The Role of the RTU Students' Survey in Provision of the Quality of Mathematics Studies

Inta Volodko[1] Dr. math.; **Sarmīte Čerņajeva**[2] Mg. paed.
Riga Technical University, Latvia
inta.volodko@rtu.lv[1]; sarmite.cernajeva@inbox.lv[2]

Abstract: The amount of students who want to study technical sciences significantly reduces in Latvia, as in whole Europe. In the same way, the level of students' knowledge in science subjects also reduces, as a result of which, the amount of deducted students increase. That is why it is important to realize problems students have during the study process, and solve them by improving the teaching quality of the subject. Students' questionnaires help detecting these problems.

Study department of Riga Technical University (RTU) in cooperation with the Department of Information Technologies have created the system of students' survey, not less than once a semester carrying out surveys for students about the quality of the content of the studies of mathematics and teaching forces. Using port ORTUS, every student receives a survey about every subject acquired during the semester. Surveys are anonymous and are not personally connected with every particular student; gained results are significant for the improvement of the quality of the studies.

Students' questionnaires about the teaching staff of the RTU Department of Engineering Mathematics indicate that in general lecturers of the department work well. If students' questionnaires indicate any problems in the content of mathematical subjects or teaching methods, the problem is being solved inside the department.

Keywords: surveys for the studying, quality of the studies of mathematics, university education.

Introduction

In recent years, not only in Latvia, but in whole Europe, the amount of students who are interested in studying in technical universities has decreased (Zeman, Hrad, 2013). One of the ways to attract students is to improve the quality of the studies. An important component of quality improvement is inner evaluation of the system. Methods for inner evaluation of the system for universities are viewed in the article (Kalimullin, Khodyreva, 2016). Also one of the basic methods is mentioned students' questionnaire. Various approaches and procedures for quality of education evaluation in three universities in Russia, Poland and Ukraine are viewed and compared in the article (Noskova, Pavlova, 2016). Analyzed facts are gained from students and lecturers' questionnaire.

As the greatest amount of deducted students in RTU is in the first academic year and mostly because of the general subjects (mathematics and physics), it is important to understand problems which students face during the studies. Of course, number one and main factor for successful studies is students' own input and work. But, also lecturer's role in the study process is not insignificant. There are several criteria to receive individual evaluation of the teaching staff:

- students' questionnaires,
- students' results,
- demands for perfection of the qualification for the teaching staff,
- control during the study process.

Aim of this research is to analyze students' questionnaires about teaching staff of the Department of Engineering Mathematics of RTU, which consist of both individual evaluation of the teaching staff, evaluation of the syllabus, and show how much time do students spend for acquisition of mathematics themselves. Taking into consideration results of this questionnaire, the quality of teaching mathematics can be improved, thereby, reducing the amount of deducted students.

Methodology

Survey, using the Internet, is one of the newest and up to date research methods. It is also one of the most used research methods. An objective evaluation about the interested question can be received by correctly and precisely defining the questions in the survey and by choosing appropriate amount of respondents.

Survey gives an opportunity to gather information from a group of people that is too large for an oral survey; it is a great tool to receive an opinion from a numerously large group of people (Babbie, 2016). As amount of students of RTU course 1 is large, survey is the best and cheapest method to receive information from students about programs of mathematics and other subjects, according lecturers and their working methods. Taking into consideration that survey is anonymous; students can freely express their opinions, attitude and point of view. Analysis of the results of these surveys is one of the ways on how to improve subject programs and teaching methods.

