

Pre-Service Physics Teachers' Ideas about Teaching and Learning Using Smartphones

Ivana BOGDANOVIC
University of Novi Sad

Abstract: The teachers in primary and secondary education try to get students to put away their smartphones while in the classroom. It can happen that students use their smartphones to text each other, check social networks, and even listen to the music or watch videos, during instructional time. However, skilled teachers find a way to overcome the problem of these interruptions. They manage to make students use smartphones to support learning. The educators stay divided on the issue of whether students should use smartphones in the classrooms. Pre-service physics teachers at Faculty of Sciences of University of Novi Sad are asked about their opinion whether smartphones should be used in the classroom and their ideas for using smartphones in teaching and learning. Three ideas are presented in this paper: inquiry-based learning, project-based learning and playing Kahoot. Stated ideas indeed can be realized in classroom successfully with the use of smartphones. Different approaches to teaching and learning, including stated, impact students' performance in physics, as well as their motivation for learning. Moreover, the impact that technology has on today's schools is very significant. The adoption of technology in education can change both, how teachers teach and how students learn. Accordingly, it can be suggested to implement presented enthusiastic future physics teachers' ideas in school practice.

Keywords: Cell phones, Inquiry-based learning, Kahoot, Physics education, Project-based learning

Introduction

The teachers in primary and secondary education may have problem because students sometimes use their smartphones to text each other, check social networks, and even listen to the music or watch videos, during instructional time. Number of teachers are trying to get students to put away their smartphones while in the classroom in order not to be interrupted. Skilled teachers find a way to overcome the problem of these interruptions by getting students to use smartphones for learning. However, the educators stay divided on the issue of whether students should use smartphones in the classrooms.

Different approaches to teaching and learning impact students' performance in physics, as well as their motivation for learning (Sağlam, 2010; Zouhor, Bogdanović, Skuban & Pavkov-Hrvojević, 2017). Moreover, the impact that technology has on today's schools is very significant (Cvjetičanin, Pećanac, Sakač & Djurendić-Brenesel, 2013; Odadžić, Miljanović, Mandić, Pribičević & Županec, 2017). The adoption of technology in education can change both, how teachers teach and how students learn. New technologies include, not only smart boards, projectors and computers, but also cameras, smartphones... Different types of emerging technologies can be used in education separately, or they can be combined. Their use can facilitate and make more interesting delivering of physics contents, students' own investigations, evaluation...

Method

With the aim to determine pre-service physics teachers' opinion whether smartphones should be used in the classroom and to find out more about their ideas for using smartphones in teaching and learning, ten students (in different years) at Faculty of Sciences of University of Novi Sad are interviewed. Three ideas described by the students are presented in this paper. Each student was additionally asked to think of physics topic that can be

suitable for teaching and learning using proposed idea and to make photo (or screenshot) of using smartphone as described. The students had one week to do this.

Results and Discussion

Pre-Service Physics Teachers Opinion

Interviewed students seemed very determined when expressing their opinion on using smartphones in the classroom. Three different beliefs could be distinguished: (1) smartphones should be used often, (2) smartphones should be used rarely and (3) smartphones should be banned in schools (Figure 1).

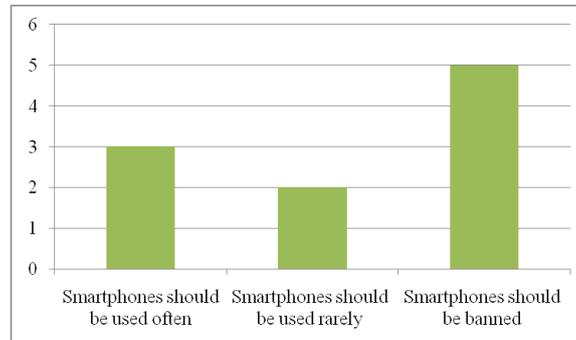


Figure 1. Frequencies of pre-service physics teachers' opinion on using smartphones in schools

Three students expressed very positive opinion about using smartphones in schools. In just few minutes they described, one idea each – how smartphones can facilitate teaching and learning. Their ideas will be described below. Two students said that smartphones should be used rarely with explanation that smartphones are not suitable in classroom because students will not use them as instructed. Half of interviewed students think that smartphones should be completely banned in schools. They think that smartphones can be just interruptions and that students will use them only to entertain themselves and ignore the teacher or in order to cheat on the tests.

