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The use of active learning methods to stimulate student activity in the online course

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Abstract

The development of innovations and related changes in the labor market, as well as Ukraine's aspiration toward Euro integration, have led to the need for transformation of teaching media and methods in higher education. The consequence of this is a massive transition to e-learning, both in the native language and in English, which, however, creates psychological and pedagogical problems. These are difficulties for students with self-organization and self-training, establishing interpersonal contacts, maintaining the motivation to learn, and meeting a certain level of foreign language proficiency. The problems for teachers include the need to develop new teaching methods and technologies, changing the role of the teacher and the methods of interaction between participants in the educational process. The article presents the experience of mitigating these problems in the online course, "Fundamentals of Vehicle Certification" in Ukrainian and English by using active learning methods, innovative methods of motivation, and organization of reflection and communication, presenting some sections both in the native and foreign language. The introduction of this course into the educational process in the extramural form of education showed that the methods proposed by the authors reduced these problems, while the number of A and B grades increased. In addition, it was concluded that the effective use of online courses requires their preliminary approbation and further improvement, taking into account the characteristics of the discipline, experience and goals of the students.

Keywords: online course, extramural education, REAL (Rich Environments for Active Learning), active learning methods, gamification

Introduction

Currently, Ukraine is at the stage of reforming all branches of socio-economic activity because of its aspiration to enter the single European area, including the field of higher education. In this regard, within the framework of the Bologna process and in order to implement the Bologna Declaration, it is necessary to create conditions for strengthening the European principles of functioning of the national system of higher education, becoming closer to the systems of other countries of the Bologna process and increasing the responsibility of the main participants of the educational process for the results achieved. These factors, as well as rapid development of innovations and their widespread introduction in all areas of activity form new requirements for learning results. This leads to changes in conditions for specialist training and the need to develop congruent teaching mediums by transforming them into information and communication forms. One of such processes in modern pedagogy is the creation of online courses in both the native and English languages, and the actual problems of their application.

The State National Programme "Education. The 21st Century Ukraine" was established in this regard. It provides for the development of education based on new progressive concepts, the introduction of the latest pedagogical technologies, and scientific and methodological achievements into the educational process, the creation

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of a new system of education information support, and Ukraine's entry into the transcontinental computer information system (Moskalenko, 2015). To implement the programme, the Ministry of Education and Science of Ukraine (2013) introduced an electronic form of education and adopted the "Concept for the Development of Electronic Education in Ukraine".

Historically, education at a distance is represented in Ukraine by extramural education, when students are in a university for a short period of classroom-based orientation sessions (usually 2–3 weeks), then receive materials and assignments for independent work, which they hand in at the end of the semester (another 2–3 weeks). Avdeiuk and Aseeva (2011) mark out several significant drawbacks of this form of education: possibility to communicate directly with teachers is limited by sessions; in some cases, special educational content or its sufficient volume is absent; there is a focus on more hours of students' independent work; the majority of students lack the skills to organize independent work during the intersessional period. This means a lack of systematic training and its low efficiency.

It seems possible to minimize these drawbacks with the help of e-learning. However, despite its high popularity (for example, a third of students studied remotely in the United States in 2016 (McFarland et al., 2018), the market of online education in Ukraine is still in its forming stage. There are no statistics in Ukraine similar to the American ones, however, according to some signs, it can be stated that distance education is being actively developed. It is possible to get an educational degree through distance education (as a form of extramural education) at Ukrainian universities, but the volume of proposals is quite small. Distance learning technologies are developing most actively as additional methodological support for full-time and part-time forms of education.

At the same time, the limited experience in the use of distance learning in higher education in Ukraine has revealed a number of organizational, pedagogical, information-technological and psychological problems. The authors agree with Korobii (2014) that it is possible to solve these problems with the help of using active education methods. For example, Johnson et al. (2006) include problem-based learning, case-based learning, project-based learning, learning by design, inquiry learning, anchored instruction, team-based learning, and collaborative learning. However, their practical implementation requires teachers to create appropriate pedagogical conditions by choosing one or another pedagogical technology, organizing effective communication, using innovative methods of motivation, and organizing reflection. In addition, the development of online courses in both the native and English languages also requires a reconsideration of the teaching methodology, the model of activity and interaction of the subjects of the educational process, professional development of teachers, and exchange of methodological developments.

