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Original scientific paper

THE IMPACT OF THE USE OF CLICKER TOOLS IN ACADEMIC CLASSROOM ENVIRONMENTS

Valentina Nejković, Dragana Andrejević

University of Niš, Faculty of Electronic Engineering, Niš, Serbia

Abstract. *Digital technologies have become a part of our everyday life, which has caused certain changes in the education system, which follow the achievements of modern technologies. Changing the way of presenting teaching content in relation to traditional teaching methods and adapting them to new generations is one of the important tasks of teachers. Also, the task of the teacher is to use in a creative way all the advantages that modern digital technologies bring in order to engage students and improve the learning process. Keeping students' attention during class and engaging students is one of the biggest challenges for teachers today. Finding the right way to motivate students is a topic that has been very topical in recent years. E-learning applications, better known as clicker applications, help teachers motivate, maintain attention and engage students more in the classroom. An important and immediate benefit of using clickers is that it motivates all students to participate. The anonymity of the answers also encourages students to present their ideas without fear of what their peers might think, which further encourages their participation. This paper presents the research conducted at the Faculty of Electronics, University of Niš, Serbia, on the impact of the use of clicker tools in teaching on student performance on the exam, showing a moderate correlation. Greater activity in classes affects the better success of students in the exam.*

Key words: *Clicker, E-learning, Web application, Motivation*

1. INTRODUCTION

Accelerated advances in technology and technological innovation have led to the development of distance learning via the Internet. In addition to traditional forms of teaching, many schools and universities are increasingly using different models of e-learning to improve the teaching process. This type of teaching is based on the use of modern computer and communication technology. Communication, as well as the exchange of different learning materials, between the participants in the educational process takes place via the Internet, using different platforms.

Technological solutions for expanding student participation in lectures are called "Student response system". Other terms such as "Voting Tools" or more simply "Clickers" can be found in the literature. Clickers are cloud-based tools. Some of them focus on providing

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Corresponding author: Valentina Nejković, University of Niš, Faculty of Electronic Engineering, Aleksandra Medvedeva 14, 18106 Niš, Serbia
E-mail: valentina.nejkovic@elfak.ni.ac.rs

interfaces for answering questions (from multiple choice to open text), while others provide opportunities to ask students questions, vote, assess, discuss and integrate with various documents such as presentations, tables, multimedia content and other.

By using clickers, students can ask questions as well as answer them, and the lecturer can use management options to focus attention on various important topics during the lecture. There are a large number of such tools, each with its advantages, disadvantages and specifics.

The first software for tests and quizzes depended on the use of clickers, a physical voting device given to students at the beginning of a lecture. Today, students and teachers use mobile phones and appropriate software applications that offer a higher level of engagement (Hedgcock & Rouwenhorst, 2014). Encouraging commitment and providing opportunities for reflection (D. Bojinova & N. Oigara, 2011), promotion of active elements and student-centered elements in didactic practice (Caldwell, 2007) are some of the advantages of this way of working and using clicker applications (Compton & Allen, 2018).

The use of clickers has great benefits for students and teachers. When a large group of students asks a question in real time, the teacher can get answers from a large number of students and currently provide them with feedback. This advanced educational technology facilitates teaching and enables active learning with improved learning outcomes (Berry, 2009). Heaslip, Donovan and Cullen (Heaslip et al., 2014) found that students become more participatory, interactive, and engaged in the use of clickers due to anonymity and ease of use. Liu, Sands and Audran (Liu et al., 2019) in their paper state that students who used clickers showed a higher level of motivation, self-efficacy, participation and engagement. Wang, Ran, Huang and Swigart (Wang, W., Ran, S., Huang, L., & Swigart, 2019) have further introduced elements based on clicker games and found that this has a very positive effect on students during the teaching process.

