BYOD and turn to your neighbours

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Abstract

The use of mobile devices (BYOD) has increased considerably in education, in the last years. The social and economic impact of technology is widespread and accelerating, therefore as educators we have to develop minimum 8 digital skills in our children and students. These skills prepare them for the digital age, and will contribute to their digital intelligence (DQ). "DQ is the set of social, emotional and cognitive abilities that enable individuals to face the challenges and adapt to the demands of digital life" [1] Many of the students have at least one of the devices, which can be transported and used also during the lectures or workshops in higher education. Students like to bring their own devices (BYOD) and work in pair or groups, by turning to their neighbour when the lectures present opportunities for that. M-learning devices are very useful for learning, reading and finding relevant content on the Internet, for assessing acquired knowledge and for performing real measurements. We should not let our students to become digitally illiterate, therefore we have to act immediately using different methods (Richard, 2016), and we should take the advantage of the ICT, multimedia and m-learning devices (laptops, smart phones, tablets) and their applications (Jarosievitz, 2015, 2011, 2009). In this paper I show how students' own devices have been used for anonym assessments during the lectures.

1. Introduction

Based on the conclusions of my previous research it has become clear that the education of natural sciences is in crisis in the world (OECD, 2000, 2001, 2005). To overcome this crisis physics lectures should be made more colourful, attractive, interesting and interactive.

[1]https://www.weforum.org/agenda/2016/06/8-digital-skills-we-must-teach-our-children?utm_content=buffer2645f&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer

We do hope that students can take part more interactively in the courses by using their own devices, and accessing and sharing information by their mobile devices will motivate them and will change their attitude towards science in a positive way.

2. M-learning devices used during the lecture

M-learning can be used in very different ways. The following word-cloud shows us some of the "frequently used" possibilities.

Fig. 1.: Word cloud of students' answers related to "frequently used" possibilities of own portable devices.

Motivated by the impact from Eric Mazur's development (Mazur, 1997) done using "Peer Instruction Method" for teaching science, I have decided to introduce the use of M-learning devices for making physics significantly more accessible to my students.

This experimental teaching with mobile devices involved 188 students who were enrolled in my course during the school year 2015/16.

In the beginning of the course 43 % of all 188 students (20,7 % female; 79,3 % male of them) filled in the general questionnaire (31 questions of different types) sent to them via internal communication system.

Analyzing the responses of the students I find that 24,4% are not interested to use their own devices for physics measurements, but 75,6 % are enthusiastic, and look forward to do the measurements with their own devices.

I was also curious about what purposes the students used the new high-tech devices for, if they had one.

Examining the responses I find that my students use their devices mostly for communication. My results are in a good agreement with other results obtained in a completely different part of the world (Megan, & Jomayra, 2014)

The following diagram shows us how my students use their devices for different purposes.

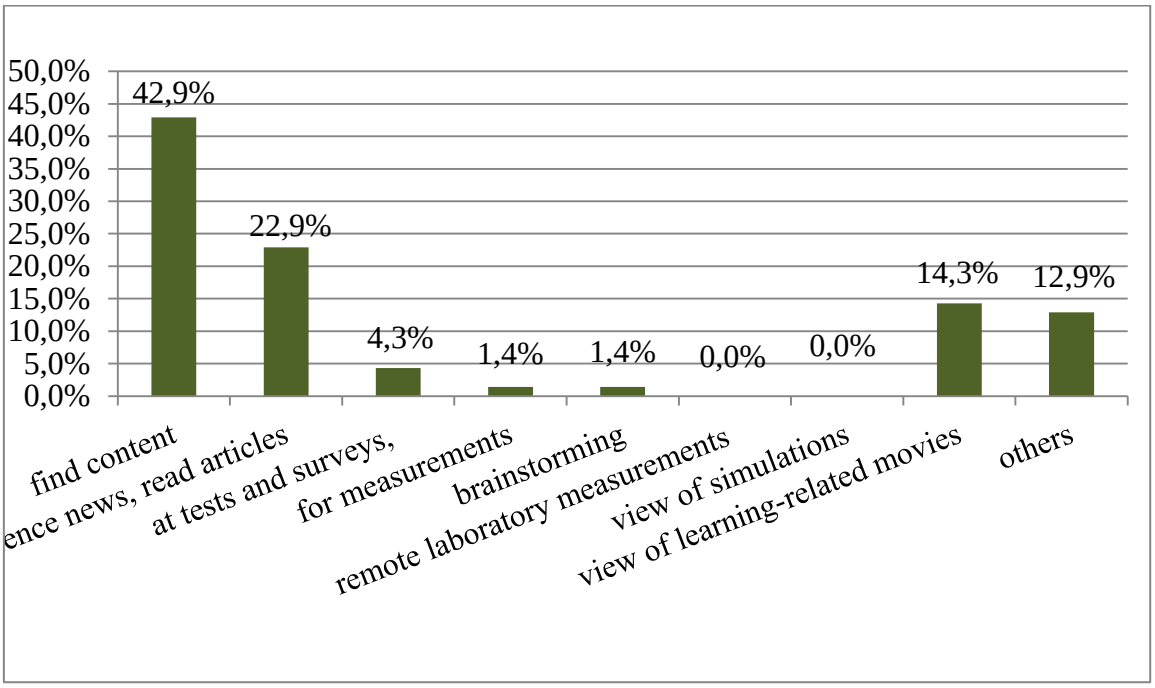

Diagram 1: Portable devices used by students, for different purposes.

