

## **Critical Thinking Paper: Technology in the Classroom**

There have been predictions that by the year 2013, a supercomputer that is more advanced in computation capability than the human brain will be made (Fisch, McLeod, & Brenman, 2010)! Technology is increasing every day. Newer and more advanced computers, cell phones, iPods, calculators, and the like are being developed constantly! Technology is inevitable. It is something that students are exposed to each and every day. It has become a part of life and, in order for students to succeed in today's high-tech world, they need to be able to use it. Teachers need to know how to use technology in the classroom and allow for technology to assist in student learning and growth. But the overarching question is: how much technology is too much? In this day and age, when the use of technology is so commonplace, to what extent should teachers use technology in the classroom? If students do not understand the material in a math class and they cannot solve a problem, should teachers automatically hand them a calculator?

The fact of the matter is that technology surrounds us and is an integral part in the life of every student. Lynne Schrum and Barbara B. Levin (2009) cite a 2006 survey of students aged 12-17 years that states that 87% of the students surveyed had Internet access at home; 89% of those with home computers used e-mail daily; and 75% of students surveyed used text messaging (p. 28). They also refer to a survey of college students in 2007 in which 97% owned a computer; 94% owned a cell phone; 76% used instant messaging and social networking sites; 75% had a Facebook account; and 60% owned a portable music and/or video device (p. 33). It cannot be debated that, "today's students grew up in the digital age and have never known a world without the Internet, cell phones, video games, on-demand videos, and portable computing devices" (Schrum,

& Levin, 2009, p. xiv). In order for schools to teach students relevant information, they are going to have to implement technology into the classroom. There is no question about it. However, how much is too much technology? When does it help students learn math and when does it hinder their progress?

There are numerous benefits for implementing technology into the classroom. In particular, we will focus our attention on the high school math class. The Technology Principle of the *Principles and Standards for School Mathematics* states the following:

“Electronic technologies—calculators and computers—are essential tools for teaching, learning, and doing mathematics. They furnish visual images of mathematical ideas, they facilitate organizing and analyzing data, and they compute efficiently and accurately...When technological tools are available, students can focus on decision making, reflection, reasoning, and problem solving.” (National Council of Teachers of Mathematics, p. 24)

The Technology Principle breaks the benefits of using technology into three sections in which, “technology enhances mathematics learning...supports effective mathematics teaching...[and] influences what mathematics is taught” (NCTM, 2000, p. 24-27).

With regards to enhancing learning, the *Principles and Standards* indicate that technology has multiple implications. Technology allows students easy access to visual models. It enables them to examine more examples or representations of classroom material. Technology gives students more time to conceptualize and model information because it helps them to execute routine procedures quickly and accurately. Students can also use technology to help them better understand abstract mathematics and investigate

mathematical ideas using multiple strategies. Additionally, it helps teachers adapt instruction to the needs of students.

Furthermore, technology has benefits in the support of effective mathematics teaching. Teachers can use technology to help their students learn to graph, visualize, and compute mathematical information more efficiently. Also, it can be used to aid in student assessment because it enables teachers to observe the different ways that students think about mathematics and the processes that students use.

Finally, technology benefits the expansion of mathematical information that can be taught. Technology assists students in considering more general and complex problems. It helps students connect different areas of mathematics, as well as gain a better understanding of the skills and procedures that are used regularly in all areas of math. Students can explore and increase their understanding of abstract mathematics through the use of technology (NCTM, 2000, p. 24-27).

In more general terms, Todd W. Kent and Robert F. McNergney (2009) note that, with the use of technology, greater attention can be given to the development of students' higher-order thinking skills and problem-solving skills, instead of on basic facts. Technology also presents various opportunities for basic skills to be learned in collaboration through real-world tasks. Furthermore, it allows informational resources to be easily accessed when needed, topics to be covered in more depth, and gives students a more central role in their development of knowledge and skills (p. 5-6).

Though the rise of technology is inevitable and there are significant advantages for its usage in the classroom, there are also reasons for hesitation. The most significant and important disadvantage of allowing students to use technology for investigating

mathematical problems is that it will become a crutch for executing mathematical solutions. Students can easily use calculators and computers for “solving equations, factoring polynomials, producing the roots, graphing the functions, doing the calculations” (Confrey, 1996, p.139). However, this means that the students are no longer learning how to apply these mathematical skills without the use of technology. If students are relying on technology to assist them in solving math problems, it is questionable as to whether or not the students fully comprehend the material and know why it is important.

Jere Confrey (1996) refers to a group of students who were asked to graph sine and cosine functions when he stated, “for most of the students, sine and cosine functions were keys to push on a calculator, and the students had no idea of the connection of these functions to the geometry of the situation, the triangles of the inclined plane” (p.139). He poses the question at hand: if this is the case, “what mathematics was being learned?” (1996, p.139). Teaching students how to use their calculators to find solutions to their math homework may help them pass their tests and come up with the correct answers, but the use of technology takes away from students’ learning of the processes for solving standard math problems.