Nowadays, technology is one of the main sources of learning. Because it plays such a significant role in the process of acquiring knowledge, it is important to use technology in all aspects of education. One of the important pedagogies of learning in recent years is constructivism (Kakoulli Constantinou & Papadima-Sophocleous, 2020). Constructivist pedagogy sees students as active subjects who acquire knowledge through conscious processing of information and personal interpretation of what they have learned. This theory of learning shifts the learning paradigm from teacher-centered to student-centered, allowing the student to construct knowledge through active exploration, experimentation, collaboration, and the use of their existing knowledge (Andrejević & Nejković, 2022).

Active learning, with the teacher creating an interactive learning environment, encourages student engagement. Clickers are a useful technology to improve active learning by engaging in lectures and providing feedback even in very large groups of students (Wong & Yau, 2020).

Active learning is often described as a method of teaching that mentally involves students in the learning process. It can take many different forms, but often involves students in activities focused on discussion, problem solving or reflection, which is a great advantage over passive listening to lectures. During active learning, students do content-related activities instead of passively listening to lectures. Although many effective active learning strategies do not depend on the use of clickers, there are several ways in which clickers can be used to promote an effective active learning environment, especially in large groups of students.

Teachers who are not skilled in the use of information technology can have a problem with the use of clickers, so claims can often be heard among them that the primary role of

clickers is to maintain attention during lectures. Certainly, one of the challenges in lectures is to keep students mentally focused on the subject. During a 45-50 minute lecture, 'wandering minds' cycles are common. This data suggests that the use of clickers could be multiple times during the lecture, especially if the lecture lasts longer, in order to reduce episodes of inattention.

This paper presents some of the most popular clicker tools, their functionalities and characteristics, based on which the criteria for classification were identified, as well as a comparative analysis of different clicker tools according to the defined criteria. The results of the research conducted at the Electronic Faculty of the University of Niš, Serbia, on the impact of the use of clicker tools in teaching on student performance on the exam are presented.

2. Question Design for Clicker Applications

In order to mentally engage students, it is essential that clicker questions encourage students to think. One of the bigger challenges for teachers is creating "good" clicker questions. Some textbook publishers include clicker questions in the materials they prepare for teachers, but very often the type of question needs to be adapted to a specific topic in a specific context. The time it takes teachers to compose clicker questions can be an aggravating circumstance and can deter teachers from using these tools in their teaching.

Beatti (I. D. Beatty et al., 2006) in his work presents a framework for the development of clicker questions that includes an explicit, threefold pedagogical goal that goes beyond just learning the content. The framework consists of three separate objectives, the first of which relates to the content of the question, the second to the process and the third to metacognitive reflection, and emphasizes the use of questions as a practice in developing skills for improved lecture delivery. Multiple choice questions that include incorrect solutions can be a good way to assess a student, but also serve as feedback on whether a student has mastered a particular topic. The aim of this framework is to encourage cognitive skills such as those found at higher levels of Bloom's taxonomy - interpretation, ranking, identification, etc. (Heer, 2018). The metacognitive goal considers the perspective of the ability to understand and reason, rather than memorizing facts and memorizing formulas. While not every clicker question may cover all three of the objectives defined here, this framework can be a useful guide for writing questions as well as for assessing and modifying the existing questions.

Reay (Reay et al., 2005) describes a slightly different approach. He advocates the idea that questions should be asked in such a way as to try to lead students to a deeper understanding. His approach is based on the idea that learning depends on the context, and students who have learned something in one context may not be able to properly apply the same knowledge in another context. According to this approach, the first question in the series should be simple and concrete. The second question in the series is designed to be more difficult, and the choice of answers includes incorrect answers. The third issue is an explicit attempt to challenge students to apply knowledge in a new context, which includes different characteristics from previous issues. In this way, a set of questions promotes the transfer of knowledge and at the same time assesses the level at which students have acquired knowledge (Koenig, 2020).

3. CHOOSING THE BEST CLICK-BASED TECHNOLOGY

Over the past decade, the use of clickers has become more widespread, and teachers are no longer thinking about whether to use clickers or not, but about which clicker applications are best to use in teaching. There are many different clicker apps available right now, and choosing the right one among them can be very difficult. Although this can be a stressful decision, the teacher is guided by the fact that the application can be used effectively with larger and smaller groups of students, that the time needed to prepare questions and manage the system is as short as possible and that there is flexibility in using the application.

