The Idea of an Essay

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Teaching Technology

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I am Tom Lowry a Computer Engineering student so I would rather write code than actual papers. However, it is important for all majors to be proficient in writing not just English majors. I hope you enjoy my writing.

Teaching Technology

Despite the thousands of technological advancements made in the last fifty years, teachers are still teaching in a style similar to 1960. In most classrooms, the teacher lectures in the front of the room while the students sit at their desks listening. This passive method of learning does not take advantage of the advances made in computing technology and the connectability available with the internet. Regrettably, some students' learning is stunted by using these outdated methods, causing society to lose many intelligent students who would learn more effectively with a modernized formal education model. To enhance education, schools from kindergarten to twelfth grade should incorporate technology by augmenting their traditional curriculum (like math, writing, and science) with computers and by adding programming classes. Integrating computers into the classroom would improve the education model because it allows students to have a more engaging individualized education, a more universal teaching standard, an enhancement of communication skills, an increase in creative problem-solving skills, and a better preparation for their future.

What would it look like to integrate computers into the schooling system? First, schools from kindergarten to high school would add computer programming to their curriculum. This addition of programming classes would not only help expose students to an expanding technological field but also allow students to gain other skills associated with coding such as problem-solving. Schools could easily implement programming into their curriculum by teaching simple coding languages, like Scratch and Blocky, then increase complexity as the students' progress. Secondly, computers could be utilized alongside human teachers. Computers would never completely replace teachers since human involvement is essential in the education process. However, technology can enhance students' learning beyond the chalkboard and lecture method. Lynette Gorder (2008), an associate professor at South Dakota State University, argues in *A Study of Teacher Perceptions of Instructional Technology Integration in the Classroom* that teachers need to develop "technology-supported activities that promote worthwhile learning," as well as teach life-long learning techniques using technology (p. 64). For instance, teachers could use computers to present a section of a lesson while being available for students who need extra help. This method helps teach students how to use technology to increase their personal learning. Using the learning skills they developed, students would be equipped to learn concepts both inside the classroom to enhance their current classes and outside the classroom for pursuing their own interests. Thus, students are prepared to become effective lifelong learners.

Integrating technology in the classroom enables the learning process to be enhanced for students from kindergarten to high school because it individualizes learning. Frederick Bennett (2002), Ph.D., argues in *The Future of Computer Technology in K-12 Education* that technology can benefit schooling, especially for the individual. By incorporating technology correctly in education, students can learn at their own pace. Students who take longer to understand the material can avoid being overwhelmed with the help of computers because they can review concepts using the "personal tutor" of a computer. On the other hand, students who learn more rapidly can progress quicker and be challenged — not bored (p. 624). Adam Dube (2015), a professor at McGill University, and Rhonda McEwen, a professor at the University of Toronto, also reported similar findings in their study *Engaging or Distracting: Children's Tablet Computer Use in Education*. They found students with both low cognitive ability and high cognitive ability were able to understand information better when a teacher allowed them to use iPads (p. 20). Thus, students on all points of the spectrum can benefit from an education that integrates electronic technology as it tailors lessons to their individual needs.

Also, schools that integrate technology can offer a more engaging curriculum. Technology allows students to learn in more intriguing ways, whether through apps or through programming. As Bennett (2002) says, "the software develops interaction between the computer and the student" (p. 623). Computer-aided lessons require students to pay attention as they can only move forward and learn if they finish the task that the computer requires. This is

unlike traditional schools, where students can choose not to focus on the lecture and leave the class without comprehending the subject because they were daydreaming, causing students to fall behind. However, technology combats this temptation not only by forcing students to engage but also by engaging students in a fun way.