An important aspect of teacher activities is also studying the characteristics of students' perceptions of educational material during distance learning. It allows timely adjustments to be made and recommendations to be developed and increases the effectiveness of the educational process (Arnavut et al., 2019; Hamid & Yip, 2019).

In this regard, the purpose of the paper is to show the authors' method of mitigating the indicated problems by using various techniques and methods of intensifying students'activities in online courses, researching their effectiveness, and studying the feasibility of using online courses in both the native and English languages in extramural education.

Research methods

The authors studied the regulatory documents mentioned above and the theoretical foundations of developing distance learning courses, analyzed the experience of Ukrainian and foreign colleagues, and designed the "Fundamentals of Vehicle Certification" (FVC) course. After that, the authors conducted a closed, linear, formative pedagogical experiment in vivo for two academic years. In the first stage, the authors collected the characteristics of the control group using questionnaires and prepared the developed course for implementation. In the second stage, students were taught in this course, while in the third stage, the authors improved the course based on the results of students' surveys and invited them to study several sections in English. The experimental results and statistical data processing are described in detail in the Results and Discussion section.

Study context

The FVC online course is designed to train bachelors in the "Automobile transport" specialty. It is studied by 3-year students of full-time and extramural forms of education. According to the curriculum for bachelors developed by the Kharkiv National Automobile and Highway University, 180 hours are allocated for the study of the course. It contains 18 units (some of them are presented in English as well), but teachers are allowed to choose a subset of them depending on the curriculum changes. Educational materials (curriculum, methodology guides, PowerPoint presentations, text resources) were available throughout the semester.

Participants of the pedagogical experiment:
– control group: 15 students (from 25 to 42 years old) who studied in the traditional extramural form without using the online course in the 2016–2017 academic year;
– group 1: 16 students (from 22 to 38 years old) who studied in the online course in Ukrainian in the 2017–2018 academic year;
– group 2: 13 students (from 24 to 40 years old) who studied in the online course in Ukrainian and English in the academic year 2018–2019.

Student activities design

The specific character of the FVC online course suggests that a student must first study a large amount of general theoretical material in order to gain practical skills in the professional field. This factor also contributed to the fact that the authors chose methods of active learning, in particular, cooperative learning, to solve the problems mentioned above. According to Barkley et al. (2014), it can take the form of discussion, mutual learning, problem-solving, organization of information, writing and using games.

In this regard, developing the course, the authors aimed to create an environment as close as possible to REAL (Rich Environments for Active Learning), proposed and described by Grabinger and Dunlap (1995), since it is aimed at promoting learning in authentic contexts, encouraging student responsibility and initiatives, and cultivating collaboration among students and teachers. Grabinger and Dunlap (1995) also marked out the attributes of a REAL: student responsibility and initiative, generative learning activities, authentic learning contexts, authentic assessment strategies, and cooperative support. It is these attributes that the authors of the article sought to implement in their course.

The first attribute is fundamental, because students will not be able to actively develop their knowledge without taking responsibility and initiative for their training and shaping their actions around topics, not goals. It is crucial for students to monitor their progress, learn, correct their mistakes, and analyze the effectiveness of their learning strategies and change them when necessary. The most desirable way to organize reflection would be a weekly questionnaire and for the student to keep a journal where they would record their goals and the techniques which they have found to be effective in achieving them. However, the survey of 300 students of the 4th–5th years showed that only 10% of them set learning goals and analyzed their achievement and their practical significance for their professional activities. The rest either did not ask themselves such questions or were satisfied with the teacher's answer. In this regard, the authors organized reflection in the online FVC course by indirect methods.

Firstly, the goals for each lesson to a large extent reflect what should be remembered and identified, the main components of the activity to be recognized, its content, types, methods, problems, solutions, and results obtained, etc. Secondly, some direct elements of reflection are implemented in the course: weekly questions for self-assessment, pre-course and end of course questionnaires, compilation of memory cards. Thirdly, since reflection is a process of awareness of one's activity, its goal is to create new modes of activity. In the FVC online course, this is implemented in several assignments for the lessons. In addition, a test is also known to have a learning function, so it can also be attributed to indirect methods of organizing reflection. Fourthly, according to the concept of metacognition (Khalin, 2003), reflection can be reflected in tasks that require documentation and notes, and also enable tracking how the student's opinion has changed in the learning process. Forums with problematic questions serve this purpose in the course.