Some features to consider when choosing among clicker-based technologies include:

- Type of survey device, such as standalone clicker, smartphone, tablet or laptop;
- Presentation method for clicker questions, such as Microsoft PowerPoint or a network-based platform;
- Allowed types of questions, such as e.g. multiple choice, free answer, hand drawings (i.e. waveforms), mathematical expressions, etc.;
- Integration with a learning management system or interactive whiteboard, which can make it easier to award points or track attendance;
- Availability of analytics, which can help with formative and summative assessment.

3.1. Advices for effective use of clickers to improve learning

In addition to choosing the best technology for the use of clickers, another important issue is the proper use of these e-learning applications in order to achieve maximum work efficiency. This paper presents some important tips for the efficient use of clicker applications (Premkumar & Coupal, 2008).

- **Pedagogy should be the focus, not technology**

Clickers are used effectively in teaching to increase student participation in the teaching process. The literature indicates that when students are actively involved in the content of the subject, critical thinking skills are improved and there is increased motivation, attention span and transfer of new information (Middendorf & Kalish, 1996). Knowing that students' attention span decreases after first 15-20 minutes of the lecture, the teacher can plan to use a clicker every 20 minutes to start a discussion or ask a question. It is important that clickers should be used based on the teaching topic. The use of clickers should not distract from learning. The question must be clear and should benefit the student, not just the teacher. The teacher should ensure that the main focus is on learning (Premkumar & Coupal, 2008).

- **Willingness to use clicker tools in teaching**

Using student response system tools as an active learning strategy requires prior planning and the time it takes a teacher to work with a particular tool. Also, it takes some time to create questions and record students. Potential problems that a teacher may face are: problems with the Internet connection, software bug, computer or mobile device failure. If such a scenario occurs, it may be necessary to change the planned course of the lesson, which the teacher must be prepared for. Teachers who do not have much experience in the use of information technology, mastering the use of software can be one of the problems, but it should not be allowed to discourage teachers and deter them from using clickers in teaching.

- **Analysis of student responses**

The teacher should decide on how to analyze and use the collected raw data to improve the teaching and learning process. The teacher can compare data, e.g. one class with another. The data can also be used for research purposes, e.g. what answers were given by students who had not had any prior knowledge of the given topic compared to other students, whether there is a difference based on gender, age, or the like. The teacher can do different analyses with the obtained data, but that requires additional time and engagement.

3.2. Using the clicker tools for learning English

The use of technologies in the classroom is not less effective than the traditional way of learning in the classroom (Shadiev & Yang, 2020). In their study, Golonka and colleagues (Golonka et al., 2014) reveal that there is a lack of evidence on the effectiveness of the use of technology in foreign language teaching in peer-reviewed articles. Studies focus on learning pronunciation, with the help of technology and in those situations technology has a positive impact. Shadiev (Shadiev et al., 2017) in his study, based on a review of professional literature in the field of technology use in English language teaching, reveals that technology increases the performance of language learning in terms of interaction, feedback and motivation.

Ghanizadeh (Ghanizadeh et al., 2015) explains that technology can support the development of all language skills (e.g. listening, writing, reading, speaking, grammar and vocabulary). In their paper, Chan (H. Chen et al., 2015) defines the active learning technique Think-Pair-Share (TPS). Think-pair-share is a technique used to promote active learning and help deepen understanding of the subject. Research conducted among Japanese students on the use of clicker tools for English language learning shows that the use of clicker tools has a positive effect on learning, achievement, satisfaction and peer cooperation. Based on the results of this research, it can be concluded that the use of technology in the techniques of active English language learning can be very successfully applied.

Baran-Lucarz and colleagues (Baran-Łucarz et al., 2015) in their study during student observation, had students in the group that used clicker tools show more interest and desire to participate in various tasks. Also, they showed more interest in practicing pronunciation. Students in the group that did not use clicker tools in language teaching, on the other hand, were less enthusiastic, showing less interest, especially towards the end of the lesson. Students who gave incorrect answers felt uncomfortable, which was not the case for students who used clickers.

