MATH TEACHER’S VIEW ON INTEGRATING COMPUTERS IN THE CLASSROOM

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Abstract

Technological development affects all aspects of our lives including the field of education in general and the field of mathematics in particular. Teaching math with the help of computers contributes greatly to the quality of the lesson. The purposes of the research were: to examine the point of view of math teachers regarding use computer in the classroom and to see if there is a connection between their opinion and the actual integration of computers. Eighty-two math teachers in junior high schools answered a close questionnaire. The research findings indicate that math teachers have a positive point of view concerning use computer in teaching. There was also a significant positive correlation between the teachers’ opinion and the use of computers in practice. From a ENTER regression analysis we see that teachers' use of the computer can be explained by the teachers’ attitudes towards the computer, the predictor variable explain 10.1% of the variance of teachers’ use of the computer for teaching purposes.

Keywords: ICT, computer integration in teaching, teaching mathematics.

1 INTRODUCTION

The math teacher’s role in teaching mathematics using computers is the teacher’s ability to match both the content and the teaching method to the previous knowledge of the pupils, thereby encouraging thought and performance via interactive instruction. The goal of computer integrated teaching (ICT) is to develop and empower the mathematical discussion amongst the pupils in order to advance mathematical thinking. ICT invites the pupil to engage interactively and for the teacher it is a method to advance diverse mathematical discussion and the use of meta-cognitive strategies to understand the pupil's thought and performance processes. The teacher is no longer just a tool for sharing knowledge but rather an agent who designs and promotes independent thinking (Grossman & McDonald, 2008; Hiebert & Morris, 2009; Lampert & Graziani, 2009; Wasserman & Millgram, 2005).

The use of the computer does not generally advance novel pedagogical paradigms but rather is used to perpetuate the traditional teaching methods (Nachmias, Mioduser, & Forkosh-Baruch, 2009). The integration of computers in the teaching of mathematics has several advantages as described below:

- Visualization – There are quite a few abstract topics in mathematics and visualization will contribute to the pupil’s understanding and improve his achievements (Ocal, 2017).
- Drills – with the help of a computer software program the pupil can practice the material according to his level (Clements, 2002).
- Research skills – with the help of a computer software program the pupil can learn research skills and present models that he has built. (Eshet, 2006).

There are a number of software that have been developed for teaching mathematics. For example: 1. Geogebra which is a software that enables the learning of mathematics research from elementary schools level through high school and up to college. The software enables the building of visual and interactive models in geometry and algebra. The models that are built by the pupils can be modified in accordance with the didactic needs. The software also contains a library with more than a million resources which is open to the public at no cost. Geogebra is an active type of software or in the words of Bisharah (2013) ”An active teaching method”. 2. Desmos is a graphic software that helps analyze functions – it allows the pupil to study the function and to see the function visually. In addition, the pupil can play with the function in various forms and he is able to see how moving the function effects the algebraic presentation. The tool contributes to concretization and creates a connection between the algebraic relationship and the graphic connection of the function. The software also includes additional mathematical options such as: interactive variables, drawing graphs, graphs with cutting points, regressions, drawing on the same plane, polar function graphs, two types of graphic networks and more. The software supports several languages including English, French and Italian. 3. The application
Photomath. The purpose of this software is solving equations – the pupil photographs the exercise and the app solves the exercise in an orderly fashion. The solution is presented step by step but the user can simply flip back and forth between the different steps. The app currently supports arithmetic operations such as addition, subtraction, division and multiplication, the decimal system and fractions; powers, roots, linear equations with one or two unknowns. The developers of the software have promised additional and more complicated functions that are in development and will be marketed in the near future. The main problem with using Photomath is that the app may harm the task of independent drilling, for example when preparing homework. There is no way to check how the pupil arrived at the solution and the pupil is apt to reach the correct solution without solving the equation by himself.