The second attribute of REAL – generative learning activity – implies that students cannot build or develop their knowledge-skills without generation through active participation. That is, for successful training, they must apply the information they are studying, and be deeply and constantly involved in solving real problems by developing and completing projects. In the FVC course, students are invited to complete 11 short-term projects with a duration of one week each, and one final project.

The third attribute of REAL – authentic learning contexts – requires students be not only provided with real problems and situations, but that solving these problems must also be realistic and include complex contexts that require the students to perform interrelated subtasks. They should identify the problem and resources, set priorities and explore alternative solutions with the same initial data, which may require a team approach. In the FVCcourse, 4 out of 11 projects are related to specific work situations that may arise in an automobile enterprise.

The fourth attribute of REAL – authentic assessment strategies – suggests that assessment standards should include complex, multifaceted criteria that can be defined and are reliable for several evaluators. Important criteria among them are project management, research, and project presentation. In order to evaluate these skills when working in a group, the FVC course takes into account the student's self-assessment, assessment of their work by the group leader and assessment of the leader's work by the team members. Taking into account the weighting coefficients of these components, the final system for assessing the work of each student can be adapted to the goals set, depending on the individual, team or competitive assessment system for the specific task.

The last attribute of REAL – cooperative support – is the quintessence of the idea of cooperative learning, which finds its expression in engineering education from short-term informal and formal group activities to long-term less or more structured group-based assignments (Gapinski, 2018).

The organization of teamwork and cooperation is especially relevant for extramural students who do not know each other well and have little contact with each other. In the FVC course, communication begins in the first week through a forum and chat dedicated to getting acquainted, and is supported throughout the course using the group projects described above, thematic forums, question-answer forums, reviews, news, and webinars.

The authors agree with Petrushanko et al. (2013) that discussion is a key teaching method that significantly activates the learning process. Correctly compiled informational materials play an extremely important role in organizing communication: a letter

of invitation to the discussion forum and the webinar, for example.

It is more difficult for the teacher to organize and support constructive communication during the webinar, as it takes place in real-time, and the lecturer needs, in addition to presenting the material, to quickly monitor the activity of the students in the chat, form and direct the discussion with leading questions, comment on individual messages, etc. Therefore, before the webinar, it is advisable for the tutor to compose a chat script.

In REAL, active communication and assignments with a problematic issue also have a motivational effect and attract students more because they want to find out its solution (Grabinger & Dunlap, 1995). Empirical studies conducted in various engineering courses have shown that students achieve significantly better results in cooperative learning (Nerona, 2017). However, taking into account the problems identified in Ukraine in the extramural and distance forms of education, the course authors considered it necessary to use additional methods to motivate the students.

According to the well-known concept about the source of motivation (Ilin, 2003), the educator in the process of his or her activity operates with external motivation and creates such conditions so that the student has internal motivation. Many researchers offer their systems and methods of motivating students in e-learning. The authors decided to combine several of them.

According to Pappas (2015), the FVC online course has: a questionnaire for assessing students at the entrance, clear measurable goals each week, real feedback (question-answer forums, news), support for the relevance of the course, and the formation of significant skills.

According to Sprenger (2014), the following motivation tools were used: whip (lack of evaluation, negative analysis of activities), carrot (rewards), law (learning conditions in the course), expert opinion (participation of the tutor in forums), and support of the tutor (emotions in communication, encouragement and praise in the forums, summarizing each week with an analysis of student activities, creating a welcoming atmosphere, private communication with low-performing students, support in self-respect).

The following methods were used to increase motivation during working with text, both in Ukrainian and in English: creation of a system of questions and questions-answers (self-assessment); discussion of the most difficult topics; the use of text structuring and compression tools, increasing its visibility and information content; immersion in the information space of the text, keywords and phrases; summary.

The system of situations that can occur in the activity when using the concepts and regularities obtained; reproductive activity, its patterns and alternatives; structuring and modelling of activities, including the process of task solving (creating algorithms, models of cognitive activity, mental experiment, etc.); tasks for search activity; hypotheses and questions-hints

when solving problem or search tasks; discussion of results, analysis of reasons for the positive or negative consequences of training, the system of rewards and support, and bonuses were implemented to increase motivation in organizing practical activities.

Such methods as discussion on the topic; creating scenarios; discussion of open issues; taking into account the laws of communication and interaction; modeling a possible situation, and visualization were used in order to increase motivation in organizing communication and cooperation.

