaching staff's work. Through the RTU ORTUS portal, every student receives a questionnaire for each semester's acquired study subject. The results of the questionnaire for each semester can be found in the appendixes and are fully accessible to each particular academic staff member (regarding their study subject), to the head of the structural unit of the teaching staff and - upon request - to the study program directors of the academic staff involved in the implementation of their study program and to representatives of the Students' Parliament. Survey results are carefully analyzed, evaluated, accumulated and compared with the results of the previous period in order that appropriate decisions are made to improve the quality of studies.

3 How this research began at the Department of Engineering Mathematics

Every semester surveys are mandatory and every RTU student has to answer all survey questions before the beginning the next semester. The existence of the "deadline" and the obligation to go through the whole survey, in our opinion, significantly influences the honesty of answers given by badly-organized students doing the survey at last moment, who may not think about the questions. The existence of such the survey, which aims to improve Mathematical studies through knowing what students really think, and to understand what can help them learn Mathematics better, prompted us, several Professors of Mathematics of the Department of Engineering Mathematics, to create our own survey with questions which are specific to Mathematical subjects.

We have a particular innovation this year. Due to the initiative of the Students' Parliament, starting from this 2017/2018 academic year, all RTU Professors of Mathematics are obliged to grade the course for a student not only upon the student's final exam results, but also upon their work in the semester. The following formula for calculating the semester mark is applied from the current academic year. The formula gives 50% of the mark for the final exam, taken during the exam period; 40% of the mark for tests and assignments, taken during the semester; 10% of the mark for homework solved at home. Such an approach encourages students to learn steadily and deeply, so that the results rely on a student's knowledge, not on luck during the exam.

The aim of the students' survey was to find out the students' view of the study program they are studying, as well as the progress of studies at the higher education institution. In total, 317 students of the Faculty of Civil Engineering, Faculty of Mechanical Engineering, Transport and Aeronautics, Faculty of Power and Electrical Engineering, were surveyed. The survey was given for the 1st year students of the basic Mathematics course, and for the 2nd year students of the course "Supplementary Mathematics", both for Latvian and foreign groups of students. The survey sample for the 2nd year students is presented below.

For students of the study subject „**Supplementary Mathematics**”

SURVEY

“Students’ opinion and suggestions for improving lessons on Mathematics”

1) Did YOU like Mathematics at school?

___ YES; ___ NO.

2) Has YOUR **ATTITUDE** to Mathematics changed over time?

___ YES, (at present, I _____);
___ NO.

3) Have YOU **FAILED EXAMS** for the 1st year subject „Mathematics I, II”?

___ YES, I have 1 failed exam for the _____ semester;
___ YES, I have failed exams for BOTH semesters;
___ NO, I do not have any failed exams. Besides,
My mark for the 1st semester is _____, and I passed the exam on the _____ attempt;
My mark for the 2nd semester is _____, and I passed the exam on the _____ attempt.

4) In YOUR opinion, are **HOME WORK ASSIGNMENTS** needed?

___ YES, since it helps students to master the material and to be better prepared for the tests;
___ YES, to increase the semester final grade, since it contributes 0% - 10% to the semester's final mark on mathematical subjects in RTU;
___ YES, but **MANDATORY** home work is needed (this means that without having a positive evaluation of work made at home, students are not allowed to come and take the exam);
___ NO, it isn't needed, if it does not influence the final grade of the semester.

5) In YOUR opinion, are classroom written **CONTROL TESTS** on Mathematics needed?

- YES, since it helps students to master the material and to be better prepared for the exams;
- YES, to increase the semester final grade, since it contributes 40% - 50% to the semester's final mark on mathematical subjects in RTU;
- YES, but **MANDATORY** control tests are needed (this means that without having a positive evaluation of all classroom tests, students are not allowed to come and take the exam);
- NO, it isn't needed, if it does not influence the final grade of the semester.

6) In YOUR opinion, does the division of the semester final exam into **MIDTERM EXAMS** facilitate passing exams on mathematical subjects?

- YES, (since _____);
- NO, (since _____);
- NOT important, it can be the choice of the lecturer.

7) In YOUR opinion, which **LECTURE** style would be better?