4. Advantages and Disadvantages of Using Clicker Tools

Teachers who use clicker tools in a wide range of different disciplines, including science, technology, engineering and mathematics (STEM) (Aljaloud et al., 2015) they received a lot of positive feedback from students regarding the use of clickers in classrooms (MacGeorge et al., 2008). Beatti's 2004 study (*Transforming student learning with classroom communication systems'*, 2004), which was the first study on the use of clickers in a class with a large number of students, found that the use of clickers greatly affects the engagement of students during lectures. Habel and Stubbs (Habel & Stubbs, 2014) found similar encouraging results in a class with a large number of students (460 students), as many as 84% of students used the clicker application and said that such lectures are much more interesting than traditional ones. Meanwhile, the positive results noted by researchers are mostly a reliable reflection of the usefulness of clickers in university environments, i.e.

classrooms with a large number of students. Some of the most significant benefits of using clickers are: interactivity, successful learning and greater student engagement.

Interactivity - Interaction between peers and teachers has a positive effect on active collaborative learning in addition to improving student engagement. Active collaborative learning allows students to think critically about a teaching topic. In addition to being a more active student, the teacher can focus on a topic that is less clear to the students or from which they have not achieved learning outcomes and, if necessary, redesign the questions. Interactivity does not only involve student participation, but also provide feedback on learning. In general, the use of clickers can improve the process of receiving feedback from teachers during classes. Chen and Lan (T. L. Chen & Lan, 2013) in their study, confirmed that students who use clickers believe that they have received appropriate and timely feedback from their teachers, which resulted in a deeper understanding of the teaching topic. Clicker tools have many advantages and some of them are: successful learning and greater engagement of students; while the disadvantages are the time needed to train teachers and prepare content, inefficiency and use of devices for other purposes in class, not for learning purposes.

Successful learning - When students assess their own performance and identify areas for knowledge improvement, they take steps to improve their learning outcomes. All students have the opportunity to give an answer, which can be very important for shy students. The use of clickers always results in a higher level of concentration during class, students are more focused on tasks, and knowledge acquired in this way can be remembered longer.

Greater student engagement - The use of clickers can make teaching more interesting. When students use these technologies, they are not bored during class because they are constantly involved in the teaching process. Titman and Lancaster (Titman & Lancaster, 2011) emphasize the importance of fun in determining performance: the results of their study show that the use of clickers stimulated students and aroused their interest in learning. Student attendance also tended to increase in classes using clicker applications as the use of clickers contributes to creating an active, positive and enjoyable classroom (Dunn et al., 2013). The use of clickers increases levels of student engagement, interactivity, and classroom performance.

Time required for teacher training and content preparation - Using clicker applications requires additional time that the teacher must invest in order to master the use of software and it takes some time to create tests before each lesson.

Inefficiency - Another critical pedagogical issue facing clicker applications is the fact that students' answers may not accurately reflect students' level of understanding, as some students may vote for a specific answer even when they do not fully understand it. In other words, these tools provide the possibility of blind guessing, so the student can sometimes answer correctly without mastering the material.

Use of devices for other purposes in class, not for learning purposes - The use of mobile devices for clicker applications can be "abused" by students, so instead of answering questions, they can use a mobile device to play games, send messages or surf the Internet. According to research (Stowell, 2015), 58% of students who use clicker applications on a smartphone have used their mobile device for purposes not intended for the classroom.

5. CRITERIA FOR FUNCTIONING OF CLICKER TOOLS

In order to successfully choose a clicker application for teaching, it is necessary to define criteria and evaluate tools according to the given criteria. One way to do that is a comparative study between different clicker tools and exploration of the pros and cons. Clicker software

has many features and capabilities. For simplicity reasons, we can divide these functions and possibilities into the following groups: *graphically characteristics and integration*, *creation and presentation of questions* and *answers and technical characteristics*. Each group can be divided into subgroups. Table 1 provides an overview of the criteria.