Furthermore, despite the fact that technology may help us to form better connections and improve communication throughout the world, there is concern that it will also lead to a decrease in social skills and interactions. As more and more of classroom instruction takes place virtually, there is less need for students to partake in hands-on, face-to-face experiences. As Kent and McNergney (1999) note, “teaching and learning are based on human interactions. Removing the personal aspect of education, or

the ‘experience,’...may have consequences that are difficult to predict” (p. 56). The increase of instruction through the usage of technology may decrease the essential personal interactions that are necessary for students to develop social skills.

In addition, student understanding of the physical application of mathematics may decrease. If students are only exposed to virtual simulations of mathematical problems, they may lose understanding of how it applies to hands-on, real-world situations. Confrey (1996) states that, “children suffer if they are not encouraged to integrate the physical and mental,” and in particular may experience a disconnection from one’s surroundings (p. 142). To conclude, technology may harm student connections with action-oriented, physical applications of mathematics if they rely simply on modeling through technology.

Based on this research, I believe that it would be most beneficial to student learning to use technology as a supplementary tool to their instruction. Students must first learn the processes and steps used for solving math equations, graphing functions, factoring, and so on before they should be handed a calculator. Thus, once students have a basic understanding of the material and why it is important, technology may be used to help increase their understanding. I believe that students should be taught the basics behind all mathematics. Once students get to high school, they should be expected to recall simple addition, multiplication, etc. and have an understanding of simple math facts. However, if they do not and it is hindering their understanding of the current material that is being taught, technology can be beneficial in helping these students focus on the current problem solving strategies and processes, instead of on the memorization of mathematical facts. I do believe that it is very important for students to know simple

math once they enter high school. However, if their lack of this basic knowledge is holding them back from increasing more rich, in-depth understanding of the material, then technology may be used to assist them. Thus, helping the students focus more on higher-order mathematical thinking.

Through research, I have concluded that teachers should use technology once the students have understood the purposes of the mathematics behind the usage of computers or calculators. As Confrey (1996) puts it, “We must engage our students in understanding the genesis of mathematical ideas, because herein lie their original purposes. Functions are not models of the world. They evolved as means for describing curves” (p. 141). We must help students understand the concepts and the processes that have given us the mathematics that we use today. Teachers should do this by allowing students to participate in hands-on activities and providing them with experiences to see how math is applied to real-world situations. Technology can aid in these activities. However, teachers must be aware that, “if we use our technologies only to invite our students into virtual realities and simulations, we risk losing their understanding and commitment to everyday living...simulation is a powerful learning tool, but it is not equivalent to or better than hands-on experimentation. It can extend but should not replace these activities” (Confrey, 1996, p. 142). Therefore, teachers need to find a balance in their use of technology for instruction.

In addition to the benefits of technology that have already been presented, research has shown that technology can, in fact, help aid student learning. It can help them learn the material in a variety of ways and may expose them to new ways of understanding what is being taught. Technology can help to make learning meaningful

and more interesting to students. Levin and Schrum (2009) refer to the story of a principal who integrated a technology project into the school and found that:

“Technology has empowered students by challenging them and giving them opportunities to explore. Students are more self-directed and self-confident with having choices of ways to use technology to share knowledge. Students are more engaged now that technology has made learning more interactive...students are more motivated to learn.” (p. 39)

Thus, teachers need to use technology strategically and use it as a tool to aid student learning. As Confrey (1996) puts it, “We need to ask, What can I do with the software? rather than, What can this software do?” (p. 143).

When technology instruction is used properly, students will be able to, “spend less time manually calculating and plotting data and more time using technology to summarize and interpret data, look for trends, and predict relationships” (Snowman, McCown, & Biehler, 2009, p. 268). Jack Snowman, Rick McCown, and Robert Biehler (2009) have concluded that when technology is used to supplement and reinforce teaching efforts, it can aid teachers in modeling problem-solving strategies, provide students with cognitive and metacognitive feedback, and provide students with scaffolded instruction (p. 314-316). In fact, teachers can use technology in the classroom to, “allow learners to construct, share, and revise knowledge in more open-ended environments. In effect, learners become producers, designers, and ‘authors of knowledge’” (Snowman, McCown, & Biehler, 2009, p. 353). When used properly, technology tools can, “promote collaboration, interaction, and creativity in new ways for the encouragement of authentic learning” (Schrum, & Levin, 2009, p. 60). If technology is used in the high school math

classroom as more than just a tool for entering numbers, and instead to help students expand their knowledge of the topic that is being studied, it can greatly benefit student comprehension of the material and increase their problem-solving abilities.

In conclusion, it is an inevitable fact that teachers will need to incorporate technology into their classroom instruction. However, it is important that they are made aware of both the positives and negatives of incorporating these high-tech tools to facilitate student learning. Technology may assist students in their comprehension of mathematical logic by allowing them to focus their attention on higher-order problems. However, when used too frequently, it may become a crutch to student learning and hinder student comprehension of simple mathematical facts. Yet, it is my belief that if teachers use technology to aid instruction and incorporate it as a supplementary tool to other hands-on activities, it may greatly benefit student learning. In general, when technology is used properly and students are taught the problem-solving skills and mathematical processes behind the math that they are learning, the pros will greatly outweigh the cons in aiding student instruction through technology.

## References

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