At the end of every semester, during a time of one month, every student, who enters ORTUS e-studies, is asked to fill in the survey about the corresponding course and lecturer. Questions and answers were created by Study department of RTU, but technical solution was done by Information technology department of RTU. There are 13 questions in the survey and place for comments:

- at the introductory lecture, the lecturer/professor informed the students on the curriculum and assessment procedures and criteria;
- the lecturer/professor covered all curriculum themes required to achieve the defined learning outcomes;
- the course was well-structured and the themes were explained in a comprehensible manner;
- the lecturer/professor was well-prepared for the classes;
- the lecturer/professor used audio-visual materials efficiently;
- the lecturer/professor promoted creative thinking and practical application of theory;
- recommended literature sources were accessible and helped in acquiring the course materials;
- Study materials were available in the e-study environment;
- it was possible to timely attend tutorials;
- the curriculum of the course did not overlap with the curriculum of other courses;
- the lecturer/professor's attitude to the students was positive and helpful;
- the number of hours allocated for the study course per week (independent work, lectures, practical classes and lab works);
- what is your attendance rate?
- other comments, advice, praise or complaints about this course and/or the lecturer/professor.

Every lecturer has an opportunity to add questions if he or she wishes so. Students can choose one of the six answers in the first 11 questions:

- strongly agree;
- partially agree;
- neutral assessment;
- partially disagree;
- strongly disagree;
- no evaluation.

Every answer is numerically evaluated with points 1 – 5. When answering to the question 12, students point out their spent time for acquisition of the subject per week with an interval of 2 hours:

0 – 2 hours, 2 – 4 hours, 4 – 6 hours, 6 – 8 hours, 8 – 10 hours, more than 10 hours.

In question 13 students point out the amount of lectures attended:

0 – 19 %, 20 – 39 %, 40 – 59 %, 60 – 79 % or 80 – 100 %.

At the end of the survey, students can write their own comments and suggestions both about the content of the subject, and teaching methods, and also about the lecturer. Usually it is the most interesting part from the results of the survey.

Results from every semester can be found in appendixes. Results of the surveys are fully available to every particular teaching force about their own study subject, managers of the department of the teaching forces and - by the demand - directors of the study program about the teaching forces involved in realization of their study programs, as well as, representatives of the Student Parliament. Received results are carefully analyzed and evaluated, and accordingly, decisions are made to improve the quality of the studies of mathematics. Results of the surveys are saved and compared with the results of the previous period.

Further results of the survey are gained by gathering the data from the students' survey about RTU Engineer-mathematics department 2nd semester subject "Mathematics" and its lecturers. The mentioned before subject is taught by all lecturers of the Department of Engineering Mathematics department, 21 in total. From 1668 students that are registered for this course, survey was completed by 1058 students or 63.42 % of all registered students. Surveys were completed in May, 2016.

Of course, credibility of the survey results depends on the amount of students that have completed the survey. As the number of participated students in the survey is great, the results are quite credible. It must be pointed out that students' activity in the survey is affected by accessibility of the study materials in the e-studies portal and their quality. The better are the study materials, the more often student goes into e-studies portal ORTUS, the more often he or she is asked to complete the survey.

Results and discussion

The summary of the results of students' answers (answers to first 11 questions) is shown in Figure 1: the first column shows the lowest evaluation in the department, the second – highest evaluation, the third – middle weighted evaluation.

As seen in the graph, overall evaluation of the lecturers of the department is good: average evaluation of the lecturers in all questions exceeds 4. The lowest evaluation - 4.18 is for question 5: „The lecturer/professor used audiovisual materials efficiently". It is also understandable, because the most part of the lecturers of the department read lectures, using chalk or marker and board. In my opinion, that is the best lecture reading method in mathematics for first year students.

The highest evaluation - 4.72 are given to the question 1: „At the introductory lecture, the lecturer/professor informed the students on the curriculum and assessment procedures and criteria". Of course, every lecturer at the beginning of the course must introduce students with the curriculum and must formulate their assessment criteria.