Pre-Service Physics Teachers' Ideas

Each student proposed different idea of the use of smartphones in school: (1) inquiry-based learning, (2) project-based learning and (3) playing Kahoot. Although the first student did not use the term inquiry-based learning, his idea was described in detailed and it fit that approach, so it will be widen in accordance to literature review.

Inquiry-based Learning

The first student's idea was that: "The teacher should give instructions to students to prepare themselves during physics class to communicate about selected topic on the next physics class; and for that they can use all the information they can find on the internet by using their smartphones. If they need more time, they should finish their task for homework."

Inquiry-based learning implies involvement in learning that leads to understanding. Students should construct new knowledge on their own. In order to seek for new information or knowledge, students can carry out experiments, observations, research in literature and other. There are various levels of inquiry that can be carried on, described by Banchi and Bell (2008). *Confirmation inquiry* is the first level of inquiry. After topic is delivered by the teacher, that is for what is already known, students are following instructions and carrying out procedures to collect and record data in order to confirm and deepen understandings. *Structured Inquiry* is when the teacher provides the topic in a form of question and gives rough guidelines of the inquiry procedure; students should collect and analyze data in order to formulate their explanations. *Guided Inquiry* is when the teacher proposes the research question, but the students are responsible for designing and carrying out their own procedure to answer given question, and then report their findings. *Open/True Inquiry* is when students are carrying out their own investigation on the topic they have chosen and answer their own questions. Very important phase is reporting of results because students then can exchange their findings and get feedback.

It can be noticed that approach proposed by the student can be categorized as structured inquiry, where students are instructed to use material available on the internet. This student made screenshot of Google search for using smartphone (Figure 1). The student suggested this approach for topic Friction. Additionally, it should be noted that the student stated as a potential obstacle of this approach that: “Maybe students do not have good English knowledge and sites on Serbian are poor with quality physics contents”. The student emphasized that when exploring something on the internet, different sources should be considered, their validity should be questioned and students should use text, video material, presentations and other formats.

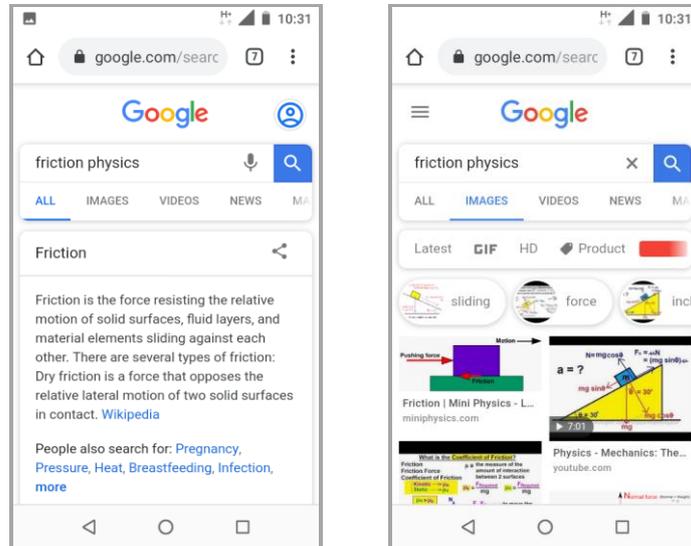


Figure 2. Google search proposed by student

Students at home actually often conduct true inquiry on the topic they are interested in, and for that purpose they use computers or smartphones to search relevant material on the internet; often it is not school content.

Project-based Learning

The second student’s idea about using smartphones for implementation of project-based learning was that: “Students can carry out project with the aim to make their own video material about given topic. It is not idea for one physics class but for longer period. I think that during this project realization, students should work in groups and talk and move around the classroom freely.” The student who described this idea instead of screenshot said: “Imagine smartphone with camera turned on”. The student did not select any topic since thinking that every topic is suitable. This student had experience because of personal involvement in very similar project in physics class.

