

УДК 372.851

ОТНОШЕНИЕ УЧАЩИХСЯ СРЕДНЕЙ ШКОЛЫ К ИСПОЛЬЗОВАНИЮ ПЛАНШЕТОВ НА УРОКЕ МАТЕМАТИКИ.

Толкунова Ю.И.

Карлов Университ, Прага, Чехия (121 16, Прага, К Карлову 3, Физико-Математический Факультет), e-mail: katapulta.yul@gmail.com

В представленной статье описаны результаты исследования мнения учащихся о использовании планшетов на уроках математики. Также показано, как данное мнение изменилось после одногодичного внедрения данной технологии в обучение. Исследование проводилось в течение одного учебного года в десяти классах (более 260 учеников) с двумя разными учителями в двух разных школах в США. В исследовании были использованы качественные методы. В статье представлены результаты входных и выходных анкет, наблюдений и интервью, которые проводились для того, чтобы выяснить отношение учащихся к использованию данной методики в обучении математике. Из этой статьи вы можете узнать, нравится ли учащимся использование планшетов на уроках математики или нет, и какие аспекты могут повлиять на их отношение. В статье рассматриваются положительные и отрицательные стороны, которые ученики видят при использовании планшетов в классе, а также выделяются некоторые важные моменты для внедрения технологии в школах. Результаты показывают, что обучаемые весьма вдохновлены и мотивированы в начале года при появлении планшетов, однако эта мотивация снижается в течение года. Мое исследование показало, что для большей части учащихся технические проблемы преобладают над другими преимуществами планшетов, и после продолжительных технических проблем большинство учеников испытывают негативное отношение к использованию планшетов в классе.

Ключевые слова: планшеты, математика, учащиеся, школа.

MIDDLE SCHOOL STUDENTS' ATTITUDE TOWARD USING TABLETS IN MATHEMATICS CLASS.

Tolkunova Y.I.

Charles University, Prague, Czech Republic (121 16, Prague, Ke Karlovu 3, Faculty of Mathematics and Physics), e-mail: katapulta.yul@gmail.com

Presented article deals with students' opinion on involving tablets in mathematics lessons and shows how the opinion on using tablets is changing after a one-year implementation. The study held over one school year and explored ten classes (over 260 students) with two different teachers in two different charter schools in USA. The study employed qualitative methods. The article highlights findings from input and output questionnaires, observations and interviews, which took place in order to find out about using tablets in mathematics lessons. From the article you can learn whether students like or dislike using tablets in mathematics classes and what aspects can influence their attitude. The paper studies positives and negatives in using of tablets in class and also highlight some important points for implementation of the technology in schools. Findings indicate that students are very excited and motivated at the beginning of the year, however this motivation decrease through the year. My research showed that for great part of students, technical problems prevail over other advantages of tablets and after continuing technical issues most of the students have negative feelings about using tablets in class.

Key words: tablets, mathematics, attitude, students, school.

Nowadays, the use of technology in everyday life is very important and rapidly developing. In my research I focused specifically on the use of tablets. In 2014, around 840 million of people around the world used a tablet at least once a month (about 12% of the world population). By 2020 this number is expected to increase to 1.46 billion [1]. According to other forecasts, the number of tablets in the US is expected to reach 185 million in 2020. This increase means that more than half of the US population will be using tablets in 2020 [2].

Another research [3] shows data especially for tweens (8 to 12 years old). A total of 80% of tweens in US have a tablet at home and 53% of tweens have their own tablets. Moreover, 29% of tweens stated that they use a tablet every day¹. Americans tweens use tablet devices for various activities: playing games, watching videos, listening to music, accessing the internet and reading. In average, tweens spend 2 hours 34 minutes per day using a tablet.

With the increasing use of tablets in society, this technology also gets into schools and education. Tablet can be a great tool for teachers and it can fulfill different functions. Tablets can be helpful for teachers during explanation in class, preparing online materials, and consulting students. Working with electronic documents and the ability to write notes in electronic format improves the effectiveness of students' communication with a teacher. Researchers often highlight the benefit for remote students, however tablets can generally be an advantage for all students. They can come back to materials at anytime and anywhere, tablets are very compact and easy transferable. Students can find information from a variety of sources on a tablet, use math-friendly applications, draw graphs, diagrams and formulas, record and listen to audio and video, make notes and write solutions. A tablet can be always wirelessly connected to a projector, so the teacher can move around the class with the tablet in hands and control it from anywhere. Students' tablets can also be connected to a projector to demonstrate their solution. In addition, using tablets can support students with vision and hearing difficulties by easily adjusting the size of text, color, contrast and sound. However, researches show that audio notes have so far only been used by a small number of schools [4].