Table 1 Criteria for functioning of clicker tools

Graphically characteristics and integration	Creating and presentation questions and answers	Technical characteristics
Graphic interface ▪ intuitive graphically interface ▪ interface adjusted different devices ▪ unlimited number of participants surveys / quizzes ▪ visualization results surveys / quizzes	Questions ▪ restriction length questions ▪ options multiple of choice ▪ questions open type ▪ questions closed type	The way of use applications ▪ internet connection required ▪ synchronous communication ▪ asynchronous communication ▪ required projector / interactive board
Integration with others tools ▪ possibility insertion presentation ▪ possibility insertion multimedia content ▪ connecting with lms ▪ division surveys / quizzes across social network	Answers ▪ restriction length answers ▪ a game teams ▪ restriction for giving answers ▪ restriction quiz / survey	Price / licensing ▪ optional appendices ▪ costs ▪ licensed software
	Analysis of results ▪ export results ▪ comparative analysis results ▪ visibility results on the screen teacher ▪ forwarding the result electronic by mail	

The **graphically interface** should be intuitive, simple and easy to use. Teachers, especially those who do not have much knowledge in the field of information technology, will prefer an application whose use is intuitive and does not require much time to learn. The interface should be adapted to different devices and screen dimensions of mobile devices. If the results of the survey can be nicely visually presented, it will be easier for the teacher to analyze them and get the necessary data on the knowledge and progress of students. Some clicker tools have the option of integration with e.g. PowerPoint presentations, which can make it easier for the teacher to insert a quiz into an already prepared presentation, which can additionally engage students in class. Some clicker tools have the option of integration with different documents (images, pdf documents, yotube videos, etc.), which can affect greater student engagement and maintenance of attention during class. Clicker tools can be able to connect to distance learning systems and can be an effective add-on for knowledge testing and assessment, especially in the online teaching process.

Creating and presenting questions and answers - Some clicker tools have limitations when creating questions on a certain number of characters, which can be an

aggravating circumstance for the teacher when creating a test. Some of the most commonly used types of questions are: multiple choice options - the type of question that offers the possibility of more than one correct, open-ended questions - the type of question where the student can write the answer, closed-ended questions - the type of question where the answers are given. Some clicker tools have limitations on the length of answers to a certain number of characters, which can be an aggravating circumstance for students when answering open-ended questions. The time limit for giving answers may be time limited by the teacher. A large number of clicker applications have the ability to export results to, e.g. excel table, so that the results can be further analyzed. Some clickers provide the possibility of comparative analysis of the results and their visibility on the teacher's screen, as well as the transmission of results by e-mail.

Technical characteristics include how to use the application and price / licensing. Table 2 gives a comparative overview of different clicker learning systems according to previously defined criteria. Any software has its own characteristics and based on the

Table 2 Comparative overview of different clicker tools according to defined criteria

Platform	Mentimeter	Socrative	Kahoot	Quizizz	Naiku
Intuitive graphically interface	Y	Y	Y	Y	Y
Interface adjusted different devices	Y	Y	Y	Y	Y
Unlimited number participants surveys/quizzes	Y	Y	Y	Y	Y
Visualization results surveys / quizzes	license	license	Y	Y	Y
Possibility insertion presentation	Y (up to 5 slides)	N	Y	Y	Y
Possibility insertion multimedia content	Y	N	Y	Y	Y
Connecting with LMS	N	N	N	Y	Y
Division surveys / quizzes across social network	N	Y	Y	Y	Y
Restriction length questions	Y	N	Y	N	N
Options multiple of choice	Y	Y	Y	Y	Y
Questions open type	Y	Y	N	N	Y
Questions closed type	Y	Y	Y	Y	Y
Restriction length answers	N	N	Y	N	N
A game teams	N	Y	Y	N	N
Restriction for giving answers	Y	Y	Y	Y	Y
Restriction quiz / survey	Y	Y	Y	Y	Y
Export results	Y	Y	Y	Y	Y
Comparative analysis results	Y	Y	Y	Y	Y
Adaptability different devices	Y	Y	Y	Y	Y
Visibility results on the screen teacher	Y	Y	Y	Y	Y
Forwarding results electronic by mail	license	Y	Y	Y	Y
Internet connection required	Y	Y	Y	Y	Y
Synchronous communication	Y	Y	Y	Y	Y
Asynchronous communication	Y	Y	Y	Y	Y
Required projector / interactive board	N	N	Y	N	N
Optional appendices	Y	Y	Y	N	Y
Costs	N	N	N	N	N
Licensed software	Y	Y	Y	N	Y