- A lecturer **DICTATES** rapidly all the theory, so that it is the personal responsibility of a student to write it down or not. The lecturer solves all task examples on the blackboard;
- All theory is given in **SLIDES** projected onto the screen so that a lecturer just explains it, but students are to write the notes over their personal printed copy of the slides. The lecturer solves all task examples on the blackboard;
- All theory and a part of solved examples are given in slides so that a lecturer just explains it. And only a **PART** of solving examples is solved by the lecturer on the blackboard;
- A lecturer writes the lecture key points and formulas, and solves all task examples on a screen which projects it onto a big wall screen;
- YOUR suggestion: _____.

8) What is YOUR attitude to the **INVITING** students to the **BLACKBOARD** to solve tasks during tutorials on Mathematics?

- FOR** such a method, since it increases the level of understanding of mathematics;
- AGAINST** such a method in mathematical subjects, since _____ ;
- is **BETTER**, but only if the lecturer solves all task examples on the blackboard so that many solved examples can be considered during every tutorial;
- NOT important, it can be the choice of the lecturer.

9) In YOUR opinion, should the **NUMBER** of **LECTURES** and **TUTORIALS** on Mathematics be increased?

- YES, it definitely must be increased, since the number of solved tasks on each topic is not enough;
- YES, it would be good;
- NO, the present number of lessons is enough.

10) In YOUR opinion, is a **5-min BREAK** during the mathematical lessons needed?

- YES, it definitely is needed in the middle of the **LECTURE**;
- YES, it definitely is needed in the middle of the **TUTORIAL**;

___ NO, not needed, since in this case the lesson will be finished 5 min earlier;

___ NOT important, it can be the choice of the lecturer.

11) Do YOU have any other **SUGGESTIONS**?

___ YES, these are _____;

___ NO, I don't have.

THANK YOU FOR THE RESPONSE! YOUR OPINION IS VERY IMPORTANT!

Fig. 1. Survey questions for the 2nd year students.

4 Analysis and interpretation of the results

What is the optimal way to provide students with each of the necessary components of the learning process during their studies?

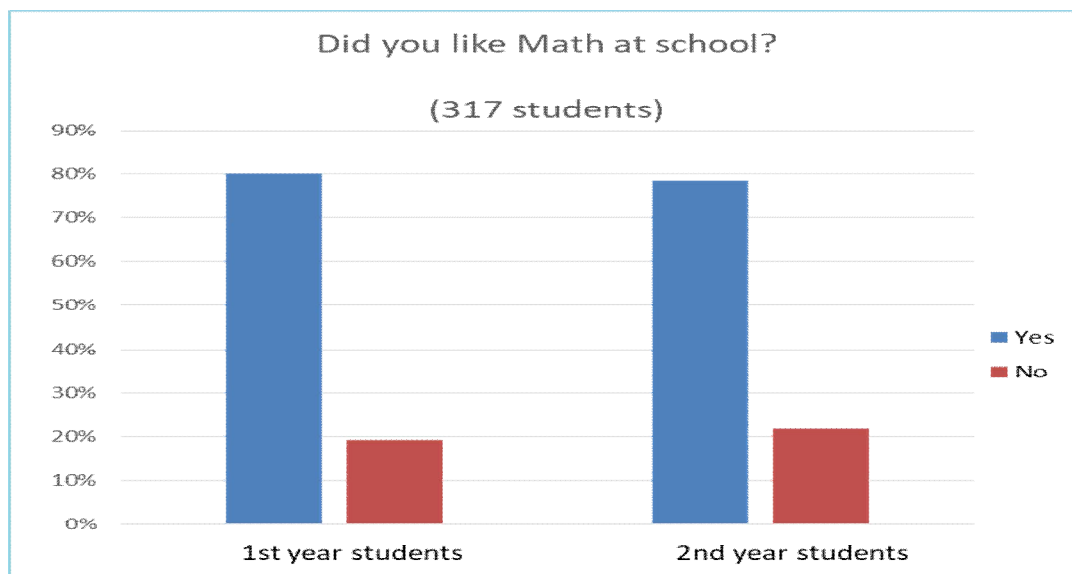


Fig. 2. Survey question: "Did you like Math at school?".

As expected the majority of students of the 1st year of studies in technical specialties of RTU liked school mathematics! The volume of work in higher mathematics in the first year probably encourages some the 2nd year students to reconsider their appreciation for school mathematics. The number of 2nd year students who liked mathematics in school is less than the number of similar students of the first year (see Fig. 2).

