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The impact of GeoGebra on learning the concept of quadratic function

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Abstract

There are many software programs used in math, but we have noticed that the Geogebra program is more equipped for groups of different ages, it is useful for elementary math teachers and even in bachelor's undergraduate teaching. It is useful for students to teach math at each school level, it's fun and fun using GeoGebra - thus encouraging students to deepen more and more in math.

The purpose of this quasi-experimental research is to show how GeoGebra can be used to learn the concept of quadratic function within the subject of mathematics at the high school level. Research will be conducted in high vocational high school visual art "Adem Kastrati" in the municipality of Gjilan with the pupils of the two tenths grade classes . One class will be the control group, while the next class will be the experimental group that will work with the GeoGebra program within the 5 week period (10 lessons from 45 minutes).

For the realization of this research, research was used as a methodology with quasi-experimental design.

From this research in the experimental class where GeoGebra software was used increased the interest of learners in learning compared to the control class. It has also been shown that the use of GeoGebra software has contributed to the increase of learners' learning outcomes in understanding the quadratic function.

Key words: Geogebra, quadratic function, teaching, learning

1. Entry

In recent years, technology exploitation has taken a great burst in all areas of life, especially in the subject of mathematics. It is essential that teachers and students have regular access to technology that support and advance mathematical meaning, reasoning, problem solving and communication. Effective teachers choose technology potential to develop concepts to students, promote their interest and increase their math skills.

Today we have multiple applications that help us to solve, illustrate and present different mathematical duties or problems. One of these applications that facilitate teaching and learning of mathematics is also the GeoGebra application or software.

GeoGebra is a dynamic math program that combines geometry, algebra, graphs, statistics and calculations in a single and easy to use package, making it suitable for teaching and learning of mathematics for all levels of education . GeoGebra was created to help teaching and learning to gain a better understanding of mathematics. It can be used for active and problem-oriented teaching, promotes mathematical experiments and discoveries both in the classroom and at home.

The program encourages students to access mathematics in an experimental way, given the changes that can be seen at all easily. The advantages of using GeoGebra (Furner, 2012):

- Provides basic features of the computer algebra system (CAS) to fill the gaps between them: geometry, algebra and calculus.
- For demonstration and visualization as it can provide different representations.
- As a construction tool, as it has the ability to build forms.
- To investigate, to discover mathematics and help create a suitable atmosphere for mathematics learning.
- For the preparation of teaching materials as a means of cooperation, communication and representation.

In this paper, it will show how GeoGebra can be useful in teaching and learning of mathematics, and in the concrete case to understand the concept of quadratic function and solving different tasks that focus on the quadratic function. It will also be shown what is the interest of students in learning when GeoGebra is used compared to traditional teaching, when labeling of quadratic function is used only chalk, table and axes A4. We will see what are the results that will arise from this draft proposal.

The purpose of this almost experimental study is to investigate the level of student learning in understanding the quadratic function using GeoGebra.

2. Literature Review

Today's instructions for teaching and learning in the subject of mathematics show the important role of visualization techniques. In response to these needs, many software applications were created to build constructive geometry and solving analytical and algebraic problems. One of the best applications designed to build and illustrate some mathematical problems is GeoGebra. GeoGebra is available on multiple platforms with its desktop applications for Windows, Mac OS and Linux, with its tablet applications for Android, iPad and Windows, and with its internet application based on HTML5 technology, (MajereK, 2014).

Technology is essential in teaching and learning of mathematics, where it can affect mathematics learning and boost students. In addition, technology can also help students to give their visual images of mathematical ideas, organizing and analyzing data, and can count efficiently and accurately. Technology can support students to investigate in every field of mathematics, such as geometry, statistics, algebra, measurement and number (Joseph, 2017).

Integrating ICT in the daily teaching practice, teachers can provide creative opportunities to support student learning and to promote the acquisition of mathematical knowledge and skills. Similar to geometry may not be easy and a large number of students do not They manage to develop a convenient understanding of geometry concepts, geometry reasoning and geometry solution skills (Hohenwarter M., 2009).

According to (Idris, 2006), the lack of understanding of geometry learning often causes discouragement among students, which will undoubtedly lead to poor geometry performance. It mentions several factors that have been identified as causing the difficulty of learning geometry: they are the language of geometry, visualization skills and ineffective instructions. Moreover, she stressed that spatial visualization is associated with geometric achievements, because geometry is visual in nature. Geometry requires visual abilities, but many students can not imagine three-dimensional objects in a two-dimensional perspective.

