

## An Attempt of Project-Based Learning in e-Learning

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**An Attempt of Project-Based Learning in e-Learning:** *The paper presents an attempt to realize active learning in a distance education course through project-based learning. The authors propose a pedagogical approach where individual project assignments are combined with collaborative activities or assignments. Individual and collaborative activities are placed in each learning week, continuously throughout the whole course. The e-learning course is carried out with students from the University of Plovdiv. The obtained results are analysed and some measures for improvement of the quality of the learning are given.*

**Key words:** *Active Learning, Project-based Learning, Group Activities in e-Learning Environment, Collaborative Learning, e-Learning*

### INTRODUCTION

World famous trend on each stage in education is to transfer passive learning to the active learning or “learning by doing” where the advantages for learners are the most.

Project-based learning is a teaching method, in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex question, problem, or challenge [1]. It focuses on learners who are at the center of the training process. This kind of training develops students’ ability to learn actively, to think critically and to solve problems. It is based on activities that require students to perform different assignments, to look for information, to work in a team, to plan and develop projects with practical application. During the training process, the teacher can consult the students, but without taking a direct part in their work. The BIE Learning Institute (<http://www.bie.org>) disseminates good practices for project-based learning implementation across all educational levels and subject areas. The sources give several examples of the use of the project-based learning approach during the training courses [2, 3, 4, 5, 6, 7, 8].

According to Uziak [9] in order to prepare students for their professional careers, university courses should be designed to assist students to acquire problem-solving and lifelong learning abilities, rather than simply spoon feeding them to memorise prescribed content and design methods. Among the benefits of the project-based learning [3, 5, 9, 10, 11, 12] are:

- it engages students;
- it stimulates students’ creativity;
- it increases the students’ motivation to participate actively in the learning process;
- it encourages teamwork, interaction and cooperation among students;
- it links the learning content with the problems which students expect to solve in their future professions;
- students study the learning content easier and achieve higher results;
- it encourages different learning styles.

The aim of the authors is to study carrying out active learning through project-based learning in a distance form of education. The paper presents an attempt to conduct project-based learning during the course "Design of Learning Content", studied in the distance Master's program "e-Learning" at the University of Plovdiv “Paisii Hilendarski”.

Section 2 presents the organization of the training and used pedagogical strategy. Section 3 gives the results of carried out learning. The presented results are analysed and some measures to improve the quality of the learning are given in Section 4. The paper ends with a conclusion summarizing the contributions of the authors as well as with some ideas for further works.

### ORGANIZATION OF THE TRAINING

During carrying out the Master distant course “Design of Learning Content”, a project-based learning approach is applied. The use of such a learning approach is particularly suited for the discipline, because its main purpose is to train students to acquire knowledge and skills to design and develop learning content.

The course curriculum is designed to use a blended-learning approach with **120** hours of learning within 10 weeks – 5 face-to-face (3 lectures and 2 lab sessions) and **115** online (65 hours of self-study, 35 hours work on assignments, 5 hours individual feedback, 5 hours group feedback and 5 hours student-to-student communication). The online learning is held mainly in e-learning environment (Moodle).

**The training begins** with face-to-face learning classes (in the first week of training). In the coming weeks, students receive learning materials for self-study and weekly assignments for assessment. The learning assignments are mostly **project-based** and **inter – related**. Actually, they are separate parts of a large-scale project, the main goal of which is each student to create an e-learning course in certain subject area for a specific target group of learners. The training completes with a final test in the e-learning environment, held in the classroom, and a short presentation of accomplished assignments in front of other students.

**The final assessment** of the course is formed on the following basis: 50% from the weekly assignments, 25% from the final test, 10% from the assignments’ presentation and 15% from the weekly discussions.

Each week, the students have to perform **individual project** (assignment) and **group work** of a different type (see Table 1). Any student work, that is to be assessed, is rated up to 100 points. Only works, that is not going to be assessed, are explicitly marked in the Table 1. For the realization of the group work, the students are divided into groups of three people.

