The Influence of Feedback on the Structuring Process of Educational Courses

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Abstract. The article discusses the topic of interaction between lectors and students in a higher educational institution. It shows that feedback is the key component of successful communication and constructive interaction between the learning process participants. Feedback received from students as a result of questionnaires allows the lecturer to choose a varied teaching methodology which is optimal for the given instant and also to develop a strategy for teaching subjects that allows using new forms of work with students. This article contains the results of student surveys on the basis of which the influence of feedback on the structuring of training courses is analysed.

Keywords: Educational Course, Feedback.

1 Introduction

The learning process at any stage implies direct interaction between the lecturer and the trainees. Steady psychological and emotional contact between the lecturer and students is undoubtedly the determining condition for the success of the educational process. Managing the mechanism of interaction between people is impossible without the presence of stable feedback. It is the key component that guarantees the success of communication and constructive interaction between the lecturer and students. Works of many conferences [1], [2] and researchers [3], [4] are devoted to this subject.

The feedback acts as a regulator of the relationship between the lecturer and students, determines the strategy of human behaviour in the educational system. The authors have already discussed methods of structuring the content of training courses [5]. In this work, attention was focused on an important principle of modern methodology such as the complementarity principle. In the context of modelling a new content system for training courses, it is associated with the introduction of innovations in addition to the existing traditional components of educational content and the strengthening of interrelations between them. Thus, it determines the priority of the systematic and integrative approaches to the selection and construction of content that ensures that the focus of the courses being created is directed on the integration, sys-

tematization and structuring of a multitude of content elements into a rational system of educational content.

This article analyses the features of feedback in the learning process, its use in the learning process, the main functions of feedback, and also attempts to determine whether the correct application of feedback between the teacher and students affects the methodology of the structuring of training courses.

2 Feedback in interaction of lecturer and student

Feedback in the educational process is the activity of obtaining information about the state of the educational process and its participants. Feedback as an information about the state of the learning process and its participants in pedagogical science on the one hand makes it possible to diagnose this process, evaluate its results, correct the lecturer's actions, methods and tasks considering the individual characteristics of each student and the course as a whole, and on the other hand - evaluate the activities of both the lecturer and the student during the lesson.

Tools and methods of feedback such as diagnostic surveys, input, intermediate, boundary, final, group works, essays on a given topic, etc. contribute to the increase in the effectiveness of mastering subjects. For the analysis and correction of the activities of students and lecturers - questionnaires, group discussions, as well as new ways of feedback: e-mail, forums, chat rooms and blogs. Successful establishment of feedback allows the lecturer to organize learning sessions more effectively considering the personal characteristics of students, as well as directing the formation and development of abilities and skills for self-educational and professional activities. It is the presence of a stable contact with students that determines the professional level and the true authority of the lecturer. The feedback received as a result of the interviews of the students, if the correct conclusions were made, allows the lecturer to change or improve the technologies by which he works, choose the methodology that is optimal for the moment and design and use effective forms of work during the academic subjects.

In the Riga Technical University (RTU) at the Faculty of Computer Science and Information Technologies, the Software Development Department conducts classes on studying modern programming languages, data structures, studying the stages of software development, Internet technologies, design patterns and many other subjects.

The next section shows how feedback in the form of questioning students affects the addition of new content elements (modules) to the learning courses.

3 Influence of the feedback on the structure of the educational course

Rationality of the educational content can be achieved by justifying the “core” of content, which determines the subsequent filling of the courses. At the same time, it is important to originate from the acknowledged in pedagogy presentation of content for

any academic discipline - that being scientific knowledge, practical skills, as well as experience and skills in professional activities in a specific field of knowledge. In addition, it is necessary to take into account general pedagogical principles of optimization of the volume and complexity of the educational material (theoretical and practical significance, the correspondence of material to the age and individual characteristics of students, etc.).

Considering aforesaid, the "core" can be represented through the unity of the following invariant parts of content of the learning courses: the research and information part; the laboratory and practical part; control and verification part. However, subjects include not only the main components (the "core") of learning courses, but are supplemented by new M_i (modules) content elements [5].