The use of this technology in schools has been a part of interests of educators and scientists all over the world, so nowadays we have a lot of projects and literature on this topic. Researches were carried out in all levels of education (at elementary, secondary and higher education institutions). For example, one research in Australia came to the fact that tablets help cooperation and active learning.

¹ In comparison, for teens (13-18 years old) this number is 37%. Thus, tablets are more popular among tweens (teens prefer using smartphones).

Tablets received positive feedback from students at university level [5]. From another reported results from Europe tablets have a positive impact on the effectiveness of teaching and increase students' motivation in high school level [6]. Generally, nowadays using tablets in education is a very common question and in many countries implementation of tablets in schools is the state level question.

In my study I concentrated on students' attitude toward using tablets in mathematics class. The study employed qualitative methods to investigate students in ten classrooms, taught by two different teachers in two different U.S charter schools in Arizona, where a digital mathematics textbook of a commercial Algebra I application for tablets was used. Daily observations, a series of questionnaires and interviews depict students' attitudes toward using of the digital mathematics textbooks throughout a school year.

Over 260 students of the 7th grade (mostly 11-12 years old) participated in the study last school year. Participants obtained input (at the beginning of the school year) and output (at the end of the school year) questionnaires. Here I would like to highlight findings from these questionnaires.

Input Questionnaire: In input questionnaire there were additional introductory questions about experience with using tablets at school and at home. It was found that only 8 students out of 260 already had experience of using tablets in school, for other students it was the first time. Students were also asked how often they use tablets at home (for games, the internet, and other personal purposes). A total of 11.2% of the students said they never use a tablet at home, 20.1% answered that they use a tablet seldom, 21.3% - usually, 27.3% - often, and 20.1% of students stated that they use a tablet all the time (see Figure 1).

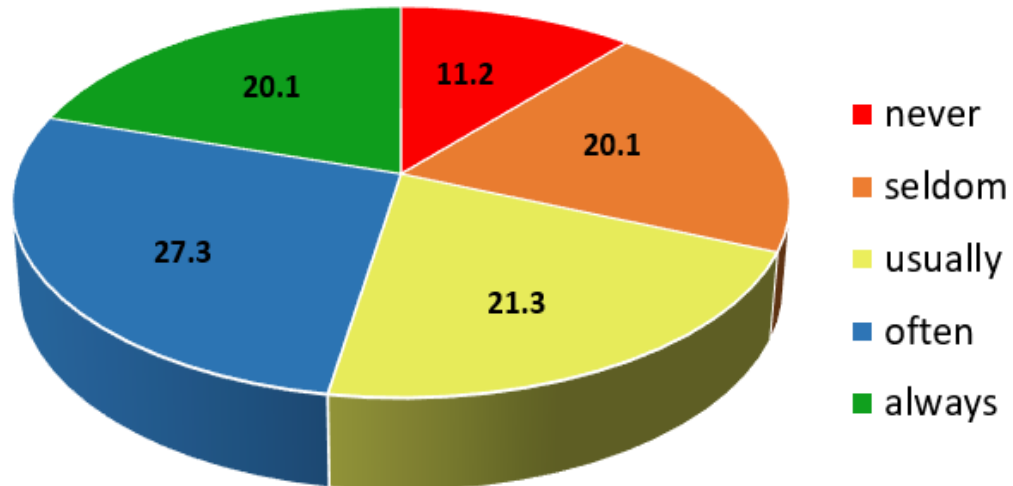


Figure 1. Input questionnaire: students' frequency of use of tablets at home (for any purposes).

Students' general attitude toward using tablets in mathematics class at the beginning of the school year was mostly positive and they were very excited about the technology. A total of 61.5% of students perceived the tablet as a positive innovation in class, 33.1% were neutral about tablets and only 5.4% of students were negative (see Figure 2). Interestingly, students who perceived tablets as negative were only students who stated that they never or rarely use tablets at home. Thus, these students did not want to use this technology at all, neither for study or entertainment.