*Table 1. Individual and Group Work During the Training*

Week. Theme	
Individual work	Group work
<b>0. Introduction with auditory classes</b>	
<b>Self-training</b> with learning materials in the e-learning system	<b>Communication</b> in a forum
<b>1. Learning objectives. Preliminary knowledge. Course links</b>	
<b>Project assignment</b> – writing answers in free text on given topics (learning objectives of the course, preliminary knowledge and links to other courses) and creating a graphical object (course logo)	<b>“Database” assignment</b> – first sharing the part of individual work (learning objectives) with other learners and second viewing the work of others
<b>2. Annotation. Course content</b>	
<b>Project assignment</b> – writing answers in free text on certain topics (annotation and content of the course) and creating a video (presentation of the course)	<b>Forum</b> – sharing the created video and assessing by commenting the work of others
<b>3. Target group. Course accessibility. Course quality</b>	
<b>Project assignment</b> – writing answers in free text on given topics (target group of the course, accessibility for people with special educational needs)	<b>“Wiki” assignment</b> – jointly writing a questionnaire for assessment of the course quality
<b>4. Concepts. References. Technical requirements</b>	
<b>Project assignment</b> – writing answers in free text on given topics (glossary of basic concepts, lists of mandatory and non-mandatory references, and technical requirements)	<b>Forum</b> (not rated) – discussing problems encountered during the performance of the individual assignment
<b>5. Maintain training</b>	
<b>Project assignment</b> – writing answers in free text on given topics (team of the course, presentation of the author /lecturer)	<b>“Wiki” assignment</b> – jointly writing a free text responses on topics (policies to overcome learner failure and different types of learner support)
<b>6. Learning design and content</b>	
<b>Project assignment</b> – creating the structure of one learning week in the course and learning resources for this week (incl. Resource of type “lesson”)	<b>Forum</b> – sharing and discussing the methodology used in week learning design and in the resource of type “lesson”
<b>7. Individual and group assignments. Communication</b>	
<b>Project assignment</b> – creating learning activities of a different kind (assignments of each type, tests assessing the level of preliminary and acquired knowledge of learners and different ways of communication)	<b>Forum</b> – discussing the used types of group and individual assignments, ways of realization of asynchronous and synchronous communication and realized activities through communication activities
<b>8. Organization of the learning process</b>	
<b>Project assignment</b> – writing answers in free text on given topics (learning schedule and learner assessment scheme) and creating administrative forum with main themes	<b>“Workshop” assignment</b> – sharing the developed own e-course with other learners and assessing one of other students’ courses (randomly chosen from the e-environment) according to certain criteria
<b>Exam</b>	
<b>Test</b> – solving a test in the e-learning system	<b>Presentation</b> – presenting the developed training course in

The assignments are allocated thematically over the learning weeks, so as a result of the training the students will pass through all the stages and elements during the development of one e-course.

## RESULTS OF THE TRAINING

Our course emphasizes on learning through practicing. Students are encouraged to do practical work during the entire course. The results of the student work during the semester have the greatest influence for forming the final mark (50% of weekly assignments and 15% of weekly discussions).

### *Results of individual assignments*

Individual assignments give students the opportunity to search the information, practically apply the theoretical knowledge, express an opinion, do creative work, combine different skills, etc. Figure 1, Figure 2 and Table 2 provide information on how learners dealt with the individual assignments.

Figure 1 shows the learners' percentage execution of individual assignments according to the 5-rate scale with following intervals 0-20 points, 20-40 points, 40-60 points, 60-80 points, and 80-100 points. The results of individual assignments show that, with the exception of assignments 1, 4, 5 and 7, the majority of learners achieve high scores ranging from 80 to 100 points. The low scores for assignment 1 are not strange, because the period of this assignment is the time for adaptation to this new style of learning. Results of assignments 4, 5 and 7 are discussed below.