presented criteria, it is possible to evaluate the clicker tools used in teaching. Depending on the needs of teachers, students and the teaching process, lecturers can choose software that will meet the requirements. The Y symbol indicates that the clicker tool has a certain characteristic, and the N does not. The license symbol indicates that the clicker tool has certain characteristics in the licensed version of the software.

Table 3 shows a comparative analysis of the characteristics of commercial and non-commercial versions of clicker applications presented in this paper.

Table 3 Comparative analysis of the characteristics of commercial and non-commercial versions of clicker applications

	Commercial version	**Non-commercial version**
MENTIMETER (*Mentimeter*, n.d.)	License for Mentimeter provides possibility changes user interface, division content from the countries teachers across order, branding and advanced visualization.	Basic package contains: unlimited Number user, anonymously voting, quizzes, unlimited number issues, security and privacy, export results and technical support.
SOCRATIVE (*Socrative*, n.d.)	Annual license for high educational institutions includes string additional function like the table are monitoring and support via email.	Non-commercial version provides the possibility of "playing teams", setting timer occasion answers, division content and export data. Access is allowed ten rooms, private and public.
KAHOOT (*Kahoot!*, n.d.)	Kahoot started project licensed version which is primarily intended companies, but it can be used in schools. Licensing versions offer the possibility use slides, feedback test information, creation interactive slides and possibility return on the previous questions.	Non-commercial version offers possibility making quizzes, no number limits users and questions. Existed feedback information on results test.
QUIZIZZ (*Quizzes*, n.d.)	Since two levels license standard and premier. Standard license allows maximum 100 participants and premier 5000 participants and provides possibility sending different reports electronic by mail i branding.	Non-commercial version offers maximum 25 participants, unlimited number quizzes / surveys, interactive presentations.
NAIKU (*Naiku*, n.d.)	Licensed version offers possibility creation banks with over 70,000 issues, integration with to some lms software, import documents, different kinds of evaluation reports and results tests.	Non-commercial version it is only available for 30 days and represents trial version. In that period it is possible to create surveys, reports, share contents surveys, evaluate students.

6. CASE STUDY

Research on the use of clicker applications was conducted at the Faculty of Electronics, University of Niš.

6.1. Participants

The participants in the research are first-year students of the Faculty of Electronics. During a lecture on the Introduction to Computer Science course, in the classroom, in the first semester, clicker tool Socrative was used. The research measured the relationship between the activities of students who used clicker tools in lectures and their success (grades) in the exam, as well as the impact of using clicker tools on student turnout. Out of a total of 491 first-year students, 181 students passed the exam in January. Activities in lectures, using clicker tools, were evaluated with grades from 1 to 5. To calculate the relationship between student grades and activities in class and the overall grade on the exam, the statistical correlation procedure was used.

6.2. Results and Discussion

- **Correlation between student activities and exam grades**

The correlation value is numerically expressed by the correlation coefficient, while the significance of the coefficient is expressed by the value of ***P***. The correlation coefficient shows the extent to which changes in the value of one variable are related to changes in the value of another variable (Udovičić et al., 2007). From 0 to 1 indicates an increase in the value of both variables, while a coefficient in the range of -1 to 0 indicates that an increase in the value of one variable causes a decrease in the value of the other. If the value of the parameter ***P***, which represents the significance of the correlation coefficient, ***P*** <0.05, the correlation coefficient is significant and can be interpreted, otherwise the correlation coefficient is not significant.

