
**UNIVERSITY “ST. KLIMENT OHRIDSKI”
FACULTY OF EDUCATION
BITOLA**

**Third International Conference
EDUCATION ACROSS BORDERS**

**EDUCATION AND RESEARCH
ACROSS TIME AND SPACE**

(1100th Death Anniversary of St. Clement of Ohrid)



**6-7 October 2016
BITOLA**

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Faculty of Education



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Education and Research across Time and Space
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Bitola

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University "St. Kliment Ohridski" in Bitola (Faculty of Education in Bitola) together with the University „Fan S. Noli“ – Korçë (Faculty of Education and Philology in Korçë), University of Niš (Faculty of Education in Vranje and Center for Byzantine-Slavic Studies in Niš), Plovdiv University "Paisii Hilendarski" (Faculty of Education in Plovdiv) and Adam Mickiewicz University in Poznań (Faculty of Polish and Classical Philology and Institutes for Slavic and Polish Philology in Poznań).

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A Word on the Slavic Patterned Teachings

Grozdana Gojkov, Serbian Academy of Education in Belgrade

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IMPROVING THE TEACHING AND LEARNING OF MATHEMATICS BY THE USE OF ICT

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Abstract

Information and communication Technology (ICT) has become one of the basic building blocks of modern society. Mastering basic skills and concepts of ICT is becoming part of the core of education, together with reading, writing and numeracy. Furthermore, the use of ICT in teaching and learning processes for various subjects gains its momentum nowadays.

ICT is essential in teaching and learning mathematics, improves the way mathematics should be taught and enhances student understanding of basic concepts ,promotes greater collaboration among students and encourages communication and the sharing of knowledge, contributes towards positive motivation, allows students to focus on strategies and interpretations of answers, promotes higher order of thinking and better problem solving strategies.

Keywords: Education, ICT, Students, Teaching Learning, Mathematics

Introduction

The range of the research literature on the application of ICT in the teaching of mathematics in the primary education is huge and it can induce us to think that the use of ICT is much greater than it is for real. The results of the projects Ofsted (Office for Standards in Education) and ImpaCT2 (emerging findings from the evaluation of the impact of information and communications technologies on pupil attainment) claim that the use of ICT in the teaching mathematics is low. However, the research results are there to show the benefits of the use of ICT in teaching maths.

Using ICT in teaching mathematics from the earliest age

Clement (Clements, 2002) in Computers in Early Childhood Mathematics, critically looks at the empirical research that are examining the application and the use of the computers in early childhood mathematics (from birth to 10 years). According to his analysis, the children even since preschool age are more competent than it was previously thought, and under certain conditions they may exhibit certain specific thinking. The young children can use appropriate computer programs, and show greater sophistication in the classification and logical thinking and greater predictability. Children can use the computers to practice arithmetic and processes in order to improve conceptual thinking.

The training and practice software can help children in developing competence for skills such as counting and sorting. The appropriately selected computer games that involve combining visual, graphics and speech, the ability to predict the feedback, the opportunity to examine the situation and individualization can also be effective. The preschool children who have used computers had greater capacity for remembering numbers and more sophisticated theories but also significantly increased ability to solve problems. The computer activities related to problem solving motivate the children and the young people and the young children

from kindergartens to make choices and decisions, to re-examine their strategies and achieve better results on tests.

The specially made programs can improve the analog thinking of the children in kindergartens, while the various programs increase their ability for solving mathematical problems. The preschool children and the primary school children develop the ability to understand the nature of the problems and serve with drawings to solve them. The advantages of computers and their use means children are allowed to create, modify, save and develop ideas to show interest, to connect ideas from different areas to provide situations with pure variables, and come to feedback that they will interpret it. It also allows children to work, think and play with ideas. Children examine the forms through the use of graphics programs and thus learn to understand and use concepts such as symmetry, patterns and space. Computer manipulative expand the overall goal of the graphic programs through that allow children to make specific mathematical transformations of the items on display. Computers connect symbols which help students to understand that is to understand the essence of the activity. Thus, computer manipulative feature unique advantages such as conservation work flexible manipulative symbolic linking with specific opinion, record and review the activities of students and raising mathematics to explicit awareness.

Application of the ICT in teaching mathematics

When it comes to the use of ICT in teaching mathematics we should mention the British Agency for Communications and Technology education- Becta (British Educational Communications and Technology Agency), which now operates under the Ministry of education-DfE (Department for education) which did the analysis of the available research on the use of information and communication technologies by teachers in teaching mathematics in the primary education. The analysis summarizes the key findings and lists sources for further use.