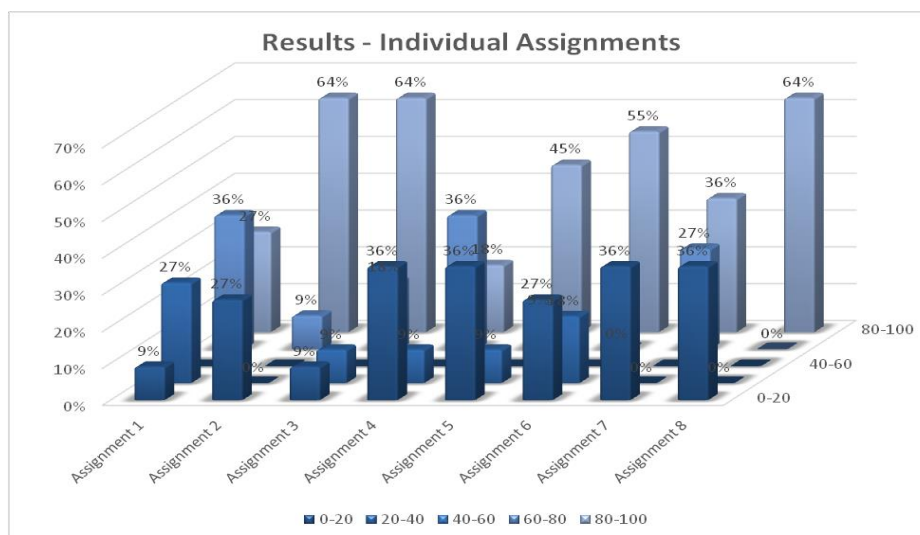


Fig. 1. Results of individual assignments.

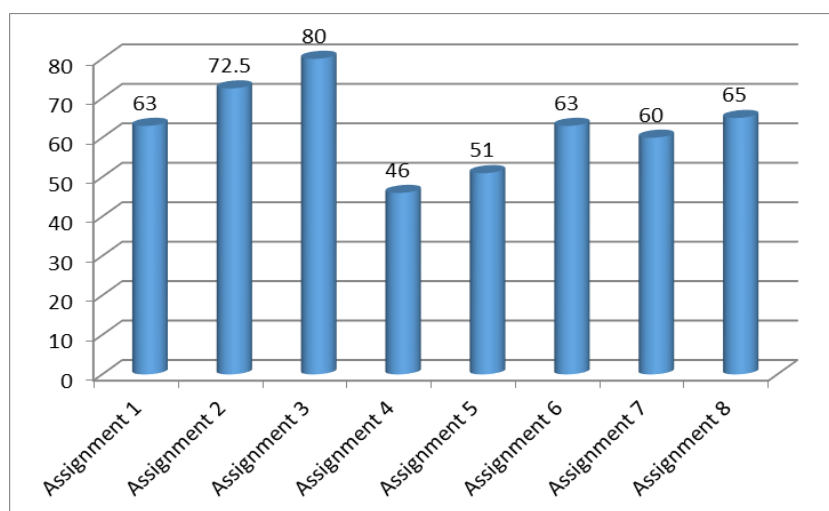


Fig. 2. Average score of learners' individual assignments.

The results of assignments 2 and 3 in Figure 2 (with an average score of 72.5 and 80 points respectively) are the highest, although the part of assignment 2 is technologically the most difficult and creatively provocative – creating a video with own scenario.

Assignments 4 and 5 have the lowest number of points (with an average score of 46 and 51 points respectively), although the requirements of the assignments are some of the easiest. It is noted that a fairly large part of learners (about 40%, see Table 2) neglects lighter assignments (assignments 4, 5, 7 and 8) and does not deepen in detailed implementation.

Table 2. Students with Very Low Results in Individual Assignments

Assignment	1	2	3	4	5	6	7	8
Learners' number with low results (<= 10 points) in %	10	30	10	40	40	30	40	40
Average number of points	63	72,5	80	46	51	63	60	65

**Results of group assignments**

We use the group assignments to give students the opportunity to do collaborative work, organize group work, understand, review and assess other learners' work, share knowledge and personal opinion, etc. Group work gives the opportunity to each learner to express and apply personal ability in the most suitable work for him/her in the group.

Figure 3 shows the percentage performance of group work assignments according to the 5-rate scale with following intervals 0-20 points, 20-40 points, 40-60 points, 60-80 points, and 80-100 points. The results show that, with the exception of the first forum and the assignment 8 of type workshop, the majority of learners do not achieve high scores (ranging from 80 to 100 points). Something more in four of the group assignments, the most results are in the range of 0-20 points.