Individualized learning offers another advantage, it tailors lessons to a wider range of learning styles. According to M. S. Hasibaun (2016) and colleagues from University of Gadjah Mada, one categorization of learning styles is the VARK model, which splits learners up into four groups visual (learning through visual information), audio (learning from audio information), read/write (learning from the input and output of text-based sources), and kinesthetic (learning by experience or doing). Sometimes these learning styles are neglected in a traditional schooling environment, however, when incorporating technology, each of these learning styles can be addressed. For example, the visual learners can look at more visual models, charts, graphs, and pictures of the topics they need to learn. Audio learners can enhance their learning by listening to videos and podcasts. Read/write learners are aided by the plethora of e-books, websites, and journals provided on a subject. Finally, incorporating interactive computer activities enables kinesthetic learners to stay engaged and understand concepts better than traditional methods. Therefore, integrating computers into education can help an increased range of learning styles (p. 65-66).

In addition to individualized learning, incorporating technology produces more consistent high standards for education. Bennett (2002) asks, "If you could choose to have your child taught either by Socrates or a freshly minted holder of a degree in education, full of the latest pedagogical theories [who would you choose?]" (p. 621). Most people would choose Socrates as he is a respected expert. With the help of technology, schools can have experts teach classes, thus creating high universal standards for teaching. Using videos, students could be instructed by the best. Students could learn to code from Bill Gates or learn to write from Sherman Alexie. This would also help alleviate many of the inconsistencies inherent in instruction from different teachers. Students would no longer be hindered from learning because of incompetent teachers as everyone would have an equal opportunity to learn from the best (p. 621).

Incorporating computers in schools would also help improve students' communication skills in this digital age. Today, most communication occurs through computers or other technology. Thus, it is important to teach students how to use these technologies to communicate more effectively. As Amy Hutchison (2017) and fellow professors at George Mason University states in their article *Planning for Technology Integration in a Professional Learning Community*, "Integrating technology into literacy instruction is especially important because of the way technology is used for everyday communication and the many skills required to use technology" (p. 167). They reaffirm that it is crucial to integrate technology when learning other subjects, especially literacy, as

currently, most communication happens using technology. Some examples of computer integration include incorporating Microsoft PowerPoint when speaking and Microsoft Excel when presenting data. Using technology, students can communicate information in a more efficient manner and in a more aesthetically pleasing way, such as adding graphs and charts to a report or presentation. Proficiency of basic communication software would help students to communicate more effectively and work more efficiently in the future.

However, not everyone agrees that integrating computers into the classroom is beneficial. For instance, Dube and McEwen (2015) found that although incorporating technology in the classroom can be more engaging and helpful for some students learning, it can also introduce "challenges to cognitive load of children users" (p. 20). In other words, learning new concepts requires extra mental effort. However, this should not cause too much concern because it is just a side effect of highly interactive learning, and highly interactive programs can create environments where students learn concepts more efficiently. Higher test scores are indicating that students are benefiting from the increase in mental stimulation. Fahad Alkhezzi and Ammar Safar (2013), professors from Kuwait University, show some of these improved results in *Beyond Computer Literacy: Technology Integration and Curriculum Transformation*. Their data reveals that students with technology incorporated into their schooling significantly outscored students who lacked technology in their education. Alkhezzi and Safar even state that the group with computers

integrated into their schooling "submitted projects with better quality [and] earned higher final grades" (p. 624). Thus, students are performing better even though learning requires a higher cognitive load. Therefore, integrating computers can help many students thrive.

Adding computers to the classroom can cause another issue, eye strain. Tufan Aytac and Muharrem Duran (2016), professors from Bozok University, discuss this concern by observing that many students they studied experienced eye strain when looking at tablets too long. Eye strain can be minimized if teachers work appropriately with technology and avoid continual screen use. For example, a teacher could mix classroom interaction with technological activities throughout the day to give the students' eyes a break. By doing this, eye strain can be greatly diminished (p. 74).