1.1 The Teachers' Viewpoint on ICT

According to psychological theories, beliefs and perceptions about a particular object create attitudes and these attitudes influence the behavior of the individual towards that object (Wilson & Myers, 2000). From studies that have been performed on this subject there appears to be a difficulty in integrating change in teaching methods. The teacher's perception and competence in a computerized environment influence the integration of the computer into the classroom. Moreover, they constitute a primary factor in the ability to integrate computer teaching methods in schools (Fullan & Smith, 1999; Cunningham & FrieDmAn, 2009). Additional study has shown that if teachers believe in the educational course of ICT in teaching and they have the knowledge to apply it practically they will integrate the computer into their teaching (Anderson & Maninger, 2007).

1.2 Math Teachers' Viewpoint on ICT

The study of mathematics by technological means requires behavioral change in the way mathematics is taught by teachers who had previously studied and taught mathematics (Pierce & Ball, 2009). Studyers state that the teacher's commitment to integration of technology in teaching stems from the realization of the educational value it has and the belief in the potential for change that can be achieved using technology (Hennessy, Ruthven & Brindley, 2005).

A study which examined math teachers' viewpoint regarding the use of a graphic calculator, which is a technological tool that presents a function graph, found that in general the teachers believed that the use of this tool would improve the mathematical understanding of the pupils and contribute to a positive approach of the pupil towards the subject. (Tobin, Routitsky & Jones, 1999). On the other hand, a study that was conducted in 2003 reported that experienced teachers with a rich mathematical background were divided on their views towards ICT in teaching. It seems their negative attitude stemmed from the belief that technological tools do not advance the pupils, but their belief and their use of technological tools have changed over time as they see more and more of the positive influence technology has had on their pupils (Cedillo & Kieran, 2003). Similarly, an additional study found that the minute teachers starting using the computer in their math lessons there was a positive change in their outlook on integrating technological tools. Their initial approach concerning ICT was negative but it changed slowly as a result of positive experimentation with the computer in their classroom (Thomas, Tyrrell & Bullock, 1996). In addition it was found that teachers' attitudes towards technological use of mathematics instruction depend on teachers' belief in the impact of these tools on students' mathematical understanding. Teachers who believe that the best way to learn is using the traditional method of paper and pencil or believe that in order to establish a basic understanding of mathematics the pupil must solve mathematical problems without the use of technological aides are liable to demonstrate a negative viewpoint towards technology integration (Pierce &Ball, 2009). Moreover, the teachers' viewpoint on technological integration takes into account not only the pupil's understanding but also the pupil's approach towards it. A meta-analysis was conducted that indicates that the teacher must be convinced that the use of technology will raise the pupil's level of interest in the lesson and his motivation in order for the teacher to choose ICT (Mumtaz, 2000). A similar study found that teachers encourage using technological tools if they perceive the tool as something that influences higher motivation, enjoyment and self confidence in the pupil (Forgasz, 2006).

Pierce and Ball (2009) examined the math teachers' viewpoint regarding technological change using the Theory of Planned Behavior (TPB) by Ajzen (1991) and a broad reference was made concerning the viewpoint of the math teacher while examining the specific attitude of changing that viewpoint based on an understanding of the role and perception of the math teacher. The study examined the teachers' intentions to change their teaching methods and to actively use technological means in their classroom particular in mathematical analysis (Pierce & Ball, 2009). According to their study the teacher's
approach to technological change and their viewpoint regarding this issue, relates to four important parameters: the importance of understanding and learning mathematics; the technological tool and the specific software's contribution in developing mathematical understanding; the influence of the technological learning on the pupil's attitude towards learning the mathematics; the role of the teacher and the pupil.

The purpose of this study is to examine the viewpoints of math teachers towards the integration of computers in their instruction. Do they portray positive viewpoints towards this innovative pedagogy or do they prefer the old and traditional methods, in addition is there a connection between their viewpoint and the actual application of computers in their teaching.