Dynamic geometry and computer algebra systems have greatly influenced mathematical education. Unfortunately, these tools are completely unrelated. GeoGebra is a new software system that integrates the possibilities of dynamic geometry and computer algebra into a math teaching tool (Hohenwarter M. F., 2004).

The advancement of technology has brought great innovations, so school teachers should be competent in using computers so they can maximize their use in teaching and learning (ABU-Obaidah Alazam, 2013). This is a study with two groups of pupils. A group used only applets, while others used GeoGebra and Applets software. The study showed how to incorporate computer learning to reduce the process of numerical integration work. The results of this study showed that the experimental group GeoGebra won more knowledge and skill than the control group. This study also suggested that the use of GeoGebra is useful for students who face difficulties in solving mathematical problems as they should not spend a lot of time for hand settlement.

3. Defining the problem, purpose of research, questions and hypotheses

In teaching and learning of mathematics, it is often indicated that students do not have sufficient knowledge and skills in the overall sense of quadratic function. Although the teacher provides the necessary knowledge to help students in constructing and understanding the concept of quadratic function, students seem to face a challenge in implementing these knowledge in a particular task. A literature summary also shows that the use of GeoGebra has an impact on the understanding of geometry on the part of students. GeoGebra can play a role in filling the gap by helping students visualize and understand the concept of quadratic function. (Shadaan, 2010) found that GeoGebra had positively influenced student learning and achievements and improved their motivation. The National Council of Mathematics Teachers (NCTM), which is the largest association in the world of math teachers, technology declares as one of the six principles for the Mathematics School. Technology is essential in teaching and learning mathematics; it affects how to learn mathematics and boost students learning (NCTM, 2000).

The main purpose of this study is to analyze the impact of GeoGebra software in teaching mathematics and in particular in understanding the concept of quadratic function by students. Further, the study also aims to investigate whether this learning method exceeds the traditional method and if students perceive that learning using technology is more useful.

The secondary goal is to investigate the influence of technology (GeoGebra) in motivating students to learn math.

This study aims to address the following research questions:

- What are the effects of using GeoGebra in understanding the concept of quadratic function on the part of students compared to traditional teaching?

☑ Hypothesis: Students using the GeoGebra program show better learning outcomes in solving problems from quadratic function than students who learn with traditional methods.

4. Research Methodology

This study will be used quasi-experimental model to explore the effectiveness of the GeoGebra program in terms of the concept of quadratic function.

In the research, two tenth classes will be included from the High School of Visual Art "Adem Kastrati" in the municipality of Gjilan. The school in question is a professional school which includes students from ten to twelve classes. In this school The subject of mathematics hold me. The sample (classes) were selected not on the basis of casualties, but based on the plans and curricula containing the chapter, the quadratic function, so the class 10. The time from the class 10 will be a group of control, while another group class

Experimental. For the realization of the research in the first place we predetermined the necessary and appropriate time to develop research and to reach a reliable result. It was also required permission from the school director and parents to develop this research.

A paratest and pastest will be administered in both groups.

At the beginning of the research, the experimental group and the control group will be subject to a preliminary test to assess their skills on the concept of quadratic function, in order to investigate whether the experimental and control group have an equal level of achievement before intervention, to identify the differences caused by treatment.

The experimental group will undergo an intervention to learn the quadratic function using the GeoGebra program, while the control group will on the other hand learn the quadratic function using the traditional learning method where GeoGebra is not included.

Paste testi will be administered in both groups after integer. Tasks will be the same in both groups and in this test only the pencil and paper without the use of GeoGebra program.

Research Procedure:

| Class X | Experimental Group | Control Group |
|---------------------|----------------------|----------------------|
| Paratesty | The achievement test | The achievement test |
| intervention | Teaching by GeoGebra | Traditional Teaching |
| Pastest | The achievement test | The achievement test |

Also in the class experimental group, a questionnaire will be accomplished to highlight the perceptions of students to the use of the GeoGebra program.

By comparing the outcomes of the Prefrication and Paste, it will be noted whether the GeoGebra program has affected the student's results.

5. Expected Research Results

Research "The Impact of GeoGebra in the Learning of the Conductive Function Concept" is an attempt to highlight the needs, opportunities and forms of technology implementation in learning (<http://masht.rks-gov.net>, 2016).