Nevertheless, integrating technology by adding programming classes in the younger grades has many more benefits to education including an increase in many students' creativity and problem-solving skills. Computer science professors, Aman Yadav and Steve Cooper (2017), state in *Fostering Creativity through Computing* that computer science fundamentals help develop creative problem-solving skills like visualization, abstracting, and pattern recognition in students. Visualizing the problem helps the problem-solving process. Often when programming, coders are forced to visualize how a program works before they can create a program, exercising their ability to visualize. Therefore, if students could program at a young age, they

could learn to visualize better, improving their problem-solving ability. Also, abstracting (summarizing the big idea and breaking down problems into smaller parts) is a crucial step in creative problem-solving. Mastering the skill of abstracting helps a person to understand a problem and break it down, so the problem can be solved. Coders use this skill extensively as often they must simplify complex problems into smaller steps. For example, a coder might have to make an image of a ladybug fly, and to do this he or she might decompose the process into individual instances, such as straight flight, turning, and rolling. Breaking down a problem can help students in many other areas of problem-solving. For instance, if a student has a project, he or she can simplify the project down into smaller steps. In addition, coding teaches pattern recognition, which is crucial for creative problem solving, since being able to recognize and create patterns solves problems faster and more efficiently. Coders are forced to find patterns all the time, so they can make efficient programs that run on repetition (p. 32-33). If young students can learn the skills of visualization, abstraction, and pattern recognition in a program, they can increase their problem-solving skills, which can help in other aspects of their life, not just coding.

These skills are not the only ways coding helps increase creative problem-solving in a student. According to Annie Paul (2016), a well-respected social science journalist, programming teaches another important aspect of problem-solving, detail orientation. When implementing a solution, a person must think of every detail so that the solution works. This skill is used

extensively by coders in the debugging process as solutions imposed often do not work as expected. Therefore, coders must spend excessive amounts of time going through every little detail of code to figure out issues in their program. This skill not only helps teach students to focus on the details, a much-needed skill in problem-solving, but also helps to reiterate analytical skills as students must solve smaller problems inside their code.

Incorporating computers into the classroom would also help prepare students for the future as it exposes students to coding early. This is very important for many reasons. The computer science field is growing at an exponential rate as more processes become digitalized. Therefore, exposing students to the computer science field early is beneficial, so they can find out if they enjoy programming. Also, students would be able to hone their skills early. As Annie Paul (2016) states, "Learning coding is like learning a foreign language". By learning to code early, students have a better chance to excel in that field. Even though teaching coding in the younger grades would not make all students experts in computer science, it would expose them to enough so that, if they want to pursue a coding career, they could start young. This would help students to become much more proficient coders in the future. Even if they did not want to pursue a career in computer science, exposing coding to students would still enable them to problem solve more efficiently, as mentioned previously.

The final advantage to exposing students to the world of computer science is that it can open doors in the future for better jobs, as many jobs in computer science pay respectable salaries. For

instance, according to the United States Bureau of Labor Statistics (2017), a software developer's median pay is about $102,280 a year. There is a growing need for more computer scientists. Therefore, a decent job can help raise students out of financial distress. Annie Paul (2016) shows some examples of how Loyola Elementary School in Los Altos, California has impacted students' lives by adding programming to their curriculum:

[A student said,] 'Before taking a class in computer science, it never crossed my mind that I could be involved in or even major in that field…As a single mother who wants to create the best future possible for my child, I also think it would be great to have a job doing what I love and [one that] provides financial stability.' Writes another student: 'Economic struggles have been around my whole life. Nonetheless, I refuse to let limited resources bring me down. On the contrary, they motivate me to utilize education as a path and guide me to life-long success. I yearn to one day possess the title of [a computer] animator with an average salary of $50,281 per year. I aspire to bring my current financial struggles to an end and take care of my family on my own.'

Thus, learning to code can positively impact students' lives, not only can students find something they enjoy, but they can also make a decent living that can provide for a family. If coding was not introduced in the classroom, these students may never have had an opportunity to learn it.

In conclusion, integrating computers into the classroom would improve education because it helps provide a more engaging individualized education, create a more universal standard for

teaching, enhance students' communication skills, increase creative problem-solving, and better prepare students for their futures. Though integrating computers may not be able to fix every troubled student's schooling issues, it can help increase the range of students reached and provide superior quality of education for most students. Thus, schools from kindergarten to high school should incorporate technological learning into their curriculum.

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