The point of view of the 1st year students about their success in school mathematics as a whole, corresponds to their assessment in mathematics in their secondary school diploma. Some reassessment of abilities is observed for students who have a "good" grade in their high school diploma, which is expected (it is possible that the school underestimated them) (see Fig. 3).

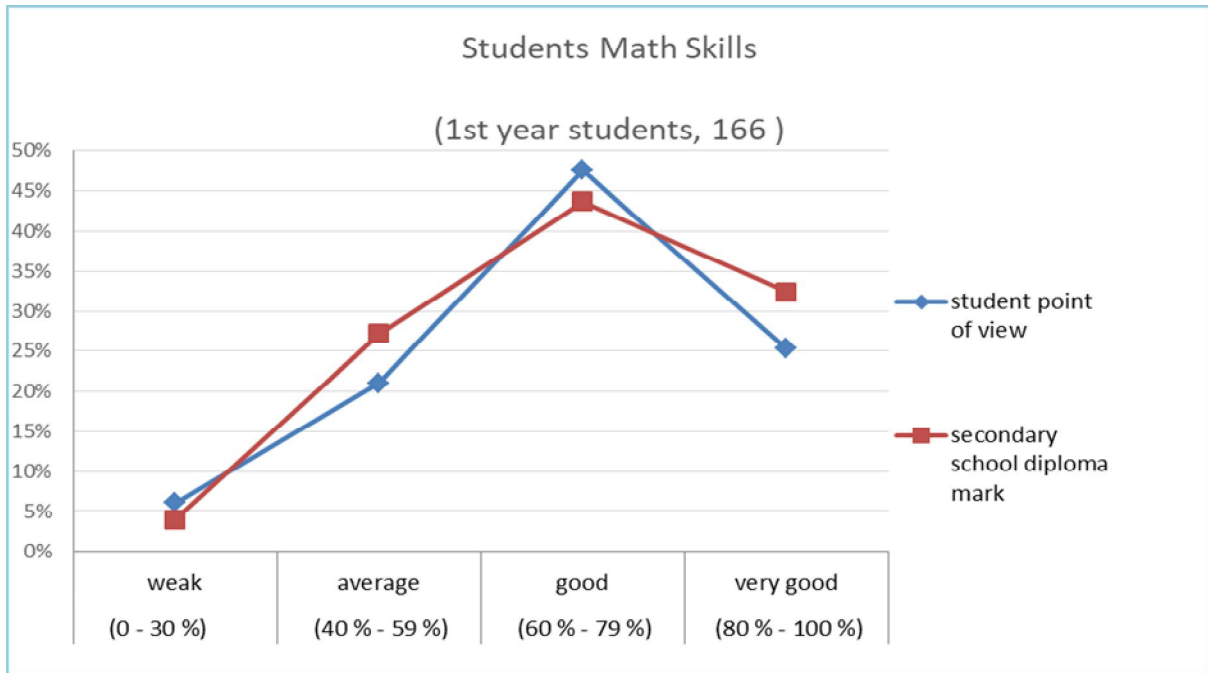


Fig. 3. Students Math Skills.

The majority of students, from both of the 1st and 2nd year, are sure that homework and classroom tests in higher mathematics contribute to the better preparation of students for examinations in higher mathematics at university (see Fig. 4 and Fig. 5).