It is obvious that the supplementing of the indicated invariant parts with concrete content elements will depend on the requirements of the educational standard, the goals and tasks of studying a particular discipline, its features and other factors.

As it is known, each learning course includes three components: the main (theoretical) part (ideas, knowledge); laboratory-practical part (skills, experience); evaluation part (control of skills and abilities). All these parts are compulsory and traditionally are taught by all lectors of higher education institutions. However, the lectors of our department improved the structure of some courses, supplementing them with new content elements (modules) that are directly related to the solution of various problems. These changes were directly related to the results of student surveys, so the feedback was taken into account.

In this article, we will take a closer look at the "Algorithmization and Programming of Solutions" course, which is taught to all the first-year students and provides the basic knowledge of the principles of computational processes algorithmization and the software creation technology using Java programming language [6]. Fig. 1 shows the improved structure of the "Algorithmization and Programming of Solutions" course.

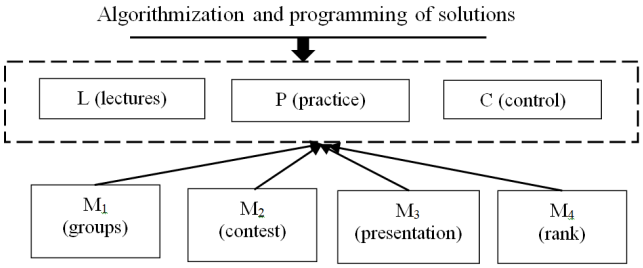

Fig. 1. The components of the course "Algorithmization and Programming of Solutions"

Lecture presentations were developed for 48 academic hours, considering two guest lectures from Java programming specialists (Fig. 1, L), also typical tasks for independent solving are provided with correct solution presentation and explanation afterwards. In this course, several practical works are envisaged (Fig. 1, P). Organization of practical tasks takes place in the following way. Student must develop an algo-

rithm, write a program and submit it electronically to the study portal ORTUS. When the program is evaluated the student must defend his work, i. e. write a report and answer teacher's questions about the program and the work in general. There are 8 practical home works and 7 laboratory assignments in the scope of the subject, where the students have to develop a software program. The first part of the course includes five (Branched programs; Development of a simple cyclical program; Processing one-dimensional arrays; Processing two-dimensional arrays; Ways of organization of nested loops), the second one – three practical home works (Sorting arrays; Lines and text files; Creation of a file processing system). The course also includes laboratory works that students perform in practical classes in the presence of the lecturer. To perform and submit a laboratory work a strictly limited time interval of one and a half hours is given. Laboratory works are essentially group tasks that are done in pairs, exchanging experience and teaching each other, and, if necessary, there is a possibility to get the lecturer's help. Tasks for laboratory works are selected in such a way to facilitate students understanding and performance of practical home works. At the beginning of the first semester, students perform two laboratory works on the topics "development of branching programs" and "development of cyclic programs", since at the beginning of the semester students have the most number of questions. In the second semester, another five laboratory works are planned on topics that cause the most number of difficulties for students (organizing nested loops, recursion, working with objects, creating files, processing files). The course provides several tests: two in the first semester and one in the second (Fig. 1, C). The results of the tests are taken into account when evaluating an examination mark.

This course on studying the Java language is conducted starting since 2015/2016 academic year. Each academic year, we conducted a survey of students on its content, in order to be able to improve this course. For example, a group project on the subject was introduced in the first year (Fig. 1, M_1). Initially, students were allowed to divide into groups independently, it was mandatory to complete the assignment and perform a presentation at one of the practical classes. By asking the students questions "How do they relate to the work in the group?", "Do they like the group project?" etc., we found out that the students liked to participate in the group project, since this provides them an opportunity to share experience, to distribute responsibilities, and to plan research results. Also as the main reason to participate in the group project, the students named the desire to learn something new, to find friends, to solve interesting tasks and the will to get higher marks. Analysis of student performance showed that 24% of the students participating in group projects received at least a very good mark (8) or higher in the examination, while among the students who did not participate in any of the group projects, only 12% got such a high score [7]. Module M_1 in the 2017/2018 academic year is mandatory for all students.