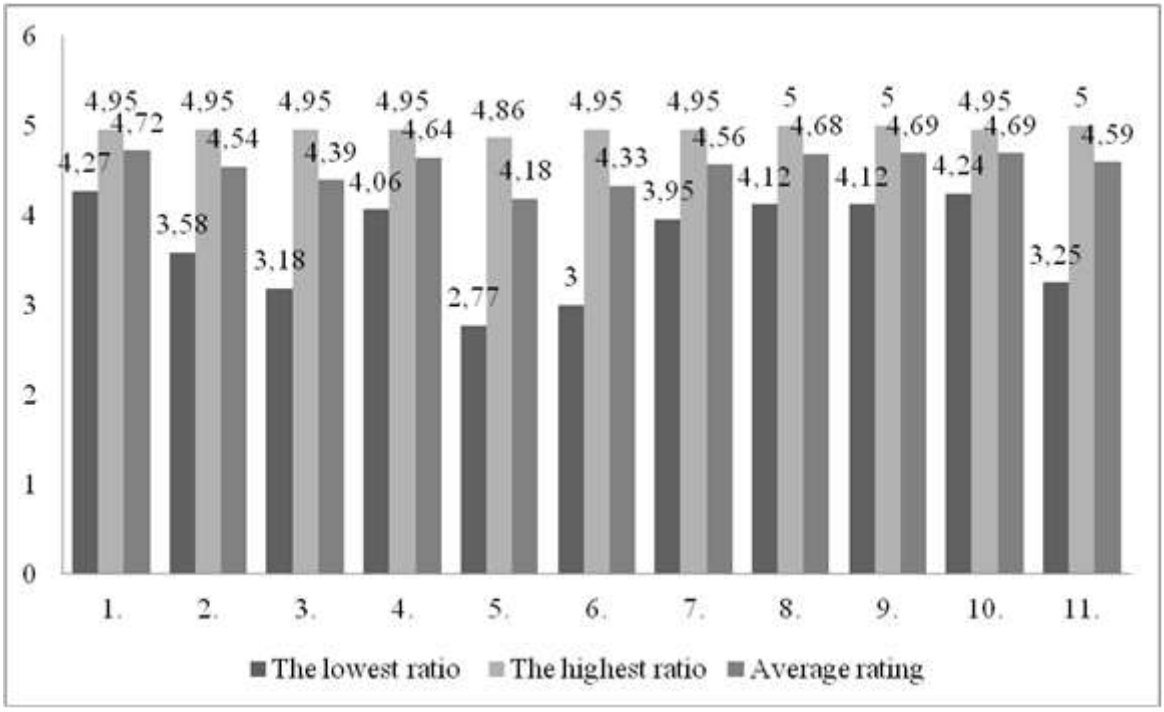

Figure 1. Summary of students' evaluation.

Lecturers, whose evaluation in any of the questions is under 4, must reevaluate their teaching methods of the subject and attitude towards students, and, taking into consideration students' evaluations and suggestions, improve the quality of their work. Every semester, the board of the Department of Engineering Mathematics views the results of the students' questionnaires about every lecturer of their department. If the evaluation on any of the points from students is low, there is a conversation with the lecturer about how to improve this showing, work mistakes of the lecturer are pointed out and

suggestions to solve the problem are given. During the following semesters there is a follow up if the suggestions are being taken into consideration.

Objective evaluation can be given only from students who attend the lectures. Figure 2 shows that 72 % of the students completed the survey have attended more than 80 % of the lectures, thereby, it is advisable to listen to their evaluation. While, evaluation of those 5 % of students, who attended less than 40 % of lectures, is not credible.

