



Compensation e-Learning in Fundamental Education

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Abstract

The paper presents the development methodology and the results from the interactive learning courses for “compensation e-learning” in Chemistry, Mathematics and Informatics in Technical university of Gabrovo. Survey was carried out among regular and part-time freshmen, in order to evaluate their learning experience with these courses. The survey was very indicative of the part-time students as it helped to evaluate the usefulness of the e-learning courses for the purposes of self-study.

1. Introduction

The analyses conducted over the last few years on the status of the university education, found its quality to be unsatisfactory, which is a result of the influence of a number of factors [1,2]. One of the identified paradoxes of the Bulgarian educational system is the constant increase of student admission against the background of constant decrease of number of high school graduates - the result is a mass admission in universities, even to students with insufficient preparation. This influences negatively the quality of preparation of specialists as well as their future professional development - a mediocre pupil becomes a mediocre student, and then - a mediocre specialist [2-4].

The development of higher technologies routed a lack of qualified engineers, particularly in the sphere of IT-sector[3]. Simultaneously, an outflow of candidates for engineer education is reported, as it is considered more complicated and requires a good basic preparation which at this moment high school education is unable to provide. The problem becomes even more serious, taking into account the changes of students' profile, which are a result of the quick development of contemporary information technologies[5] and the lasting economic crisis: more and more of students opt for learning in a combination with some form of work[6].

As one of the Technical universities in Bulgaria, providing engineer education in IT-sector, Technical University of Gabrovo is currently facing all problems mentioned above. To guarantee enough degree of mastering of the academic course the University developed specific approach, called “compensation training”, aiming at equalizing the basic knowledge level required for successful performance for the university courses in engineer education. It is based on e-learning with interactive materials intended for individual work, developed by Moodle platform on school material on subjects of the basic training - Mathematics, Physics, Chemistry, Informatics. The paper presents results from experimental testing of the compensation e-learning in Mathematics, Informatics and Chemistry for academic engineer education. A parallel conducted survey aimed at investigation of students' attitude towards the structure, quality and applicability of the developed learning materials.

2. Concept of compensation e-learning courses

Compensation e-learning courses were developed within the project BG051PO001-4.3.04 funded by the Bulgarian Ministry of Education and co-funded by the European Social Fund. They are addressed to the first year students of Technical University of Gabrovo. Learning content of the courses was developed on the basis of the Moodle platform, which was integrated to the University Information System – that way all developed interactive learning materials are fully on-line accessible by students in the University. The theoretical learning content is divided into modules, each of which covers few different topics. Each topic consists of one or more short presentations that are easy to understand, illustrations, links to web sites and other interactive tools. A database is developed for each topic, where the students can find relevant web sites, literature resources, video materials, etc., so as to expand their knowledge in the respective area. The interactive materials are available for self-study and self-work of students, as well as for the control of knowledge by the lecturer.



3. Experimental application of the developed courses in the educational process

Our previous experience has proved that exploring student's opinion about academic science education, based on application of approaches for quality management system is objective valuable information and starting point for improvement of academic education quality [7].

The created courses for compensation training were experimentally tested with pilot groups of freshmen from majors in both engineering faculties of the University. A study was conducted on the views of students about the quality and applicability of the developed interactive learning materials.

3.1. Compensation training in Mathematics and Informatics

The experimental training on "Mathematics" and Informatics compensation training courses was conducted during the the last acadademic year with 70 1st year full- and part-time students. The analysis of students' work efficiency [8] indicate that students have overestimated their knowledge or have relied on luck.

To assess the students' satisfaction with training a methodology has been developed, based on determination of priorities and the calculation of weighting factors for the following criteria: Quality of the lectures – use of comprehensible and attractive approaches for presenting teaching material(Y1); Small groups for the practical sessions(Y2); Quality of the practical sessions - use of comprehensible and attractive approaches for presenting teaching material(Y3); Available learning recourses(Y4); Topical and practically directed teaching material(Y5); Self-study (literature, consultations, internet access)(Y6); Conditions for the learning process (laboratories equipment)(Y7); Number of the students for lectures (Y8); Objective and precise assessment(Y9); Other(Y10)[9]. In addition, a survey has been done for the opinion of students through interviews with them[10].