In addition, elements of gamification can be applied to encourage and maintain motivation at a high level. In the FVC online course, these are:

1. Ranks for success in training: Specialist (in certification); Engineer (in quality); Auditor (in certification of vehicles).
2. Each rank can be obtained in three medals: bronze (for 60% of points); silver (80%); gold (100%).
3. Additional ranks (badges) can be in unlimited quantities: Repeater Bird (for 30 chat messages); Tribune (20 posts in the forum); Chip and Dale (10 answers in Q&A forum); Encyclopedist (passing the test by 100%).

Such methods help create a diverse system of motivation, which attracts the interest of the maximum number of students of various categories and maintains this interest throughout the learning process.

Based on the foregoing, the authors compiled a detailed plan of the tutor's work at all stages of the students' training in the online course:

1. Before the start of the course: to remember its content and features of e-learning; to track possible changes in the area, to adjust the content; to study groups of students, their experience, goals; to discuss this information with the partner-tutor, to take into account his or her recommendations and wishes, and to correct it again if necessary.
2. The first week: to get in contact with the students; to assist in registration and provide other technical explanations; to post an organizational entry in the "News" forum, to draw students' attention to zero week; to motivate the completion of the pre-course questionnaire; to organize the "Getting Acquainted" chat.
3. During the educational process: to organize communication in forums, to assess the tasks and comments in a timely manner; to monitor the Q&A forum; to keep in touch with students who do not manage to study on schedule; to involve leaders in assessing other students; to give them reward points; to keep in touch with the partner-tutor.
4. Last week: to remind students of the test and the final test; to motivate the completion of the end of course questionnaire; to encourage participation in the "Reviews and suggestions" forum; to conduct a final assessment of the students.

5. After the course: to provide a report to the administration; to discuss the results with the partner tutor; to process the student profiles and their comments in the "Reviews and suggestions" forum; to adjust the course according to its results.

It is these actions that help the tutor fulfill his or her immediate functions, as well as to reduce the identified psychological and pedagogical problems.

Results and discussion

In order to evaluate the feasibility and effectiveness of using the online course in the extramural education accepted in Ukraine, the authors conducted a linear pedagogical experiment during two semesters of the 2017/2018 and 2018/2019 academic years. During the first year, the authors wanted to find out whether the course would contribute to greater progress among students compared to extramural education. For this, the authors took the academic results of the previous group as a basis and compared them with the results of the group that studied in the online course in the 2017/2018 academic year (Table 1).

To determine the statistical significance of the results obtained, the authors used nonparametric methods, namely, the Mann-Whitney criterion for independent samples, since the volume of both samples was rather small (less than 30 students in each group) and it is difficult to reliably estimate the law of the control characteristics distribution of the group at each stage of the experiment (Kulaichev, 2017). It was found that the differences could be considered significant for the grades of "C" (14% less) and "B" (11.5% more) at a significance level of 0.05.

The detailed analysis of the academic results showed that the simplest tasks for the students were those that required recall and awareness. 88% of students completed them with a "C" grade or higher. The most difficult tasks for the students were those that required a detailed answer with a multilateral analysis of the problem issue, as well as the development of a practical project (communication programs with clients, motivation of employees of a vehicle repair enterprise, testing of automotive equipment). Only 42% of students received a positive grade (65% of them – "C", 32% – "B", only 1 person managed to get an "A").

After that, the authors conducted a survey of the participants in the online course about their impressions and opinions about it. Overall, this survey confirmed the previously identified problems of e-learning. Although the students found it convenient to study at any time without being tied to a place, they also indicated difficulties with self-organization (28% of students), difficult complex tasks (66% of students), weak interest in forums and chat rooms (45% of students), and low involvement of the tutor (34% of students), the desirable availability of certain sections in English (30% of students).

The authors decided to modernize the course in order to eliminate these problems: to add detailed instructions to forums, to develop chat scripts, to offer tasks with projects for work in small groups, to introduce gamification elements, and to change the tutor's work plan. It was also decided to duplicate 3 units of the course in English, namely those that reflect the subject of the discipline at the international level. After that, the FVC online course became as described above. Then the authors tested the course again in the 2018/2019 academic year (Table 2) in order to evaluate the effectiveness of these changes.

According to the Mann-Whitney criterion, the changes in the "B" (7.5% less) and "A" (9% more) grades are statistically significant. On this basis, the authors can judge the positive impact of the chosen methods of activating students' activities. Compared to the control group, the differences for all grades are statistically significant, which indicates the effective-

Table 1

Students' academic results in the 2017/2018 academic year

E-learning, Group 1		Extramural Education, Control Group	
Grade	Students %	Grade	Students %
C (60–74)	28.5	C (60–74)	42.5
B (75–89)	56.0	B (75–89)	44.5
A (90–100)	15.5	A (90–100)	13.0

Source: authors' own work.