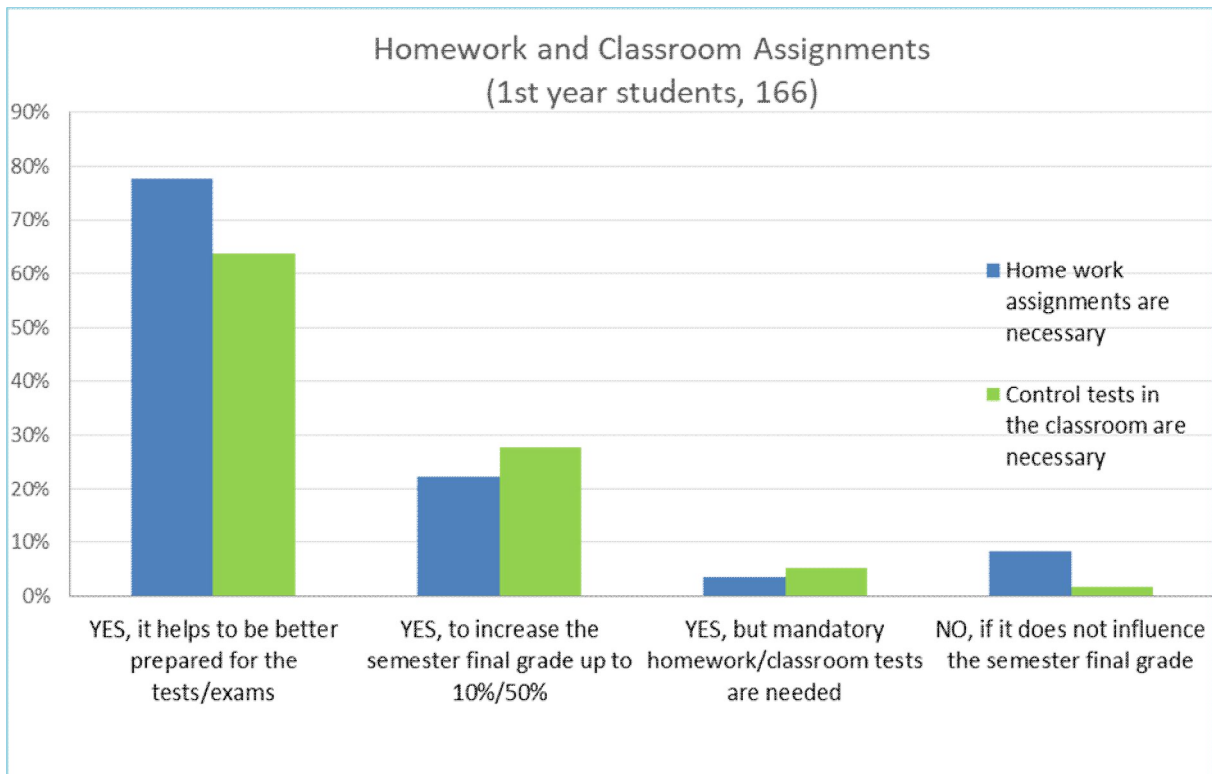


Fig. 4. Necessity of homework and classroom tests (1st year students).