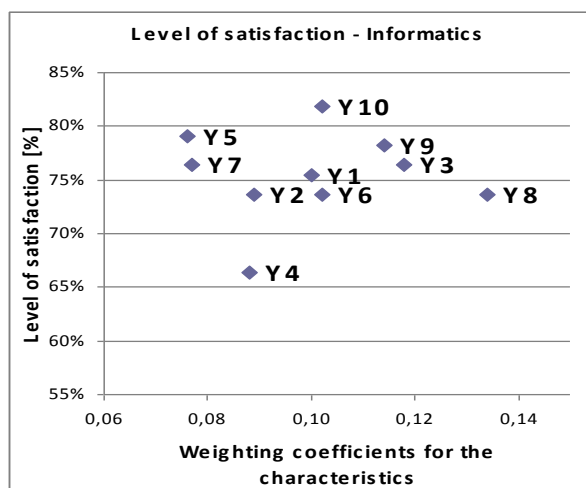


Fig. 1. Level of satisfaction from compensation training in Informatics

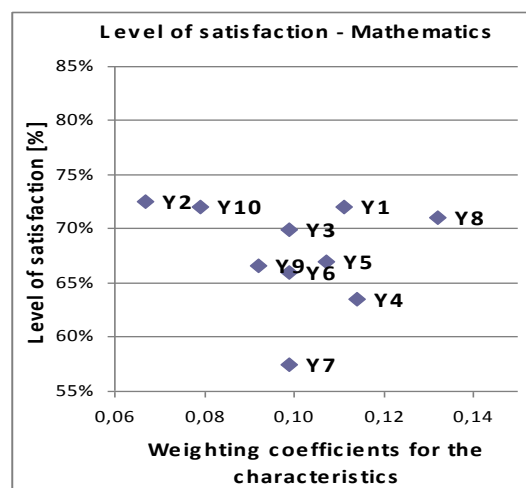


Fig. 2. Level of satisfaction from compensation training in Mathematics

The summarized results (fig.1 and 2) show that Y8 has the largest priority for both courses, followed by Y6, Y3, Y1, Y9. Satisfaction with indicators varies in the range 55%-75% and 65%-85% for mathematics and informatics, respectively.

3.2. Compensation training in Chemistry

Previous investigations on the students' opinion regarding the implementation of interactive learning materials in academic Chemistry training showed that the students approve e-learning due as attractive method of learning content presentation and for independent work regardless of time and place [11,12].

In comparison with full-time, part-time training has its specific features. One of them is the relatively low share of lecture attendance (50% of that of the full-time students), at the expense of self-preparation. In this sense, the use of e-learning facilitates their preparation in the discipline. In order to determine the applicability of the developed materials in part-time training, Chemistry compensation training course was used in real learning process with 60 freshmen from the engineering disciplines in the winter semester of academic 2015/2016.



The experimental training was conducted with three modules: Module 1 - "Structure of Matter", Module 2 - "Chemical processes" and Module 3 "Properties of Substances". The level of complexity of information and the control test (12 questions) increases from Module 1 to Module 3. The structure and content of modules were previously described [12, 13]. All modules provide for a multiple access to training and knowledge assessment.

The assessment of part-time student satisfaction was carried out by a modified version of the enquiry, including following criteria: Use of understandable and attractive approaches to the presentation of the material (Y1); Providing the necessary basic knowledge capacity for absorption of the university course in "Chemistry"(Y2); Ability for control and self-evaluation of knowledge(Y3); Organization and structure of the educational material(Y4); Actuality and practical orientation of educational material(Y5); Access to additional sources of information(Y6); Possibility of distance form of consultations and methodological assistance from lecturers(Y7); Availability of contemporary technical equipment for carrying out the training(Y8); Objectivity and accuracy in the assessment of knowledge(Y9); Possibility for distance training(Y10). It was also taken into account the specifics of part-time training and the "history" of teaching the subject preceding academic course (type of secondary school, year of completion, duration of study of discipline in school). The data from the surveys provide for the outline of the following profile of part-time students trained:

- 80% of them have graduated from vocational high schools, in which chemistry is taught 3-4 years; the remaining 20% are graduates from secondary or specialized schools;
- the majority (52%) has studied chemistry for 3 or 4 years in high school; 23.4% over 5 years and 14% - nearly 2 years;
- 65% of students have graduated more than 5 years ago (before 2010).