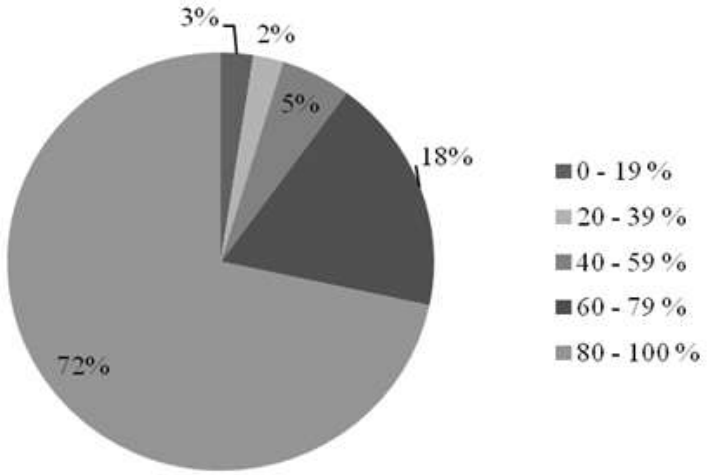

Figure 2. Students' attendance rate.

Of course, success of the students does not only depend on teaching methods of the subject and the attitude of the lecturer towards students, it mostly depends on their own input in the process. Mathematics course in semester 2 in RTU has 4 CP, which indicates that students dedicate 8 hours per week for mathematics. There are 5 hours of auditorium lectures in semester 2. Figure 3 shows how many hours per week, including auditorium lectures, do students spend on mathematics. According to graph, almost one third of students (335 or 31.66 %) acquire mathematics only during the lectures; and only 214 students (or 20.23 %) spend more than 8 hours per week on mathematics.

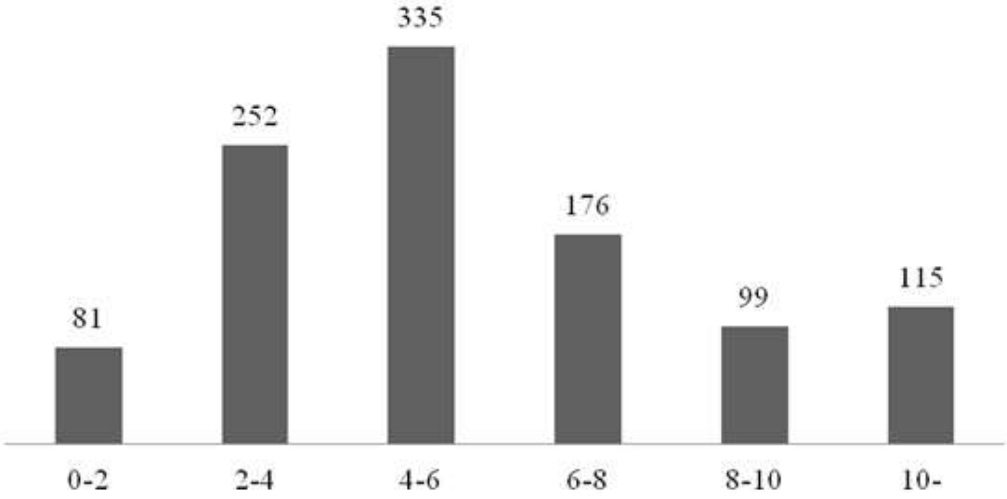

Figure 3. The number of hours allocated for the study course per week (number)

What can we gain using the results of the survey (individually and all together)? What does the students' survey give/ can give?

- Survey gives feedback about the study results from a point of view of study curriculum and the process;
- gives an opportunity to a teaching stuff to evaluate and improve their work;
- RTU board and directors of the departments or institutes can use the gained information to improve the quality of the studies in the level of university;
- survey results are used to evaluate the candidates of the teaching stuff for academic positions;

- survey results are used when signing agreements with guest lecturers;
- survey results are taken into consideration when making changes to study curriculums, study course and the methodology of their realization.

As any research method, survey also has its advantages and disadvantages. Main advantages of the electronic survey are:

- that is one of the fastest research methods because survey is carried out electronically and information is gathered automatically;
- possibility to add their own questions to the survey, gives lecturers a chance to find out the point of view of the students about the specific topic of their interest;
- from the student's point of view, anonymity of the survey is a positive thing;
- data of every survey is saved so it gives a chance to follow up the improvement changes of every study course.