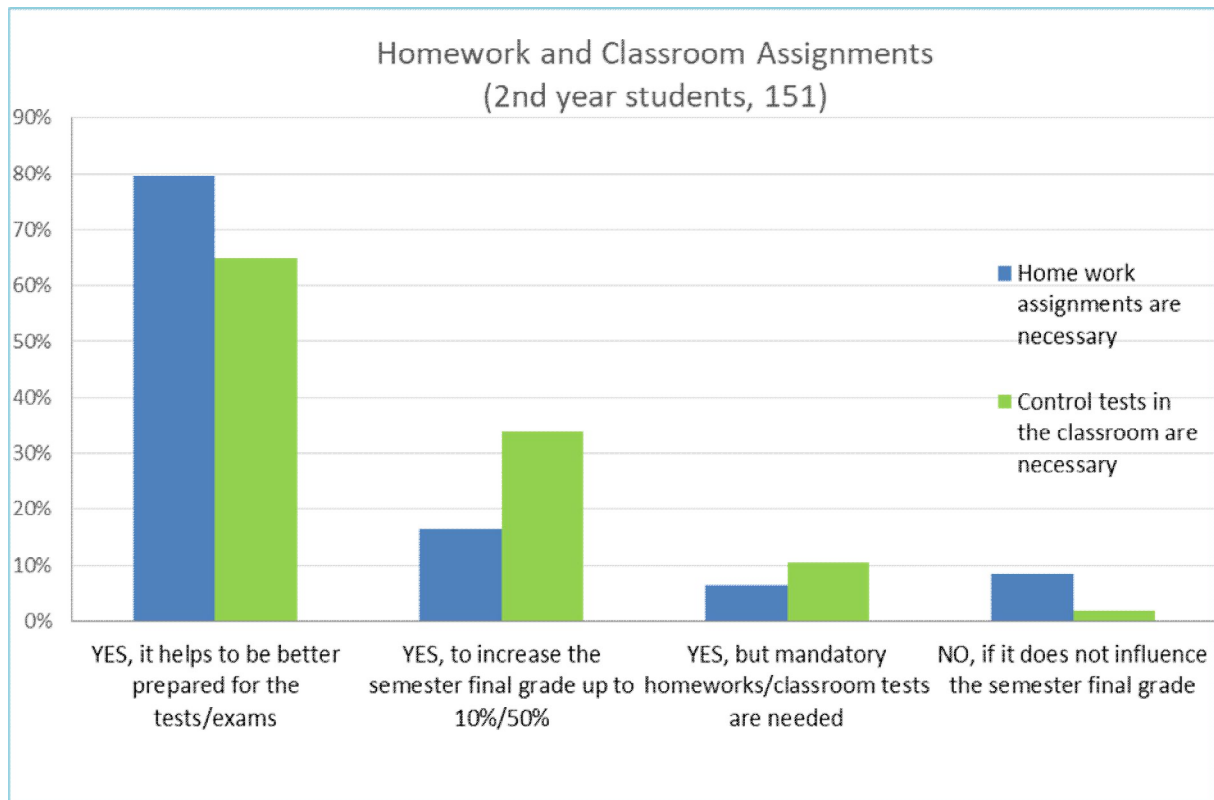


Fig. 5. Necessity of homework and classroom tests (2nd year students).

As the graphs show, the 2nd year students are more likely to expect that positive grades for classroom tests will increase their final grades at the end of the semester.

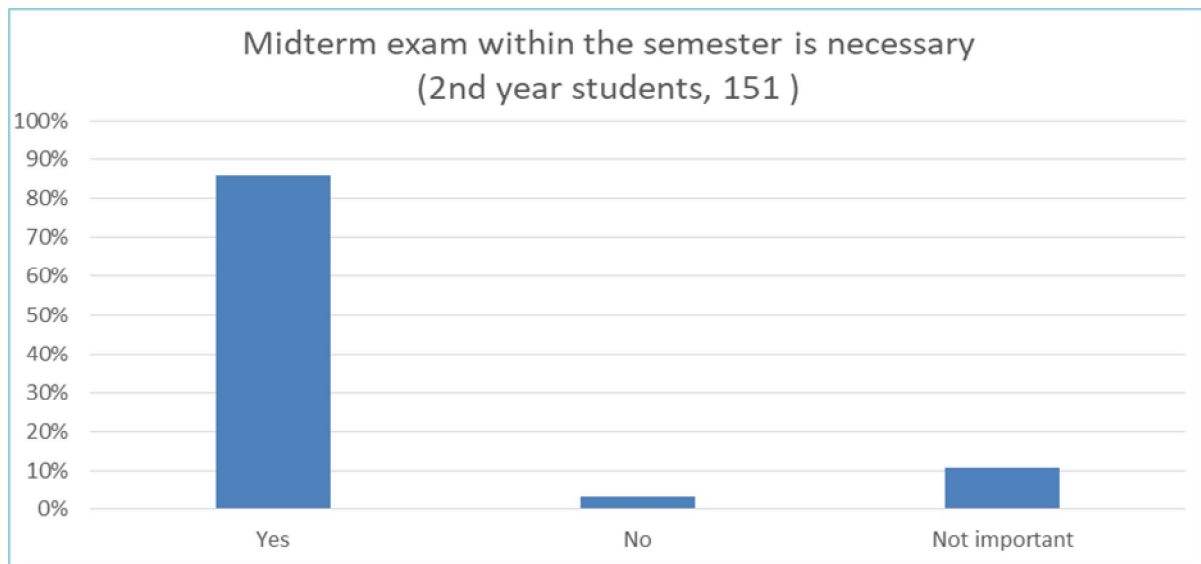


Fig. 6. Necessity of a midterm exam within the semester.

Students agree that it is easier for them to study the material for half a semester and pass a midterm exam in the middle of the semester.