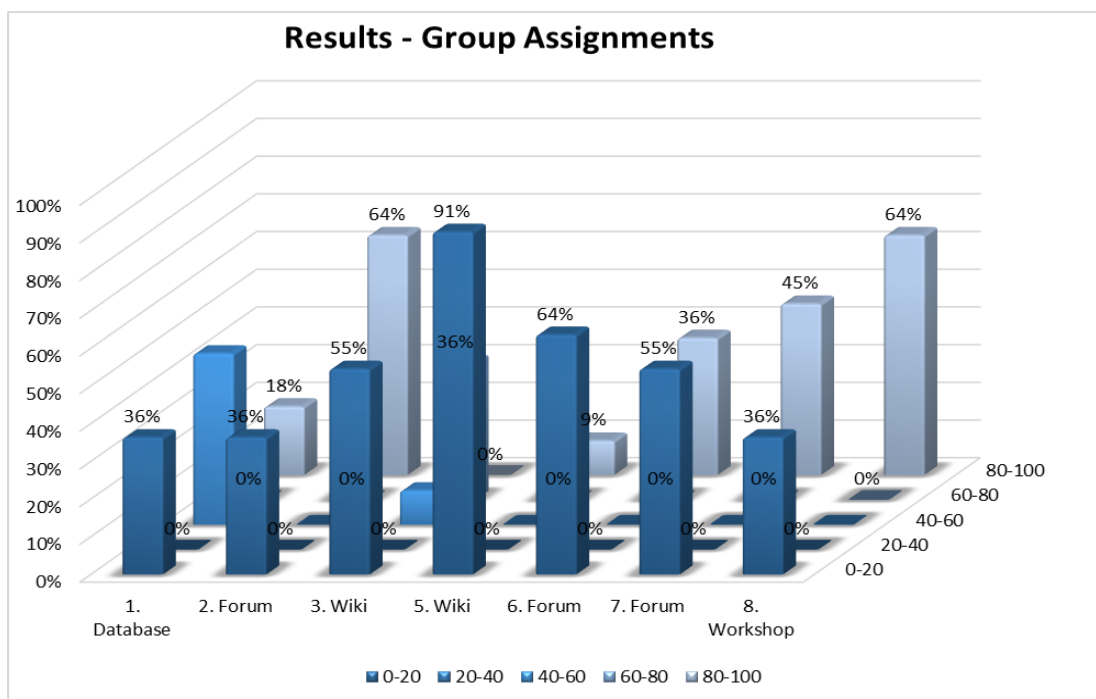


Fig. 3. Results of group assignments.

When performing the two group assignments of type “wiki” learners receive the lowest scores (31 and 13 points respectively, see Figure 4). Proposed assignments are creative. "Wiki" allows joint preparation of free text answer while conducting dialogue among the group members. Upon completion of the assignment, the teacher obtains a report on the personal contribution of each member of the group.

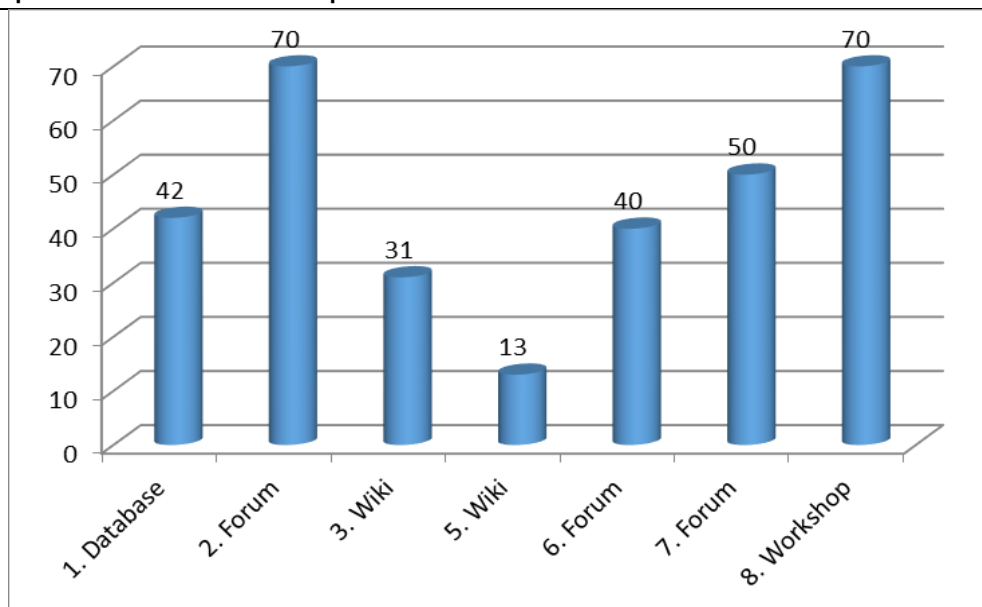


Fig. 4. Average score of learners' group assignments.