M_2 module includes interesting programming tasks, which are announced as a contest (Fig. 1, M_2). To solve this task, it is necessary to have knowledge and skills in writing programs in the Java language. The competition task is not obligatory. The student by himself decides whether to participate in the competition or not. Having solved the competition task, student receives additional points for the examination mark. In 2016/2017, 26 (about 6%) out of 440 students participated in the competi-

tion, and in 2017/2018, 57 (12%) out of 480 students participated in the competition. It is obvious that the M_2 module motivates students to solve non-typical tasks, so it is a great incentive for obtaining a higher mark on this subject.

M_3 module includes tests for presenting practical home works (Fig. 1, M_3). It is necessary to not only perform each practical work (to develop an algorithm, write the code of the program, to test it), but also to present it, that is, to show the knowledge necessary to perform this laboratory work. Test work contains questions on the topic of practical work. The evaluation of a practical work consists of two parts: the correctly working program plus the evaluation for presentation. This module was introduced only this academic year and the main goal is to combat plagiarism. Preliminary results showed that students are not very satisfied with the introduction of this module.

M_4 module is provided for ranking all students of the "Algorithmization and Programming of Solutions" course (Fig. 1, M_4). In 2015/2016 academic year, this subject was provided with an automatic mark. Those students who received a certain number of points (points earned for all the work during the semester), got a mark for the exam automatically. The rest of the students had to pass the exam. But since the 2016/2017 academic year all students had to pass an obligatory exam, but depending on the results of all works during the semester, 50 students who obtained the highest results, correspondingly the highest rank that is, were awarded with automatic mark for the exam. This methodology showed good results. Students with high ranks performed all tasks of the group project, all competitions, handed in practical works and presented them perfectly.

So the teachers of our department independently conduct student interviews (during streaming lectures, via the Internet, e-mail, etc.) to find out students' opinion about the quality of teaching courses, their complexity or ease, and on the basis of results supplement the learning courses with new content elements. In order to assess the quality of teaching and the content of the course at the end of each semester, an anonymous questionnaire of students is conducted on the training portal ORTUS for each training course at the RTU. Students are invited to answer the following questions:

1. Were the students acquainted at the beginning of the semester with how the knowledge gained in the course of mastering the subject will be assessed and where the acquired knowledge can be applied in the future?
2. Did the teacher provide the needed support necessary to master this subject?
3. Did the subject contribute to the development of creative thinking and teach the application of theory in practice?
4. Were training materials available and did they help to master the subject?
5. Were consultations available?
6. Was the content of the course duplicated in other subjects?

The seventh question asked students to evaluate the attitude towards students and the pedagogical skills of the lecturer. In addition, students are given the opportunity to leave comments and suggestions for improving the academic subject.

This questionnaire significantly helps to improve the content of the course and the methodology of teaching, providing feedback to students.

It is also planned to improve the structure of the "Software Development Patterns" course with the help of mobile technologies. Among RTU first year students in the Faculty of Computer Science and Information Technology a survey was conducted, which goal was to determine whether it is appropriate to use mobile technology in the learning process. The survey was conducted in 2018 and 161 students took part in it. Quantitative results revealed that 96% of student participants reported using their mobile devices for academic purposes. 97% of students reported using mobile devices more than 90 minutes per day. 64% student participants agreed with the statement that having course materials (e.g. slides, lecture notes, tests) available on the mobile device would be beneficial to study process. 40% of student participants agreed with the statement that the use of mobile learning technologies would improve overall accomplishments in study courses and another 41% stated that it will "probably" improve.

4 Conclusions

Student questionnaires provide an opportunity to develop a more flexible and objective system for assessing students' knowledge, to improve the content and method of presentation of learning material, making the course more attractive. In addition, involving students to improve the course provides an opportunity to find ways to increase their interest, which in turn will lead to improved student knowledge. Thus, feedback in the form of student questionnaires significantly affects the structure of learning courses, that is, the addition of new content elements (modules), as well as the teaching methodology is improved. In the future authors plan to evaluate the progress of students in all structured subjects, using the methodology described in [5].

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