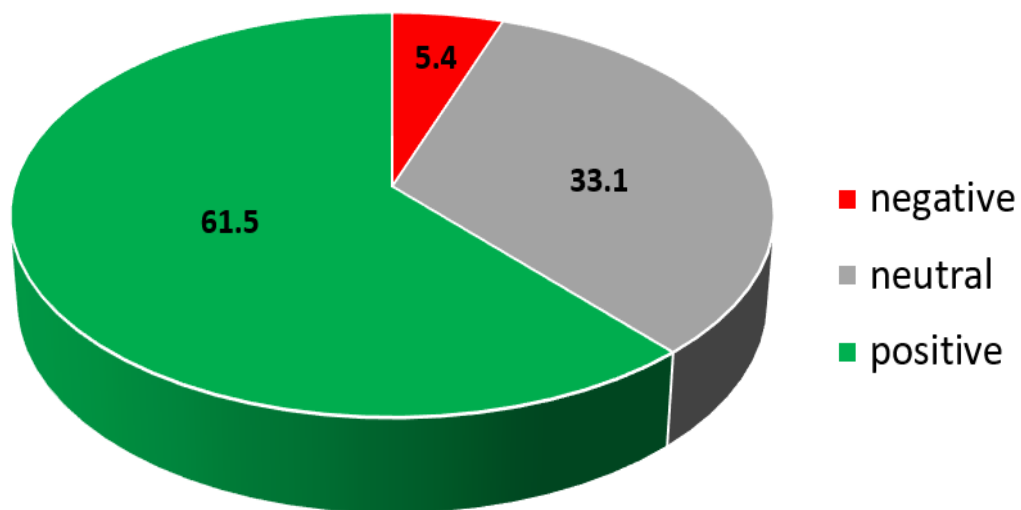


Figure 2. Input questionnaire: students' attitude towards tablets use at the beginning of the school year.

Moreover, students were asked what they like or do not like about using tablets and why. Among positives of using of tablets students often mentioned characteristics related to a comfortable and simple use (compact, easy navigation). Technological features were mentioned less often, however, some of them were noticed by students. For example, students liked glossary feature, that allows to click at any mathematical term and the definition immediately appeared. Also, they mentioned comprehension technology, that is an implemented feature in the math application they used. It allows students to send feedback of their understanding to the teacher.

Among negatives students very often mentioned responsibility – they had a fear of breaking or losing the tablet and it is an expensive tool. Interestingly, two girls wrote responsibility as a positive of tablets (they said they were learning to be more responsible thanks to tablets). Students also mentioned that tablets can be a distraction in class. 20% of students said they did not like a security system that forbid downloading apps, using a browser, camera, and changing tablet settings, which was a precautionary measure to prevent tablets misuse. We wanted students to concentrate on mathematics and use tablets for learning purposes only. Girls often specifically said they mind that they cannot change the screen background. Boys mentioned background of the screen only two times. Charging was among negatives as well. Especially at the end of the year a lot of students mentioned that they did not like that they need to charge the tablet every day. Table 1 below represents the most often mentioned positives and negatives of using tablets.

Positives	Negatives
<ul style="list-style-type: none"> • Light, compact • Easy to use/navigate • No need to flip papers • Glossary, voting technology • Interactive • Save paper • General excitement (“Good idea”, “Fun”, “Cool”, “Nice”, “Love it”) 	<ul style="list-style-type: none"> • Fear of breaking it • Expensive • Charging • Distracting • Not being able to customize, download apps • Technical problems (slow loading, glitches) • Bright (annoying screen)

Table 1. Positive and negative aspects of using of tablets in the class (students’ perspective).

In general, responses showed that most students had a positive attitude toward using tablets in class. A lot of them reported emotive positive messages such as "Fun," "Nice," "Exciting," "Perfect Idea," "Great," "I Love It," etc. In addition, many students wrote "Nothing" in negatives, thus they saw only positives in using tablets in class at the beginning of the school year. Some students also mentioned that they would like to be able to do notes on tablets and also use tablets for other classes.

Output Questionnaire: At the end of the school year students' attitude toward tablets in mathematics class changed. In School 1 positive attitude slightly decreased from 61.5% to 57.9% and negative attitude increased from 5.4% to 6.3% (see Figure 3 and Figure 2). In School 2 the attitude changed a lot. Positive attitude decreased to 25.9% (on 35.6%) and negative attitude increased to 27.7% (on 22.3%). The main reason for this negative changing was big amount of technical problems in School 2 during the first 2-3 months.

