Integration of Mobile Voting Services into Mining Engineers Training for Mineral and Resource Sector

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Abstract. Currently, sustainable development is associated with the intellectualization of the mineral resource complex, with careful use of natural resources, with a decrease in the anthropogenic load on the environment. This makes new demands on the training of mining engineers related to the digitization of the mineral and resource sector. Being one of the leading coal mining regions in the world, Kuzbass (Russia) demands from its regional higher educational institutions to follow new educational standards, making ICT, web-sources and e-learning the significant and inherent part of educational process. This paper reveals the author's experience of integration the mobile voting service (Socrative) into teaching mining engineering students. We conducted the experiment to test this service among mining engineering students. Our methods included interviewing, testing, observations. The received data proved that this mobile service could improve educational process in various ways. The value of mining engineers, provided for new knowledge, is increasing in the process of innovative development of the mineral and resource sector, in which traditional resource-intensive technologies give way to lean production.

1 Introduction

Digital era is widely extended to various areas, including education. Today educational environment becomes electronic, due to integration of new IT and web-resources. Being one of the leading coal mining regions in the world, Kuzbass (Russia) demands from its regional higher educational institutions to follow new educational standards, making ICT, web-sources and e-learning the significant and inherent part of educational process. Engineering graduates who will be leaders in today's rapidly changing environment in Kuzbass must possess ICT skills along with a variety of professional, technical skills and research skills. Near three quarters of classroom activities should ensure interactive communication, such as discussions, simulation games, while lectures should not take more than a third of educational process. We should note that nowadays e-learning via a PC has stopped being so vital due to its stationary character, large size and weight and its bind to

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the leased Internet line. Therefore, mobile technologies and m-learning are taking preference in our everyday life, work and education.

Some components of m-learning have already been integrated in some universities all over the world. Today's students are commonly referred as the Net Generation [1] and Digital Natives [2] and they have already possessed some skills to use digital and network technologies in learning. So, today's teachers have to meet the expectations of new learners and focus on efficient use of new technologies, i.e. to follow a transformational approach to the traditional language skills development together with digital literacy [3]. This approach supposes a deep change in teaching and learning, since it allows teachers arrange and support collaborative, learner-oriented approach, encouraging students' motivation and self-study. This approach can be considered as the transformation of education from "a contrived performance, on a stage, to a shared experience of contingent reality that no one, lecturer or student, has experienced before" [4]. This paper focuses on innovative approach to teach mining engineer students with the emphasis on integration the mobile voting service (Socrative).

2 Materials and methods

At present there are a great variety of web-services supported with mobile apps (Quizlet, Kahoot, Plickers, Socrative, Poll Everywhere, Easy Test Maker, My Quiz etc.). Some of them are used by the author and we are ready to share our experience of the web-service Socrative in teaching. It is accessible on Macintosh, Windows, and Chrome-based operating systems and does not require any software installation. This service allows teachers assess or check students' academic performance online through their voting via smartphones, receive instant feedback from as the whole group as a definite student after voting. Students should download the Socrative mobile app to vote in this service. When a teacher creates and launches a test for voting, he / she invites students to a virtual room, sharing them a unique code. In free version up to 50 learners may 'enter the room'. Then students are demonstrated questions in their smartphones and start voting. The teacher can arrange three ways of voting:

1) Instant feedback – students receive immediate right/wrong feedback and explanations (if applicable) after every question. Students answer questions in order and cannot skip or change their answers. The teacher can monitor their progress from the Live Results table.

2) Open navigation – students may skip questions, edit their answers, and navigate the quiz at their own pace. Once they have finished, they can submit the entire assessment. The teacher can monitor their progress from the Live Results table.

3) Teacher paced – the teacher controls the flow of questions; send one question at a time and observe responses as they happen. The teacher can also skip and revisit questions.

The teacher can monitor students' voting results online from the Live Results table. It shows right and wrong feedback of each student and students' scores in percentage. When voting is completed, the teacher can save students' answers in Google disk, send by email and demonstrate them to students on the monitor to enhance post-test discussion to correct wrong answers.

But the most valuable didactic function of Socrative is that it allows detect gaps in academic performance as the whole group of students as a single one. And instant feedback plays a significant role here [5]. Feedback is an essential component of formative assessment, which enhances a rise of students' motivation, giving them a possibility to evaluate and control learning by themselves [6]. Moreover, this service allows instant detection of knowledge gaps [7], helps the teacher to reveal weak points of presenting learning material and correct his / her teaching methods. The service helps the teacher to

detect which language aspect or material requires additional clarification or larger number of exercises and prepare problem-solving tasks for post-test discussion. The teacher can create new interactive tasks, based on augmented reality and geolocation apps [8, 9].

To examine the impact of Socrative on evaluation of students' academic performance and their language skills development, we conducted the experiment with 73 first-year undergraduate mining engineering students learning English for Specific Purpose (ESP) in 2017-2018. We had 2 experimental groups (43 students) and 1 control group (30 students). According to the European Language Framework the language competence of all students was A2 – B1.