2 METHODOLOGY

The study was conducted using the quantitative method. A questionnaire was prepared that included 3 parts: Part one – demographic data like gender and seniority, Part two – the teacher's experience with computers. This section contained 14 closed questions which examined the teacher's proficiency in various software programs and the extent to which they were implemented in the classroom in different configurations. The reliability of the questionnaire was measured using Cronbach's alpha, which is 0.824. Part three – attitudes towards the computer in the classroom. The questionnaire examined the teacher's viewpoint of computer integration in teaching and in learning. The answers to the questionnaire are on a five-point Likert scale. The questionnaire contained 32 closed items, reliability was examined in the study and it is Alpha Cronbach 0.940. The questions in the questionnaire were based on the following subjects: how to use the equipment, concerns and anxieties, computer integration in teaching, models and image.

2.1 Study Population

The study population included 82 teachers from various schools. The teachers were middle school teachers. In the study, 68.3% were female teachers and 31.7% were male teachers. 48.8% had 10 years of seniority, 11-20 years of seniority 15.9%, 21-30 years seniority 18.3%, 31-45 years seniority 17.1%.

2.2 Study Process

A request was sent via the email to the mathematics teachers asking them to participate in the study, explaining the purpose of the study, and stating that it would be anonymous. The questionnaire was added to the email using Google Docs.

3 RESULTS

The results of the study show that a significant positive correlation was found between teachers' viewpoint towards ICT and the teachers' use of the computer for instruction ($r = 0.317; p <0.01$). So that the more positive the teacher is about ICT, the more he will use the technology for teaching. In order to predict the teachers' use of ICT based on the attitudes of the teachers towards computers, a ENTER regression analysis was performed. An analysis of the regression showed that teachers' use of the computer can be explained by teachers' attitudes toward the computer ($F (1,80) = 8.953, p <0.05$). The likely predictive variable is 10.1% of the variance of teachers' use if ICT.

In order to test the correlation between the teacher's proficiency in computers and their use of ICT, the Spearman test was conducted between each computer application and the variable of ICT.

a) A low positive correlation was found between the proficiency in using Word and the use of ICT ($r_s = 0.263; p <0.05$), so that the better the teacher mastered the Word software, he more he would use ICT.

b) A low positive correlation was found between the proficiency in using Excel and the use of ICT ($r_s = 0.233; p <0.05$), so that the better the teacher mastered the Excel software, he more he would use ICT.

c) No positive correlation was found between the proficiency in using Power Point and the use of ICT ($r_s = 0.190; p <0.05$).
d) A high positive correlation was found between the proficiency in using Email and the use of ICT \( (r_s = 0.286; p < 0.01) \), so that the better the teacher mastered the Email, he more he would use ICT.

e) A high positive correlation was found between the proficiency in using the internet and ICT \( (r_s = 0.412; p < 0.01) \), so that the better the teacher mastered the internet, he more he would use ICT.

4 CONCLUSIONS

There is a significant medium high correlation between the math teachers' viewpoint of ICT and the use of ICT in their instruction, so that the more positive the teacher is towards ICT the more he will use ICT in his classroom. In addition, an analysis of the regression shows that teachers' use of the computer for teaching on the basis of teachers' viewpoint toward the predictive variable can be explained by 10.1% of the variance of teachers' use of the computer for teaching purposes. This finding supports the theory of behavioral planning (TPB) a theory that relates to the previous stages of behavioral change. This theory refers to the factors influencing a person's intention to make a change with reference to human attitudes and perceptions that may promote or prevent change (Ajzen, 1991). This theory states that the use of a technological tool is significantly influenced by the teacher's positive approach to that technological tool (Pierce & Ball, 2009).

There were significant positive correlations between the teacher's mastery of computer applications and the use of technology for teaching, so that the more proficiency the teacher has in the software, the more likely it will be for him to use it in his classroom instruction. This finding matches several studies (Anderson & Maninger, 2007) that attest to a correlation between ability and application so that the more mastery he has of the computer the more he will use it in the classroom. A teacher strives to convey to his students his knowledge and especially to connect his students through the computer for learning in the 21st century (Yerushalmi, 2011).

REFERENCES