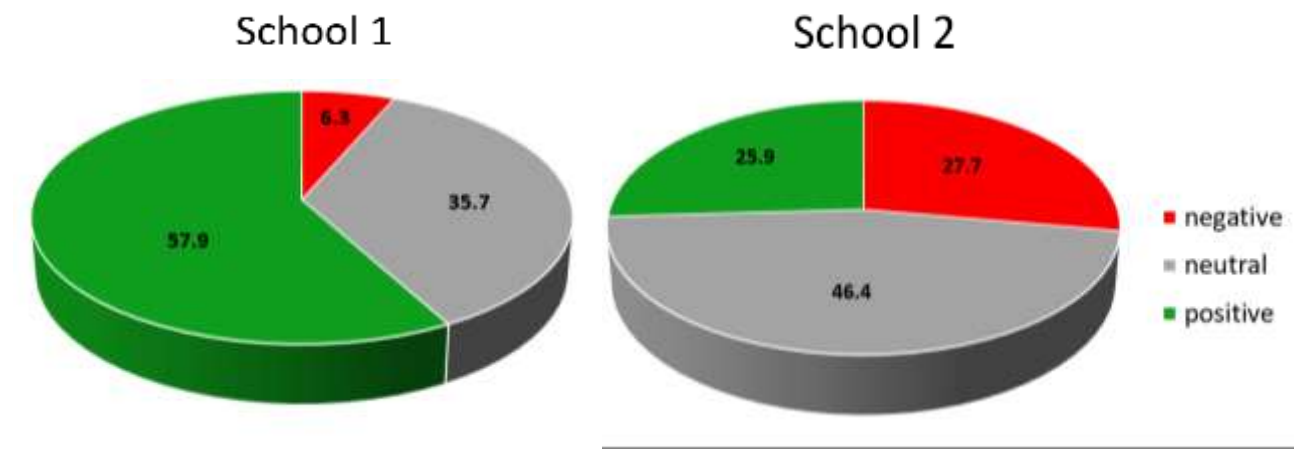


Figure 3. Output questionnaire: students' attitude towards tablets use at the end of the school year.

Thus, the conclusion that can be made from the data is that technical problems influenced students' attitude toward the technology a lot. Technical issues prevailed over other advantages of tablets and after continuing technical problems a lot of students had negative feelings about using tablets in class.

On Figure 4 below you can see other interesting results from the end of the year. Students in both schools were asked if they would like to continue use tablets or would rather use a paper textbook in their math class. A total of 88.1% of students in School 1 stated that they would like to continue use tablets in their mathematics class. In School 2 with technical problem only 52.3% of students stated

that they would like to continue use tablets. The other half of students stated that they would rather use a printed textbook.

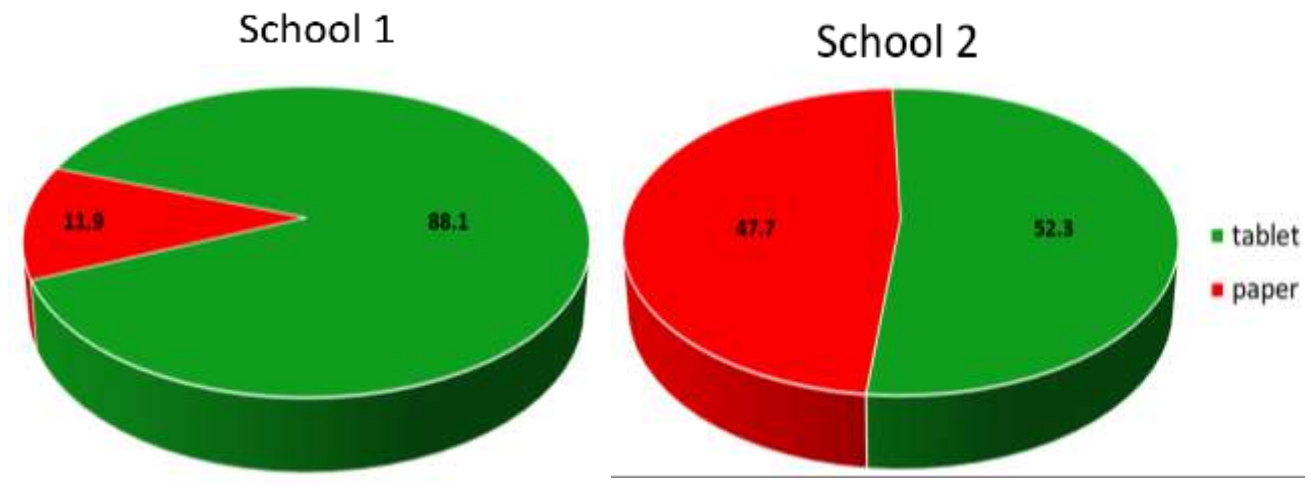


Figure 4. Output questionnaire: continue use tablets vs. paper textbooks.