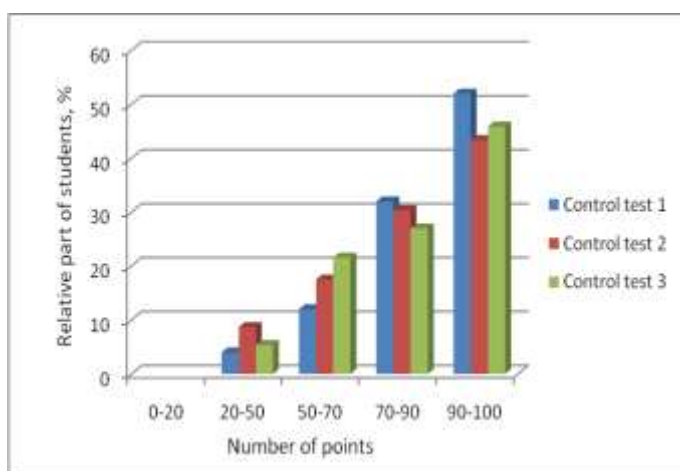


Fig. 3. Graphical interpretation of results obtained from knowledge control on "Chemistry – compensation training"

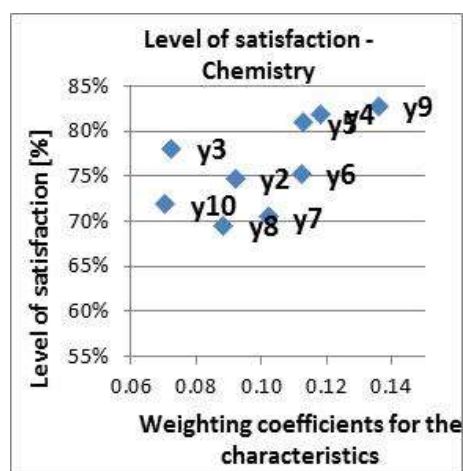


Fig. 4. Level of satisfaction from compensation training in Chemistry

The results from the evaluation of knowledge shows that the share of students who have successfully passed control tests decreases from Module 1 to 3, that is, with the increasing complexity of matter; (fig. 3). The relative share of students who have achieved over 70 (out of 100) points in the summary control tests after each of the three sections, decreases in the same row. The share of students who have achieved these results by one-time resolving of tests is only 17%, that is, the majority of students needed repeated work with training materials.

Highest satisfaction (Fig.4.) students demonstrate about the objectivity and accuracy in the assessment of knowledge (Y9). They also highly appreciated the actuality and practical orientation of educational content(Y5), its organization and structure based on the IT(Y4) and the suitable way of presenting using contemporary technical equipment(Y1, Y8). As advantage of the course they consider the access to additional sources of information(Y6). Satisfaction with these indicators is over 75%.The lower level of satisfaction for Y10 and Y3 indicates that part-time freshmen face difficulties in self-training and self-control and, in general, in Chemistry e-learning. Further study on the reasons provoking this notion should be held.



4. Conclusions

Analysing the result obtained by the experimental application of compensation e-learning in Mathematics, Informatics and Chemistry it could be summarized that students find it a suitable approach to restore their basic knowledge for successful performance for the university courses. Both full-time and part-time students approve the methodology applied in development and presentation of the learning content, which is attractive, allows easy work, self-training and self-evaluation of knowledge. Although these positive effects, the results from the experimental training led to the conclusion that the majority of the students, because of the lack of experience, cannot work with interactive learning materials and face difficulties in e-learning. Considering part-time students, besides the insufficient training in high school and the lack of enough basic knowledge, prolonged period between school and university education form is additional reason for the difficulties that students face when studying the academic course. Further study on the reasons provoking these difficulties should be held in order to achieve the aim of the compensation e-learning in fundamental education.

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