The research included a total of 491 students, of whom 181 passed the exam. The correlation coefficient was defined using the SPSS software tool. Variable1 represents the grade of the activity in the classes, and variable 2 is the overall grade on the exam. The correlation coefficient is 0.313. Table 4 shows the correlation coefficients and the significance of the coefficient.

Table 4 Correlation coefficient and significance of the coefficient

Descriptive statistics			
	Mean	Std. Deviation	N
Activity	2,71	1,542	491
Overall rating	8,38	0,890	181
Correlations			
		Activity	Overall rating
Activity	Pearson Correlation	1	0,313**
	Sig.(2-tailed)		,000
	N	491	181
Overall rating	Pearson Correlation	0,313**	1
	Sig.(2-tailed)	,000	
	N	181	181

** Correlation is significant at the 0.01 level (2-tailed).

The significance of the correlation is 0.01, so we can conclude that the coefficient is significant and can be interpreted. The coefficient of 0.313 represents a moderate correlation, which shows that higher activity in classes using clicker tools can affect the achievement of better success in the exam, i.e. higher grades.

- **Impact of using clicker tools on exam attendance**

Out of a total of 491 first year collage students, 418 had some activity in classes using clicker tools, which is 0,85%, a high percentage of using clicker tools in teaching. In the January exam period, a total of 314 students took the exam, and 181 passed the exam. 169 students who passed the exam had some activity in classes using clicker tools, which is 0, 93%; while only 12 students who passed the exam had no activity in class or in percentage 0,07%. The high percentage of using clicker tools among students who have passed the exam indicates the fact that the use of clickers in teaching helps students succeed in taking the exam.

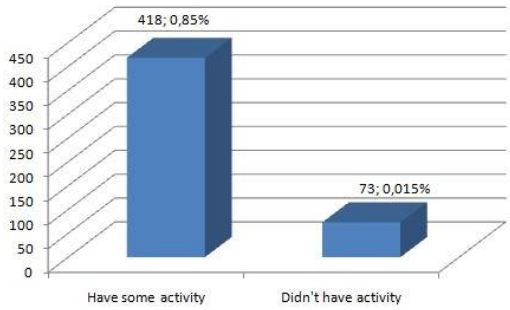

Fig. 1 Percentage of use of clicker tools

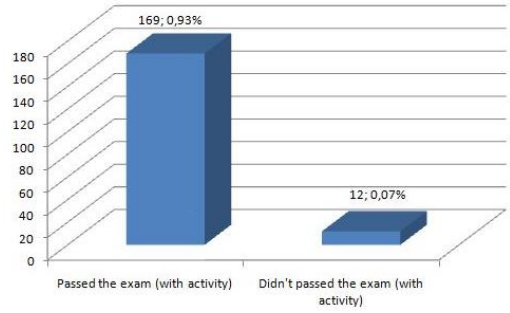

Fig . 2 Percentage of students who passed the exam

Out of a total of 80 students who received the highest grades on the exam (9 and 10), 46 students, or 58%, have a high grade on activity in class (4 and 5), which shows that higher activity has a positive effect on achieving better exam results.

7. CONCLUSION

Based on the research presented in this paper, we can conclude that there is a correlation between the use of clicker tools in class and the results that students achieve in the exam. Also, a large number of students who actively used the Socrative clicker in class passed the exam. This result of the research confirms the previous thesis of a moderate correlation between the use of the clicker tool and success in the exam.

In order for teachers to be able to choose the right clicker tool for the needs of the educational process, first of all, they should clearly determine the teaching goals and learning outcomes. Before deciding to use a clicker, one should define what the main goal of using this technology is. If the goal is to increase the activity and participation of students during the lesson, you should plan well the type of questions for the clicker application, when it is most effective to use the clicker software and whether additional time for discussion may be needed after the quiz/survey is finished. Also, teachers should compare and analyze students' learning outcomes before and after using an e-learning tool and assess how the use of clickers affects students' attitudes about learning. Analyzing student data can aid in the evaluation of clicker tools. Clicker tools are a great way to get students actively involved and more engaged in class.

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