Project-based learning is very useful in physics teaching since students learn by actively engaging in real-world projects (Holubova, 2008). The teacher sets the task for students who should work on the project, in a group of four to six students, for an extended period of time to respond to a complex question, challenge, or problem. The project-based learning results with students’ product and that makes students additionally satisfied with their engagement.

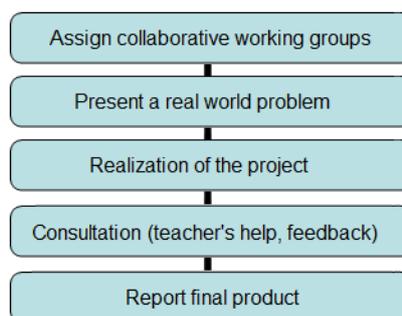


Figure 3. Project-based teaching strategy

In Figure 3. design of project-based teaching strategy is given. The idea of making video material about selected topic is very interesting; it makes possible to implement project-based teaching for any content.

Playing Kahoot

The third student's idea was playing Kahoot. This student had experience with this fun way of answering given questions. The student prepared a quiz (selected topic was History of physics) and other students played it, after what they all agreed that it is great idea.

Kahoot is "a game-based platform that makes learning inclusive, fun and engaging. Instead of looking down into their textbooks or devices, learners are encouraged to look up while playing and connect with each other – we call it a 'campfire moment'." It is free, and very simple to create and play. All instructions are available on the internet (<https://kahoot.com/company/>).



Figure 4. Screen capture of the quiz question (large screen and smartphone)

In order to become a participant in quiz, a student should open the link (<https://kahoot.it>) on his/her smartphone or use mobile app, enter the PIN seen on the large screen (smart board or projector can be used) and enter his/her nickname. While playing Kahoot, questions, answer options and related images/videos are displayed on the large screen and smartphones are used for answering (by tapping the box matching the answer one considers correct) (Figure 4). The answer must be given before time runs out. Playing Kahoot is fun way of answering questions, students can compete individually or in groups (correct answers award quiz points) and they get feedback instantly.

Conclusion

Students highly use new technologies in everyday life. However, five out of ten pre-service physics teachers think that smartphones should be completely banned in schools and only three had their own ideas how smartphones could be used. It is probably in correlation with their experience of using smartphones in classroom and it is in accordance with the fact that "old school teachers" still prevail. In schools smartphones can be both, interruption and aid, depending on the teacher's approach. Accordingly, it can be suggested to implement presented enthusiastic future physics teachers' ideas in school practice. Stated ideas indeed can be realized in classroom successfully with the use of smartphones.

Acknowledgements

This research was supported by Grant No. 179010 (The Quality of Education System in Serbia from European Perspective) financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

References

- Banchi, H., & Bell R. (2008). The many levels of inquiry. *Science and Children*, 46 (2), 26-29.
- Cvjetičanin, S., Pećanac, R., Sakač, M., & Djurendić-Brenesel, M. (2013). Computer application in the initial education of children in natural sciences. *Croatian Journal of Education*, 15 (1), 87-108.
- Holubova, R. (2008). Effective teaching methods – project-based learning in physics. *US-China Education Review*, 12, 27–35.
- <https://kahoot.com/company/>
- Odadžić, V., Miljanović, T., Mandić, D., Pribičević, T., Županec, V. (2017). Effectiveness of the use of educational software in teaching biology. *Croatian Journal of Education*, 19 (1), 11-43.
- Sağlam, M. (2010). Students' performance awareness, motivational orientations and learning strategies in a problem-based electromagnetism course. *Asia-Pacific Forum on Science Learning and Teaching*, 11 (1), Article 16, 1-18
- Zouhor, A. M. Z., Bogdanović, I., Skuban, S., & Pavkov-Hrvojević, M. (2017). The effect of the modified Know-Want-Learn strategy on sixth-grade students' achievement in physics. *Journal of Baltic Science Education*, 16 (6), 946-957.

Author Information

Ivana Bogdanovic

University of Novi Sad, Faculty of Sciences
Trg Dositeja Obradovića 4, Novi Sad 21000, Serbia
Contact E-mail: ivana.bogdanovic@df.uns.ac.rs