Survey of RTU students has its negative sides too, part of which are correctable, thou:

- often results cannot be used to evaluate a particular teaching stuff, because clerks have not written the lecturer carrying out the course in the individual curriculums of the studying. In that case, results go to a responsible professor of the subject, although, in reality, another teaching stuff is being evaluated;
- on the last days of the survey, student, who wants to get the materials in the e-study portal, is forced to complete the survey (otherwise the access to materials is denied). In such circumstances, students often complete the survey in a rush, without paying attention to the questions and given answers are not honest;
- from student's point of view, the greatest minuses of the survey is the necessity to read the questions and go into them, as well as, spend time to complete the answers.

There is still unanswered question: what do students think about these surveys? Are they only completed by unsatisfied students or the opposite, the ones, who are excited about the lecturer? Do students see a point to complete these surveys?

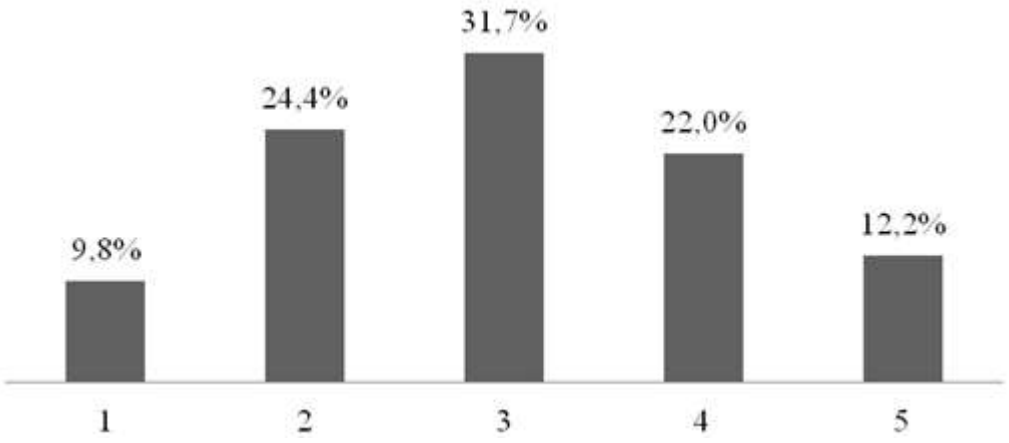

Figure 4. Number of Students' answers (%) to the question:
„Do you consider that students' surveys are useful?"

RTU assistant professor of Faculty of Materials Science and Applied Chemistry Agnese Stunda- Zujeva (2016) carried out a research that helped to receive answers to previously asked questions. 82 students from the mentioned faculty took part in the research. It is visible in figure 4 that only 34.2 % of the correspondents believe that surveys are useful (answer 1 - very useful, 2 - rather useful), whereas, exactly as many, that is, 34.2 % believe that they are not useful (answer 5 - completely useless, 4 - rather useless). Almost one third of the correspondents do not have an opinion on this question.

Great part of students (41.5 % of correspondents) do not believe that surveys are anonymous that is why they are afraid to express their opinion. That would be a job for IT department stuff who gather the results of the surveys to explain students that their fear has no ground, because survey really is anonymous, regardless the fact that it is completed in the portal ORTUS, while logged in with their names.

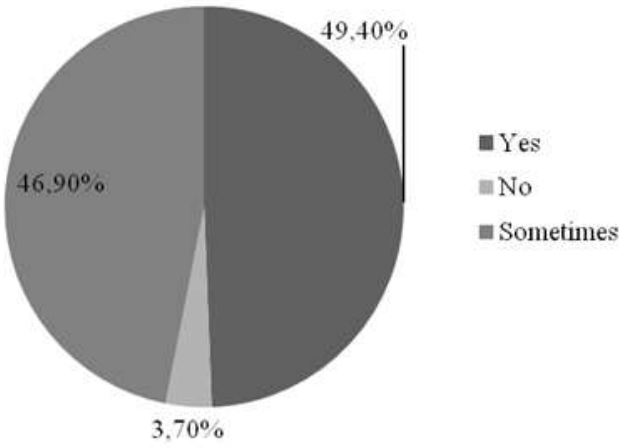

Figure 5. Number of students, who carefully consider their answers.