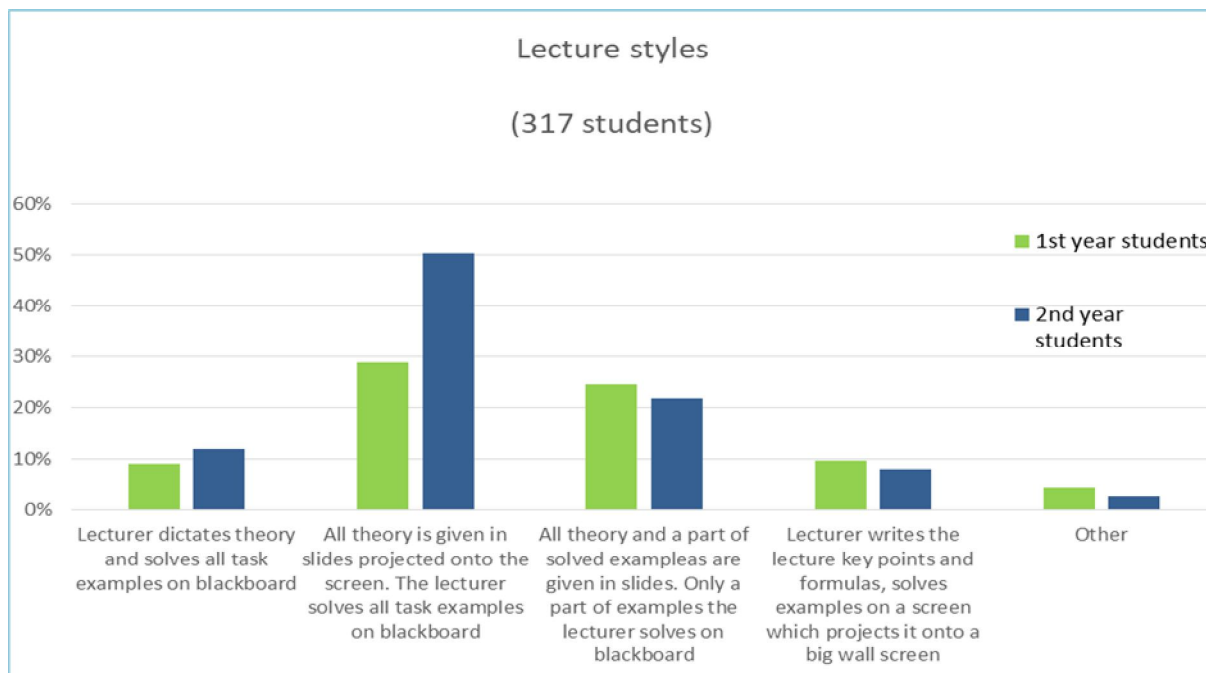


Fig. 7. Lecture preferred styles.

In general, students are satisfied with the study of lectures from slides and solved examples from the blackboard. The 2nd year students have already found internships and workplaces, so they try to use the classroom time for maximum acquisition of mathematics.

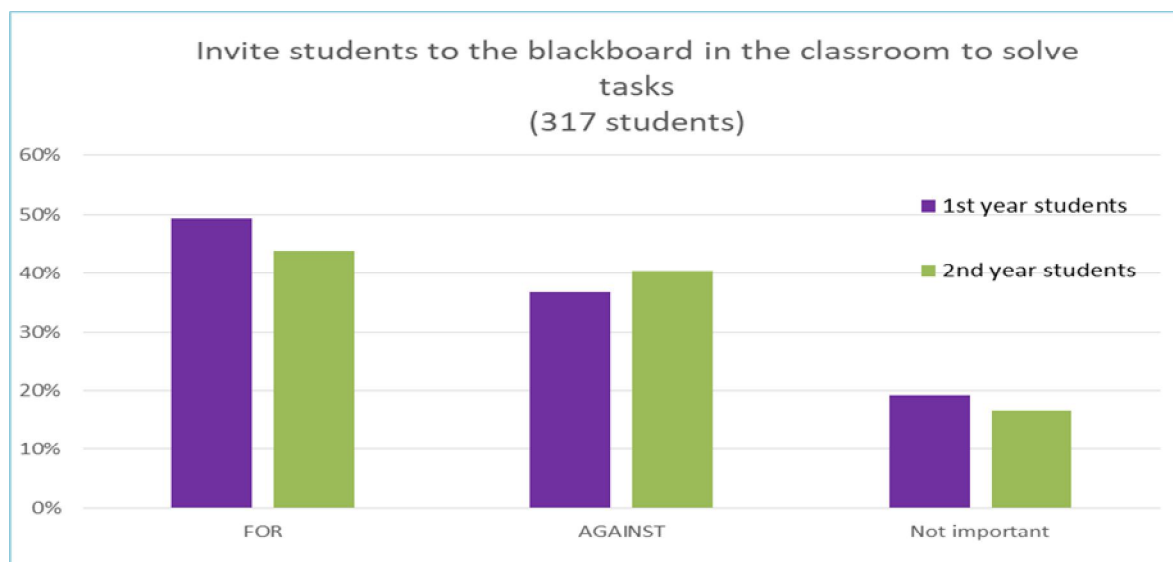


Fig. 8. Invitation of students to the blackboard.