It is noted that the average score (42 points, see Figure 4) of the first group assignment of type "database" is lower than the average score (63 points, see Figure 2) of the first individual assignment, though, the whole activity that has to be done in the group assignment is to share part of the individual assignment texts with other learners.

So, the main problem that appears after the first week is how do learners get involved in the group activities? Assessment group activities have been a good incentive. After realizing that not participating in the group activities is being sanctioned, Figure 4 shows that learners have become active in the forum in the second week.

As the assignment of type "workshop" is final and summarizes other assignments, it is not strange that the average score is so high (70 points). This assignment gives the learners an opportunity to examine and assess other learners work and to be assessed by the teacher for this.

#### **Results of participation in asynchronous communication tools**

Forums are used mainly to provoke learners to discuss some important theoretical aspects, to reach themselves to some knowledge through led discussion by the teacher, to share ideas for practical assignments, to obtain skills for defending an opinion, etc. In some of the weeks, forums have been set up to achieve these goals.

It is obvious that assessment of participation in a forum increases the participation of the learners. In the forum of week 4, which is not assessed, students' participation is the lowest, as well as the average score for the individual assignment in the same week (46 points). Not all students participate in even the assessed forums (average about 53% participation, see Figure 5), although they are previously informed that their participation will affect their final mark.

In the second and third forums, where participation is the weakest, learners have to give and substantiate their position on certain issues, as well as to discuss the positions of their colleagues. It is noted that learners avoid verbal skirmishes and limit themselves to give their own position or support someone's opinion.

In the first forum there is much more involvement. Requirements of the forum are to upload own video with course annotation and comment how much like or dislike the videos of other learners. Because these activities are quite similar to what learners are used to do in social networks, their participation is the highest.

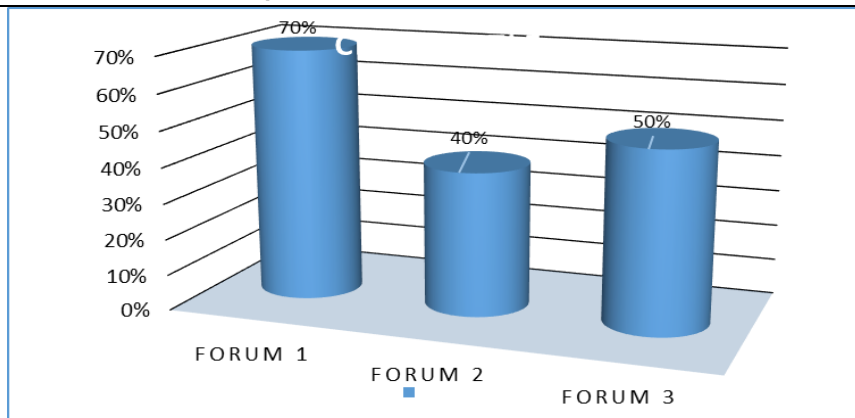


Fig. 5. Participation of learners in the assessed forums.

### **Final results**

The training finishes with final test that assesses the theoretical knowledge of the students and with presentation of what students have done practically during the semester (main components of one e-learning course).

91% of students complete the training successfully, and 9% failed during the learning process. Because of the many learning activities that are spread evenly throughout in the course, there is a gradual dropout of learners who, for some reason, are not inclined to carry out the planned activities. On the other hand, all students, who completed all proposed learning activities, successfully finish their training with very good scores.

All completing the course students successfully did their final test respectively 10% with mark SUFFICIENT, 30% - with SATISFACTORY, 20% - with GOOD and 40% - with VERY GOOD. According to the authors, the many evenly spaced practical assignments (i.e. permanent practical activity of the students) lead to the lack of trainees with FAIL mark.

### **ANALYSIS AND MEASURES TO IMPROVE THE QUALITY OF THE COURSE**

The reason for the low performance of some learners for some assignments is the weak theoretical self-learning. After receiving the feedback from the teacher with comments on their weaknesses in the implementation of the project assignments and before the final presentation of the projects on the exam, most learners have corrected their omissions. This fact leads to the conclusion that the lack of self-assessment tests or other proper pedagogical techniques (in-text questions, etc.) to highlight the main theoretical knowledge for all learning sections/weeks is a weakness of the proposed e-course.