According to the analysis by Becta, the ICT can foster a progress in teaching mathematics for example in:

- *Tasks to solve problems*
- *Practicing skills with numbers and*
- *Research shapes and connections.*

Identified are the following key benefits:

- *Greater collaboration among students,*
- *Increased focus on strategies and interpretations*
- *Quick and accurate feedback and*
- *Increased motivation.*

The use of ICT in mathematics can have positive effects in:

- Getting instant feedback from the computer programs, it encourages the students to assume and continue to explore (according to research by Clements);
- Using technology to perform manual calculation or drawing frees students can focus on strategies and promotes the process of trial and making mistakes (according to research by Jarrett and Ruthven and Hennessy);
- ICT-based tasks provide focusing on the expanded collaboration among students (according to research by Hudson);

- An interactive nature of multimedia software motivates students and leads to better performance (according to research by Moseley);
- ICT tools enable students advanced communication capability, enabling the use of charts, images and text in order to demonstrate their understanding of the mathematical concept (according to research by Jarrett).

The main use of ICT in learning mathematics stems from:

- Calculators
- Small programs like games with numbers or investigations
- Databases and spreadsheets,
- Drawing graphs,
- Dynamic geometry,
- Independent system of learning,
- Internet,
- Word processing and
- Programming.

By using ICT in teaching mathematics the students:

- Experiment and learn from feedback,
- Logically think and develop skills in problem solving,
- Observe, explore and explain examples with numbers, shapes and sizes,
- Set up and test hypotheses and assumptions that may be based on a wide range of data,
- Perform generalizations that can be based on experimental evidence and
- Develop mathematical vocabulary and language.

The application of the ICT in teaching mathematics helps the students in the following situations:

- When coming to and selecting information and interpretation,
- In recognition of patterns, relationships and behaviors,
- In modeling, prediction and hypothesizing,
- When testing the reliability and accuracy,
- When reviewing and modifying their operation to improve its quality,
- Communicating with others and presenting ideas,
- When evaluating work
- At increasing efficiency,
- ICT helps to be creative and to accept risks,
- At building self-confidence and independence.

There are three terms that are closely associated with enrichment and, whilst they are not entirely mutually exclusive, they do represent different agendas.

- Acceleration-takes pupils into areas of the curriculum normally covered by older children often resulting in early entry to public examinations. This is sometimes achieved by moving pupils into higher year groups for all subjects or just the subject in which they excel. Alternatively, children can be accelerated within their own class working independently, often with some additional support.

- Extension- involves moving outside the syllabus and looking at aspects of mathematics not normally covered within the "normal" curriculum

- Enrichment:-is about extending pupils' understanding of the mathematical ideas they have already met by applying them to other situations and problems, often requiring

decisions on what area or areas of mathematics to employ. The aim is to develop higher level problem solving and communication skills. It extends the notion of using and applying. The aim is to produce a thinking mathematician who can look beyond the standard "test" type questions.

More able pupils need to be stretched and motivated but this is often very difficult in a classroom with more pupils all needing individual attention. One of the most powerful resources available to you is the ICT. More able pupils will no more benefit from the computer than other students but in the same way as ICT can support basic numeracy skills through targeted, skills focussed, software or the use of generic software or access to resources via the Internet, it can support the needs of the more able mathematicians.

Effective use of ICT will enable you to:

- ☐ find appropriate online resources that can be used off-line or converted to a paper based resource
- ☐ use generic software and open ended tasks that will engage pupils who are struggling but offer real opportunities for stretching the most able.

This can be achieved by:

- ☐ Planning tasks for the whole group that will involve all pupils but stretch the most able. This will involve using the same mathematical ideas but extending them to more demanding contexts. What they are not doing is "more of the same".
- ☐ Sending individual or small groups of pupils to work at a computer on tasks particular to their ability but related to the activities being undertaken by the rest of the class.
- ☐ Using the Internet to locate resources to provide enrichment material that supports the lesson objectives and the more able pupils.

Conclusion

The availability of the ICT changed the nature of teaching and learning mathematics. By the application of the ICT in teaching the students more successfully acquire the mathematical concepts and structures. It influences on the development of different forms of thinking and thought processes as analysis, synthesis, abstraction and generalization. Students intensively develop their abilities for creative activity, different skills, perceptions and orientation in space and time. By the application of ICT in mathematics we influence on the development of perseverance, responsibility and accuracy in work, strengthening the confidence of students and It influences the effective and efficient introducing students to research procedures, introduction to problem situations and problem solving.

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