Unfortunately, not all students like it when they are called to the blackboard to solve problems during tutorials. This is even more noticeable to the 2nd year students, as these graphs show (see Fig. 8). Although the 2nd year students already understand the importance of independent work, the mathematical problems are already very complicated and need time-consuming work, which is better done at the desk.

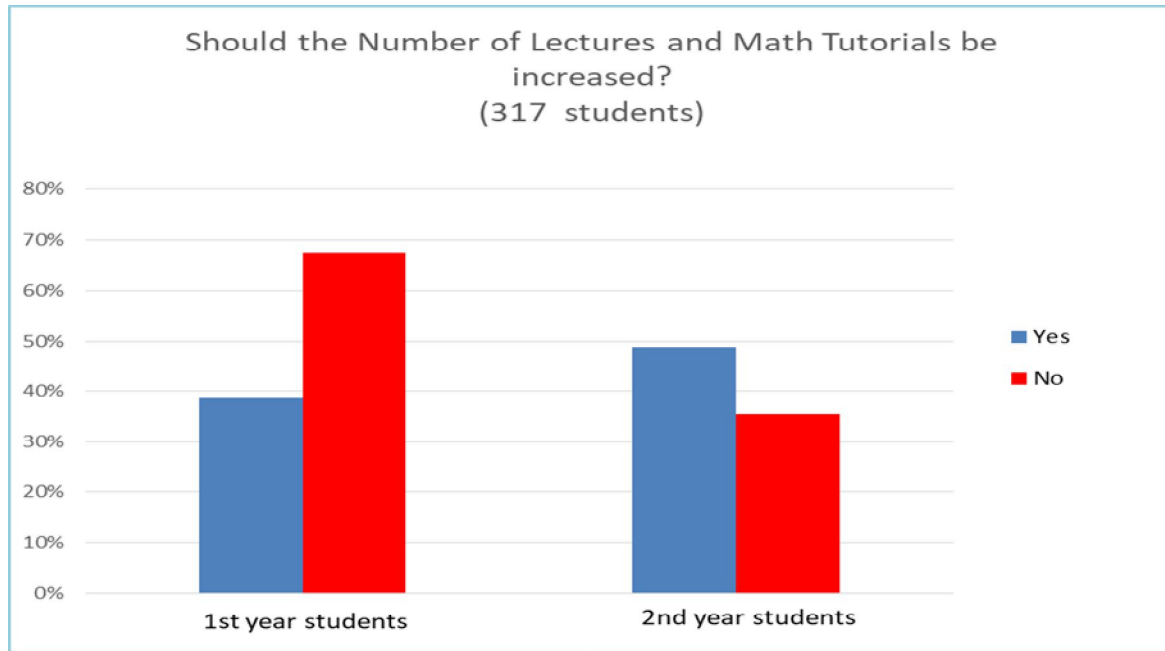


Fig. 9. Should the number of lectures and Math tutorials be increased?

According to the program of the course of higher mathematics in RTU, the number of planned classes is much more in the 1st year than in the 2nd. Obviously, for this reason, the number of students who are against the increase in the number of lectures is much larger in the 1st year than in the 2nd. More than a half of the 2nd year students want to increase the number of classes in mathematics: they already understand the importance of the topics and their complexity, and they need more explanations, but, unfortunately, the number of classes remains unchanged!

Students are directly interested in the quality of studies [4]. Surveys are one of the most commonly used instruments in higher education institutions to get students' assessment of various indicators that characterize the quality of the studies, as well as the professional work of the lecturer. At the end of the questionnaire, students can write their own comments and suggestions on both the content of the subject, teaching methods and the teacher themselves. This is usually the most interesting result of the questionnaire. Of course, the reliability of questionnaire results depends on the number of students participating in the questionnaire [5]. As the number of students participating in the questionnaire is high, the results are quite reliable.

5 Conclusions

1. Education cannot be provided with a "One size fits all" mentality.
2. Active learning methods contribute to the acquisition of knowledge-based learning, which makes this knowledge more significant and lasting.
3. Nowadays, the best option for the implementation of the study process is to work continuously on its improvement and development, according to the situation.

4. As a result of the student-centred learning process, the involvement of students in the formation of the learning process is increased, and the student's responsibility grows.

5. The still unanswered question is: what do students think about these questionnaires? Are they filled in only by dissatisfied students or, vice versa, by those who are delighted with the teachers? Do students find it useful to fill out these questionnaires?

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