As a result three intermediate self-assessment tests to challenge the learners to pay more attention to the theoretical learning are prepared. As well as constraints are imposed on learners not to move on to the next theme if they fail to give correct answers to at least 60% of the questions involved in the intermediate tests.

The lack of excellent grades on the final test provokes authors to analyse in details the statistical results of each test question in order to improve the test (replacement or refinement of "bad" questions) for the next group of learners. These results will not be shown in this paper because they are outside the scope of the topic under consideration.

After studying the dialogue between learners and in some cases the lack of one, it is concluded that learners have a great difficulty in distributing the work in the group. They also can't organize themselves to make decisions, can't choose a leader in the group, even some of them prefer to do the whole work instead of getting in touch with other learners.

The measures that we take to improve the work in a group for the next learners are to update assignments' requirements and to monitor more carefully learners' communication and work during the whole development period. Assignments' requirements are updated with administrative requirements that will help learners to do real group work – to choose the leader of the group, to divide the work into parts for each participant according to certain principles, to discuss certain points in the assignment, to write a plan of assignment activities and the activity performers, etc.

**CONCLUSIONS AND FUTURE WORK**

The paper shows how active learning on the base of project-based learning with collaborative activities engages learners and encourages them to “learn by doing”. The achieved results of carried out learning course "Design of Learning Content", studied in the distance Master's program "e-Learning" at the University of Plovdiv “Paisii Hilendarski” led to update of the course to increase the quality of learning. Future plans are to use mainly gamification approach with combination of proposed project-based approach in order to control and encourage learners more.

**REFERENCES**

- [1] Donnelly R., & Fitzmaurice M. 2005. Collaborative project-based learning and problem-based learning in higher education: a consideration of tutor and student role in learner-focused strategies.
- [2] Casasola MA, Pérez Chamorro, VA, & García Álvarez de Perea, J. 2012. Project-based learning and teamwork: innovating in the teaching of Computerised Accounting Systems subject. UPO INNOVA. Revista delInnovación Docente, 1, 107-122.
- [3] Cho Yonjoo, and Catherine Brown. 2013. Project-Based Learning In Education: Integrating Business Needs And Student Learning. European Journal of Training & Development 37.8 (2013): 744-765. Business Source Premier.
- [4] Calvo I., López Guede, JM, and Zulueta, E. 2010. Applying the PBL methodology in Computer Engineering. Revista de Formación e Innovación Educativa Universitaria. 3 (4), 166-181.
- [5] Lee Jean S, et al. 2014. Taking A Leap of Faith: Redefining Teaching and Learning in Higher Education Through Project-Based Learning. Interdisciplinary Journal of Problem Based Learning 8.2 (2014): 1-17. Education Full Text (HW Wilson).
- [6] Márquez E. & Jiménez Rodrigo, ML. 2014. Project-based learning in virtual environments: a case study of a university teaching experience. The Journal of Universidad y Sociedad del Conocimiento (RUSC). Vol. 11, No 1. pp. 76-90.
- [7] Mesa JA, Álvarez, JV, Villanueva, JM and De Cos, F. 2008. Learning Methods in Project Management Courses. Formación Universitaria, 1 (4), 23-28.
- [8] Tumkor Serdar. 2015. Project-based Learning in Manufacturing Processes Course. 122<sup>nd</sup> ASEE Annual Conference & Exposition, 2015.
- [9] Uziak J. 2016. A Project-Based Learning Approach in an Engineering Curriculum. Global Journal of Engineering Education, Volume 18, Number 2, 2016.
- [10] Liu Jeanny, and Deborah Olson. 2011. Putting Business Students in the Shoes of an Executive: An Applied Learning Approach to Developing Decision Making Skills. Insight: A Journal of Scholarly Teaching 6 (2011): 14-27. Education Research Complete.
- [11] Paulson Edward. 2011. Communication Quarterly 74.4 (2011): 399-411. Business Source Complete.
- [12] Whatley Janice. 2012. Evaluation Of A Team Project Based Learning Module For Developing Employability Skills. Issues In Informing Science & Information Technology 9. (2012): 75-92. Academic Search Complete.

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**Докладът е рецензиран.**