3. Formulated hypothesis

Before using portable devices (smart phones, tablets, laptops) for assessment I have formulated the following hypotheses:

Students turning to their neighbors and using their own devices will:

- understand better the physics phenomena, while they predict, discuss, formulate hypotheses;
- do the problem-solving exercises much better, while they are making the calculations, and click the right answer after they got the results of the calculation;
- enjoy more the physics lectures;
- increase their interest toward physics and sciences.

4. Activity done during the lectures

During the 45 hours of lectures and seminars, 5 different surveys have been filled out (10 questions/each test). Each of the questions was related to the physics phenomena or law taught previously. The 6th survey included a set of mixed questions, which were already asked during the previous surveys.

During each lectures students used their mobile devices to fill in the online survey, turning to their neighbours, discussing the results and using the program Socrative real-time questioning tool.

This table shows the date of the tests and the number of participants attending the lectures, during the research year.

In the last column the participants' results can be seen, which comes from the answers of an individual or of a pair of students.

Date of the survey	**Total participants during the lectures**	**Survey filled by participants**	**Results reached by the group**
23. 02.2016.	45 (66,17 %) FT	27 (39,70 %) FT	35 %
08.03.2016.	24 (35,29 %) FT	20 (29,41 %) FT	48,5%
05.04.2016.	18 (26,47 %) FT	14 (20,58 %) FT	25%
26.04.2016.	21 (30,88 %) FT	19 (27,94 %) FT	41,6 %
13.05.2016.	16 (23,59 %) FT	14 (20,58 %) FT	40,8 %

In the end of the course some students gave personal interview, and reflected to the method used. All the reflections were very positive, and promising.

I think that further quiz questions can be developed and the method can be implemented also in other courses.

5. Sample questions given during each survey

This method gets students better involved in their own learning and focuses their attention on the underlying concepts. Since we did not have any dedicated clickers, my students used their own devices (tablet, smart phones, laptops) and they were also able to answer online the different type of questions. In our work "clickers" were supplied with M-learning devices.

All students got a QR code (with the direct link to the online poll: http://www.socrative.com and room number: **f862bde5** used). For QR code scanning the free downloadable apps from Google Play, e.g.: QR Droid has been used.

Students without devices had to turn to their neighbors and discussed all questions and answers, and voted in pair. Every answer was projected to all participants anonymously. This approach was well-received for all students. Using the students' own m-learning devices I got very good real-time information about their knowledge, while students shared their understanding by answering anonymously the formative assessment questions in a variety of formats: quizzes, quick question polls, exit tickets and space.

Sample questions

- Which statement is true for a perfectly inelastic collision?

  a) only the total momentum is conserved

  b) only the mechanical energy is conserved

  c) both the total momentum and the mechanical energy are conserved

  d) none of the momentum and the mechanical energy is conserved

Only 3 of the participating 19 students gave the right answer, which is strange. Examining the causes why they did not know the right answer, I concluded the followings: probably they were not familiar with conservation of the mechanical energy and momentum.

The results for some other sample questions show that student are not used to connect physics phenomena to everyday life, therefore they "just click", choose one of the answers almost randomly, without some thinking.

- A compressed spring is placed between two trolleys of masses 200 g and 400 g respectively. They are in equilibrium at this stage. When the spring is released, the 200 g trolley starts moving with a speed of 6 m/s. At what speed will move the other trolley?

  a) 1 m / s

  b) 2 m / s

  c) 3 m / s

  d) 6 m / s

This question had 16 good answers from 19 clickers.

The answers of the next question show that the knowledge acquired in primary school should be taught again at least for a large portion of the students. The students had to

learn the SI system units in primary school, but in spite of that only 7 persons from the total 14 answered correctly the following question:

- In which group are units of the SI system exclusively?

  a) kg, s, oC, m, V

  b) g, s, K, m, A

  c) kg, A, m, K, s

  d) g, s, cm, A, oC

Many other different questions have been used for this research activity, and the origin of the right and bad answers has also been studied.

6. Conclusion

One aim of the use of the Classroom Response Systems "Clickers" (CRS) was to promote active student engagement during a lecture, and promote discussion and collaboration among students.

Making anonym personal interviews with my students I could conclude that students who participated in these lectures enjoyed very much to "Turn To Your Neighbours" (Mazur, et all, 2013) and click to their devices, giving me a feedback with their answer.

Students felt it very useful, and got better motivated to do their tasks, to make calculations and to answer the questions using their devices.

They also liked very much the idea of bringing and using their m-learning devices at the lectures, and be involved in active learning instead of being passive listeners.

My opinion is that we should let students use their own devices at more lectures. We are confident that students' attitude to learning and doing in the last few years has been changed a lot. Students attend the lectures, seminars and workshops more enthusiastic if they are motivated, if they are attracted, or if they enjoy the differences that the new technology devices offer as compared to a book or a paper.

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