The experiment included the summative and formative assessment. While the summative assessment we detected students' mobile competence, revealed their attitude to mobile learning and integrated mobile voting (via Socrative tests) into language lessons. While formative assessment we made a comparative study of midterm and final students' academic performance in the experimental and control groups and revealed experimental students' attitude to Socrative and its integration in language classes.

At the start of the experiment we worked out a questionnaire to detect mobile competence of 43 experimental students. The online questionnaire contained 16 questions about students' mobile technologies skills, experience of mobile apps use in language lessons and their attitude to mobile apps implementation in language lessons. The questionnaire was created in Google forms service and the link was offered to students via student social network VKontakte.

According to the questionnaire all students showed a high level of mobile technologies skills. They reported about easiness to download apps, share links, upload video and audio file online via smartphones, post in any blogs, forums etc.

As for their experience of usage of mobile apps in language lessons, only 64% students responded positively. The most popular app was language translation programs (73% respondents). Only 15% students had experience in watching English videos from YouTube. And only 3% students used special mobile apps for learning foreign languages. No students had experience of mobile voting in language lessons. Answering the questions about their attitude to mobile apps implementation in language lessons, almost all respondents (95%) welcomed this opportunity and were ready to use them.

Further we arranged our teaching ESP in two ways. We suggested mobile voting language lessons for experimental group of students and traditional language lessons for control group of students. Students of all groups were supposed to do the same class activities: vocabulary and grammar practice, pre- and post-text tasks, text rendering and discussion etc.

At the summative assessment stage, we tested the English level of all students which showed the equal level among experimental groups (44% and 45%). The English level among control group was higher (52%). During the academic year we taught Socrative supported lessons of English (carried out ten class-to-class tests on class material, two midterm tests and и one final test) in two experimental groups. All tests included multiple choice questions and true/false statements. After each test post-test discussion was arranged to promote understanding of the studied issue. The control group students took part only in two midterm tests and the final test. All the tests were identical for all the students.

3 Results and discussion

At the formative assessment stage, we compared the average scores of all the Socrative tests in the experimental and control groups (Fig.1).

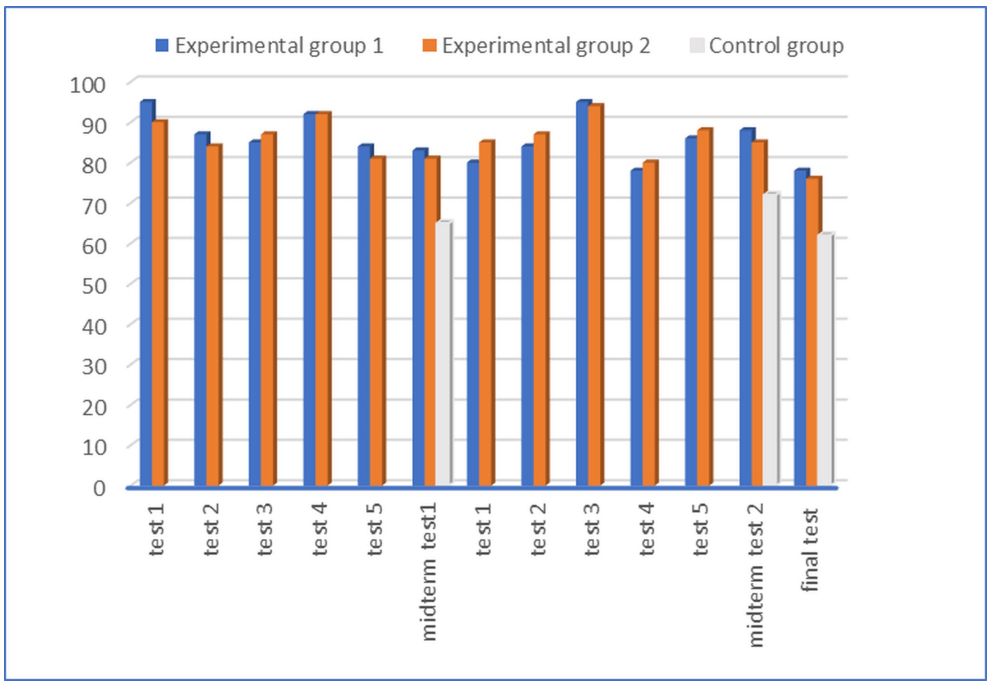

Fig. 1. The bar chart of the average test scores of the experimental and control groups.

We can see from the Fig.1 that academic performance data of the experimental groups are almost the same during all the Socrative tests. It can be explained by their equal language level at the beginning of the experiment. The Socrative tests data fluctuated during the whole period due to a different difficulty level of learning material.