In addition, students were asked about the level of tiredness after lessons with tablets in comparison with lessons without tablets. A total of 26.6% of students stated that they feel less tired after lessons with tablets, 58.8% stated that tablets do not influence their level of tiredness and 14.6% students stated that they are more tired after lessons with tablets (see Figure 5).

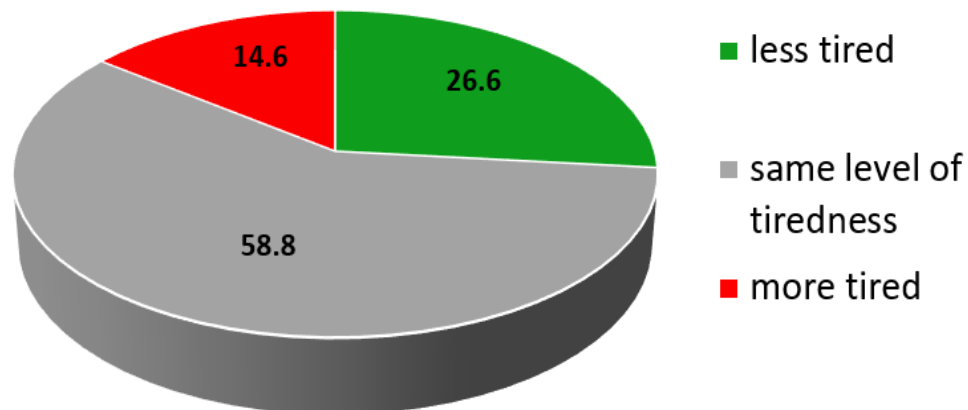


Figure 5. Output questionnaire: students' level of tiredness after lessons with tablets (in comparison with lessons without tablets).

Conclusion and future of the study: Implementation of tablets in a school is a very hard task, that requires great efforts from the teacher. Support from the school is extremely important (IT support, reliable wireless connection, introduction to students and parents, communication with parents, training on using tablets) especially at the beginning of the school year.

For sure, it takes time to figure out how to use tablets so that it is really a benefit for learning and teaching. However, when tablets are implemented in an appropriate way, they are perceived by children very positively and increase students' motivation and their interest in the subject. Also, as soon as teachers are more comfortable with this technology in their classes, they can discover in how many ways tablets can be helpful and in what parts of a lesson it can be especially useful.

My research is a part of future dissertation thesis and it is continuing this academic year. 15 new classes and 5 teachers are participating in the study this year. I am part-time teaching with tablets by myself. This year I want to concentrate more on teachers' attitude toward using tablets in mathematics classes. I hope that I will come to new interesting results after this year.

Acknowledgements:

The work was supported by the grant SVV 2017 No. 260454

References:

1. The Statistics Portal [Electronic resource] <https://www.statista.com/statistics/377977/tablet-users-worldwide-forecast/>
2. eMarketer forecast [Electronic resource] <https://www.emarketer.com/Article/Tablet-Users-Surpass-1-Billion-Worldwide-2015/1011806>
3. Rideout, V.J. (2015). *The Common Sense Census: Media Use by Tweens and Teens*. Common Sense Media Incorporated.
4. Weitz R., Wachsmuth, B., Mirliss, D. (2006). The Tablet PC for faculty: A pilot project. *Educational technology and society*, 9(2), 68-83.
5. Loch, B., Galligan, L., Hobohm, C., & McDonald, C. (2011). Learner-centered mathematics and statistics education using netbook tablet PCs. *International Journal of Mathematical Education in Science and Technology*, 42(7), 939-949.
6. Klubal, L. (2016). *Vliv použití mobilního dotykového zařízení při procvičování učiva*. Proceedings of the ICTE Conference 2016, University of Ostrava.
7. Thomas, A. (2013). *A study of Algebra I students' use of digital and print textbooks* (Dissertation), University of Missouri-Columbia.