Table 2

Student academic results in the 2018/2019 academic year

E-learning, Group 2		E-learning, Group 1	
Grade	Students %	Grade	Students %
C (60–74)	27.0	C (60–74)	28.5
B (75–89)	48.5	B (75–89)	56.0
A (90–100)	24.5	A (90–100)	15.5

Source: authors' own work.

ness and appropriateness of using online courses in extramural education.

Regarding the units translated, the study showed that 16% of students opened pages in English, 60% of those students worked only with theoretical material, and 40% also worked with assignments. Only 5% of all students studied and fully completed the tasks of all three units in English. In addition, it was found that the average number of theoretical materials studied in English decreased from unit to unit (80%, 56% and 22%, respectively).

Also, the authors asked the participants to characterize the qualitative results that they received after studying in the FVC online course compared to the traditional extramural education. Students were asked to rate each criterion on the scale: "–3" – significantly less, "–2" – less, "–1" – slightly less, "0" – unchanged, "+1" – slightly more, "+2" – more, "+3"– much more. The average values of these criteria are shown in Table 3.

These data show that the methods used can eliminate the identified difficulties of students in studying in the online course.

The experience of the authors of this research showed that the design and use of online courses, regardless of the language, is a complex pedagogical task and requires an understanding of the specifics of e-learning. As a result, the educator needs to change not only the teaching methodology, but also the general model of his or her activity, as well as the methods of interaction of all participants in the educational process. In this case, the authors believe that it would be most rational to divide this task and introduce the roles of "course developer" and "tutor" individually. And effective use of online courses requires their preliminary approbation and further improvement, taking into account the characteristics of the academic discipline, the level of foreign language proficiency, and the experience and goals of the students.

Also, a hypothesis was declared, which was confirmed experimentally, that the use of online courses is more advisable in extramural education than its traditional form. However, it was also revealed that after improving the course and applying the small group method, students still consider complex educational projects to be too difficult. 74% of students received a positive grade (48% of them got a "C", 32% got a "B", 20% got an "A"). Having analyzed the Professional Standard

of specialty 273 "Transport", as well as the requests of employers, the authors do not consider it possible to simplify such tasks or replace them with others. According to the authors' view, one of the solutions to this problem could be the use of blended learning.

It is worth noting that the effectiveness of duplication of some sections of the online course in English has not been confirmed. Despite the fact that a fairly large number of students indicated the desirability of duplication of certain sections into English in questionnaires, the percentage of students actually using these materials turned out to be much less (16%). Given the interest of students, it was decided not to remove sections in English from the course, but to leave them for facultative study.

In addition, the authors assumed that some psychological and pedagogical problems identified by other researchers could be mitigated by organizing effective communication, using innovative methods of motivation and organizing reflection. The introduction of the developed course in the educational process has shown the feasibility of these measures. The authors do not insist on the application of precisely those methods that are described in this paper. However, they consider using the methods of intensifying of students' activities in an online course absolutely necessary. Further research may be directed towards studying the influence of other methods on the success of training.

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Table 3

Qualitative indicators of academic results in the FVC online course

Criterion	Group 1	Group 2
Practical skills	More	Much more
Theoretical knowledge	Much more	Much more
Social activity	Unchanged	More
Relation to the profession	Slightly more	Slightly more
Interest in the discipline	Slightly more	More
Learning motivation	Unchanged	More

Source: authors' own work.

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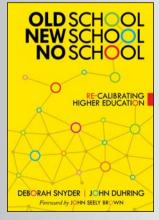
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WE RECOMMEND

Deborah Snyder & John Duhring, *Old school, New school, No school. Re-calibrating higher education*

Something magical happens when students are encouraged to take control of their learning journey. As they develop their observational skills, questions form regularly from their experience. They search naturally and immediately using whatever technology and resource are at their disposal. They seek out points of view as they make sense of the feedback they have assembled through their research. They deal with authority and meaning developed from fresh data. With a digital device or smartphone, any student becomes an "expert" in record time. But, how they can prepare themselves to act in what they have learned?
An excerpt from the book (p. 31).
Publisher: Micromarkets International, 2018.

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