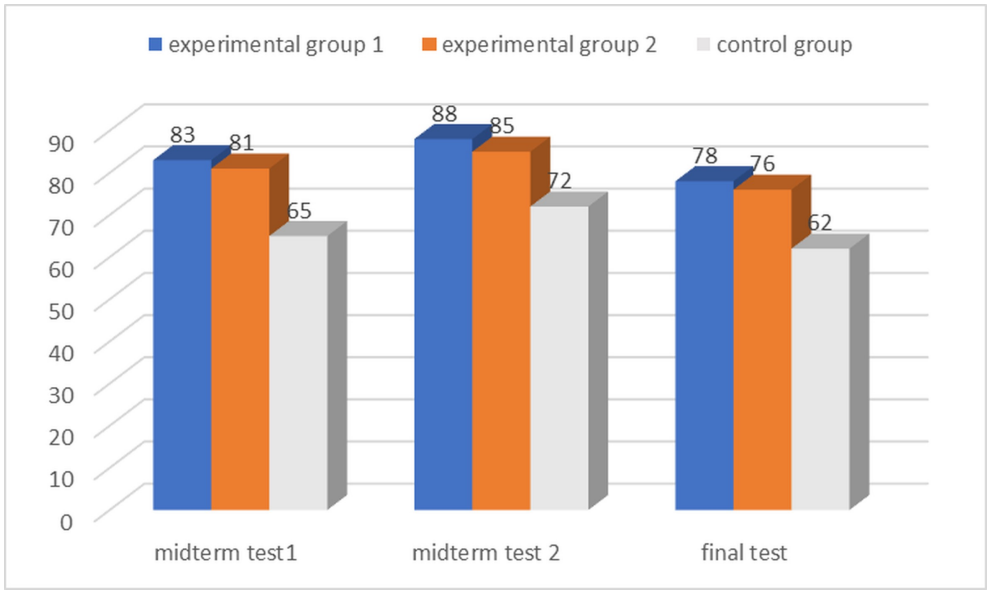

Fig. 2. The bar chart of the overall test scores of the experimental and control groups.

Having carried out the final Socrative test we compared the midterm and final test data in the experimental and control groups (Fig. 2).

We can note from the Fig.2 that the data of the Socrative midterm tests and final tests of the experimental groups are higher than of the control groups data. Thus, we can conclude about a high level of effectiveness of mobile voting service Socrative integration in teaching / learning. The likely interpretation of the academic performance improvement of the experimental groups in midterm results and final test is that they were actively involved in post-test discussion and lesson design transformation – division of the learning material into clusters and activity switch practice [10].

During the experiment we always used frontal discussions as post-test activity. The teacher enhanced discussion of difficult questions of the Socrative test, asked problematic questions, encouraging students to find right answers. This experiment showed that instant feedback of this mobile voting service and post-test discussions resulted to deeper material understanding and language skills improvement.

Finally, we offered a survey to the experimental students to reveal their attitude to the Socrative tests and integration of the mobile voting system in classes. The survey contained eight statements, which students should have ranged on 4-point scale according to their preferences (Table 1). To create the survey we also used Google forms service. We responded 40 students from the experimental groups.

Table 1. Survey's results

Statements	Strongly disagree	Disagree	Agree	Strongly agree
1.The Socrative tests helped me to understand material better			8	32
2.The Socrative тесты helped me to get ready for the midterm test		2	28	10
3.Instant feedback in / after the Socrative tests motivated me			4	36
4.Post-test discussions encouraged deeper material understanding			6	34
5.Change in classroom activities encouraged better material understanding			26	14
6.The Socrative tests changed my attitude to learning		2	8	30
7.The Socrative tests complicated learning	36	3	1	
8. The Socrative tests were useless	38	2		

Overall, the survey data showed students' positive attitude to the conducted experiment. They reported about effectiveness of the Socrative tests and post-test discussions for better material understanding and the midterm test preparation, immediacy of feedback. Though, some students responded negatively. For example, 2 students reported that the Socrative tests did not support them any help for the midterm test preparation, 2 students found the Socrative tests useless and complicating. Nevertheless, 38 students (95%) appreciated the Socrative tests integration in classes and pointed out the motivating nature of immediate response on tests. They mentioned post-test discussion gave them a possibility to learn from each other and found student's explanation could be sometimes more helpful than teacher's explanation. Our research observation also proved it.

4 Conclusion

The data indicate that mining engineering students need better and more effective ways of learning ESP and their teachers need to employ more effective teaching methods. To follow new higher educational standard demands about making ICT competence and digital skills the inherent part of education and integrating e-learning and web-services into teaching, we transformed mining engineering students' role from passive recipients to engaged disputers with help of their smartphones. Mining engineering students claimed this approach improved their overall satisfaction with ESP study because of an innovative way of interaction in classroom formats.

Mobile voting services have considerable potential in educational process due to the characteristics such as deeper digestion of learning material, instant feedback from students which allows to trace their learning problems (weak points), automatic evaluation of students' responses. The above advantages of mobile voting services in combination with traditional training techniques increase students' motivation and satisfaction with ESP learning and open great opportunities for education.

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