We conclude that all students, regardless of their level of mathematical knowledge, are encouraged to study math using this application.

Findings from this study will serve to inform teachers with the advantages of using the Gegebra program in teaching and learning mathematics.

Mathematics teachers are encouraged to use technology in teaching and learning mathematics, as it enables teachers to convey their teaching ideas on topics.

The advantages of GeoGebra software have led to teachers to be more creative in planning and providing more effective lessons. The effectiveness of GeoGebra for the theme of quadratic function should also be extended to the teaching of other mathematics topics (Zechariah, 2012).

6. Discute

At the end of the research with GeoGebra it is found that visualization can transform math lessons on the following issues:

1. Visualizations significantly improved the level of the experimental group in mathematics. At the end of the chapter, the average score was higher for a grade.
2. Benefit from visualization is for all students (all students have had improvements in mathematical skills and knowledge).
3. Use of Apple GeoGebra (a very good visualization material) in the teaching and learning process is indisputable. All students had a complete understanding about the new concept.
4. Use of visualization increases the effectiveness of the teaching time: - more visual representations and best quality (the teacher can prepare visual, high quality and attractive material for students as far as possible) - Source of Good visual and teaching is GeoGebra Wiki - Within a lesson unit can be covered a larger part of the text (using computers from each

student or design of figures and text on the screen wall offer higher speed than in traditional teaching) .

5. The use of GeoGebra has had a dual benefit: students and teachers, both benefited from improving their computer skills.

6. The best way to have effectiveness in teaching and explaining a new concept is that the teacher should be focused with students who have less computer skills or missing them.

7. Visualization helped greatly in linking formal and informal teaching and learning.

Some of the key achievements at the end of the chapter on quadratic functions were:

- deeper understanding of content
- Greater learning motivation
- Developing student thinking and learning skills.
- Developing student attitudes towards thinking and learning and their readiness for opportunities to think and learn ..

In this research, my goal was for students to receive new experiences of learning the concept of quadratic function based on GeoGebra software. For this reason, my attention concentrated in the five interconnected aspects; Motivation, discussions and interactions, learning with students in the center, meaning.

Conceptual and problem solving strategy. There has been an interaction between these aspects, which are apparently caused by the use of GeoGebra software.

However, an increasing progress of the meaning of function was observed during the use of Geogebra. Findings from teaching activities showed that students benefited more in final lesson than in previous lessons. However, in general, not all students have benefited to the same extent in this intervention. This may be due to the short period of intervention that may not be enough for students in getting knowledge and skills in using GeoGebra software. As mentioned (Laborde, 2001), integration of technology in teaching is a long process.

In summary, the general findings of relevant data sources show that GeoGebra work offered to students the opportunity to interact and discuss their ideas with each other within small groups (couples). However, broad class discussions did not achieve as much as group interaction.

7. Contracts and Recommendations

There is a link between software for mathematics (Softwari GeoGebra) and maths about their appearance for the reasons we have presented above. The four tests performed in the experimental class are a confirmation of this. This shows that GeoGebra should be used in the teaching and learning process. This fact is also confirmed by the results of the questionnaire:

Students and assessments of students regarding GeoGebra were positive.

The arithmetic averages at the end of the chapter of two classes are not equal. Moreover, the arithmetic average of the experimental class is greater than that of the control class and we are 95% sure that Geogebër teaching yields higher results than teaching in a traditional way. The effectiveness of the Geogebëer teaching method is easily visible when comparing the two classes.

There is a need to increase the level of qualification and competences of teachers in using ICT in teaching. Teacher training and vocational development is seen as the main driver for the successful ICT use in our schools.

The recommendations are:

- I. Change the teacher's opinion by training them how to use computer programs in the teaching and learning process.
- II. Organization of other trainings involving other science teachers and their expansion in other localities across the country.
- III. Establishing and building national connections between teachers using GeoGebra in the teaching process in order to share their achievements with others and develop their abilities further.
- IV. Integrating Albanian users to GeoGebra in the international community of GeoGebra.
- V. MEST to share more tools for all schools to be equipped with computers, tablets, wise tables, projectors and other accompanying materials.
- VI. Accountability and responsibility for students, but also teachers to be greater and higher in storing and not damage to PCs, laptops, wise tables, projectors and computer cabinets.
- VII. All schools have access to the Internet so that teachers, as well as students use literature and other material from other sources from internet, e-books, in addition to basic textbooks, etc.

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