Almost half of the students (49.4 %) complete surveys carefully considering answers, a small part - 3.7 % of students mark all answers the same, without thinking about the questions, but the rest of the correspondents consider answers in some subjects or question, but in some no (Figure 5).

Comments most often are left by students who have expressively positive or expressively negative opinion about the lecturer or subject. The most part think that they have spent enough time answering the questions to be writing comments. There is a part that is afraid to express their opinion openly because do not believe that surveys are anonymous.

There are several reasons why students do not want to complete the surveys or complete them superficially:

- each student has several subject during a semester, about each of those there are 13 questions to answer, that requires some time;
- surveys must be completed at a time before session, when student has a lot to study and does not have time for completing the survey;
- not all questions conform with the specifics of the subject;
- if subject is taught by several lecturers (lectures are read by one, practical works are led by another, and laboratory works by third), student does not quite understand who to evaluate;
- there is not a certain belief that survey will influence the quality of the subject.

To make survey more successful and objective, several steps should be taken:

- reduce the amount of questions in the survey and adjust them to a certain subject and types of classes (lectures, practical works, laboratory works);
- postpone the completion of the survey to after the session because of two reasons: a) then student has more time to spend on the survey, b) can answer to questions that were not clear before the exam, for example: „The lecturer covered all curriculum themes required to achieve the defined learning outcomes" or „Recommended literature sources were accessible and helped in acquiring the course materials";
- carry out the explanatory work with students about the anonymity of the survey, about who has the access on the results and how they are used for the improvement of the studies;
- give feedback on the results of the survey to students: inform students about changes in the curriculum of the subject or teaching methods, if such are done based on the results of the survey.

Conclusions

After evaluating students' questionnaires about teaching staff of the Department of Engineering Mathematics of RTU, we can conclude:

- biggest part of the students who completed the questionnaire have attended more than 80 % of the lectures, thereby can give an objective evaluation about the lecturer's work;
- students mostly positively evaluate work of the lecturers of the department;
- in case if lecturer's work is evaluated negatively, board of the department give lecturer recommendations on how to improve the work, taking into consideration critique and suggestions given in the students' questionnaire;

- as the results of the questionnaires are being kept, it gives an opportunity to follow up on the improvement of the teaching quality of the subjects of mathematics.

Bibliography

1. Babbie E. (2016). *Practice of Social Research* (14th Edition). Boston: Cengage Learning.
2. Kalimullin A.M., Khodyreva E.A., Koinova-Zoellner J. (2016). Development of Internal System of Education Quality Assessment at a University. *International Journal of Environmental and Science Education*, Vol. 11 (13), pp. 6002 – 6013.
3. Noskova T., Pavlova T., Yakovleva O., Smyrnova-Trybulska E., Morze N. (2016). Modern Education Quality Requirements and Information Technologies in Academic Teachers' Activities. *International Journal of Continuing Engineering Education and Life-Long Learning*, Vol. 26 (4), pp. 434 – 459.
4. Zeman T., Hrad J. (2013). Improved Chances for Entering Technical Universities. In Proceedings of the International Conference *on European Association for Education in Electrical and Information Engineering*, Vol. 24, pp. 16 – 21. Technological Educational Institute of Crete.
5. Stunda-Zujeva A. (2016) Priekšmetu anketēšanas rezultātu ietekmējošie faktori. Atgriezeniskās saites analīze 21.gadsimtā. (Influencing Factors to the Results of the Surveys of Subjects. Analyses of Feedback in 21st Century). RTU Metodiskā konference 2016.gada 22.martā. Rīga: RTU. (in Latvian)