Abstract: This paper gives a brief overview of past and prevalent research surrounding children who are elementary age and under ("tots"), various technologies, and how they interact in life and the learning process. This is followed by a list of pros and cons for using technology in education, according to the literature, with a focus on the three major learning theories of behaviorism, cognitivism, and constructivism. The argument that theory should be at the heart of all teaching and learning is made; childhood technologies should be used in moderation as a supplementary tool.
Tots and Technology

Introduction

There has been much debate about the role of technology in the lives of young children. In recent years, the amount of television children were being exposed to was a popular area of research. Today, the attention is turning to tablets and smartphones. In this paper, past and prevalent research surrounding toddlers, various technologies, and how they interact in life and the learning process is reviewed. After summarizing the three major learning theories of behaviorism, cognitivism, and constructivism, the pros and cons of using technology in education according to the literature are considered.

The argument here is that theory should be at the heart of all teaching and learning. Currently, less than two percent of the courses offered in university curricula in the general area of educational technology emphasize theory as one of their key concepts (Cited by Ertmer & Newby, 2011). Learning technologies are essential in today’s society, but should be used in moderation as a supplementary tool.

For the purpose of this paper, the term “tots” is used to describe children who are elementary school age and under - zero through eleven.

Learning Technologies as a Supplementary Tool

There are several ways technology can be used for learning in the classroom and at home. For those children who have not yet reached school age, educational television, mobile apps, and computer games are typical household occurrences. Students in schools are using iPads instead of textbooks, making presentations and
creative projects online, and submitting assignments through classroom webpages, to name a few.

Technology can be given to a child as a distraction or used as a supplementary tool. What’s the difference between the two? Sitting a child in front of a television, even if the program is educational, is a distraction. Using the television as a supplementary tool would include actively watching with the child and engaging them with questions about the learning program. The same is true for iPads and smartphones. Putting an iPad with an educational app in a child’s hand is a distraction, but playing a game with the child, talking, and interacting allows the technology to function as a supplementary tool.

Children of all ages are interacting with technology, but educators and parents have to decide what kind of interaction it will be.

**Childhood Use of Technology Today**

In 2005, only twenty-seven percent of 5- to 6-year-olds were using computers for entertainment at home (Vandewater et al., 2007). The most popular choice of electronic entertainment for children was television, with seventy-five percent watching TV for an average of an hour and 20 minutes per day. The researchers in this study were shocked to find that many children even had a television in their bedroom. At the same time, seventy-five percent of pre-school children were being taught how to use computers at their child care centers (Miller, 2005).

Unsurprisingly, the number of hours spent using electronic devices is on the rise. Today, seventy-two percent of children eight years old and under have used a mobile device for entertainment such as games or videos (“Zero to Eight,” 2013). Among those
children who use a mobile device daily, the average usage time is an hour and seven minutes. This time spent using new technologies isn’t taking the place of TV time though; it is in addition to TV time. In other words, the total time children spend with technologies is greater than it has ever been.

Before identifying the advantages and disadvantages related to childhood technology use related to education, a review of the three major learning theories will provide some insight on how learning takes place.

**Major Learning Theories**

Learning is a complicated process, and there have been countless attempts to categorize and define it. There are too many theories of learning to discuss in this paper. I will focus on the major learning theories of behaviorism, cognitivism, and constructivism, as they have been consistently and thoroughly implemented and researched.

Behaviorism uses instructional cues and repeated practice to produce measurable outcomes. The main goal is to create a stimulus-response relationship, which encourages students to complete the task in a specific way. Instructors use positive or negative feedback to direct the student to the correct response, and students are guided through simpler steps before completing more complicated tasks.

Cognitivism also emphasizes guiding student learning with examples and positive feedback. However, there is less focus on the end result and more focus on mental activity. The student’s thoughts and beliefs are very meaningful in the learning process. Cognitivists believe this type of learning, which includes self-planning and monitoring, allows students to transfer knowledge to different types of situations.
Constructivism is similar to cognitivism in that it defines learning as a mental activity rather than a physical response. However, this learning theory suggests that each person constructs their own view of the world through their unique experiences. Rather than being an objective science, learning is considered a subjective interpretation. Exposure to new situations allows students to build upon, and reconstruct, their current viewpoints.

According to Ertmer and Newby (2011), the question to ask is not which learning theory is best, but which one is the most effective method considering the learner and the content at hand:

Tasks requiring a low degree of processing (e.g., basic paired associations, discriminations, rote memorization) seem to be facilitated by strategies most frequently associated with a behavioral outlook (e.g., stimulus-response, contiguity of feedback/reinforcement). Tasks requiring an increased level of processing (e.g., classifications, rule or procedural executions) are primarily associated with strategies having stronger cognitive emphasis (e.g., schematic organization, analogical reasoning, algorithmic problem solving). Tasks demanding high levels of processing (e.g., heuristic problem solving, personal selection and monitoring of cognitive strategies) are frequently best learned with strategies advanced by the constructivist perspective (e.g., situated learning, cognitive apprenticeships, social negotiation) (2011, pp. 60).

With this mind, we can look at the positive aspects of incorporating technology into the learning environment from a theoretical standpoint.

The Pros: How Can Technology Contribute to Learning?

In educational technology, a behavioristic approach is common. Stimulus-response-type games are the easiest to design from a developer’s point of view. If the question is answered correctly, some type of a reward is given. This simple design is
easy for users to understand and provides motivation for them to continue playing. Scoreboards create a competitive environment to encourage users to put out their best effort. Badges, which can be described as virtual representations of accomplishing a goal or level, are also used as a motivator. Connecting games to social media accounts allows players to show off their accomplishments and challenge others to beat their highest score.

With the extremely intuitive interface of touchscreens, children are able to play games at any age. Nine out of ten of the top paid education apps on iTunes are designed for children ages four and up (Hernandez, 2014). Proponents of childhood technology argue that these apps and activities promote creativity, number sense, and phonetics. Games designed around experiential learning, although less common, can create a more interactive environment for students. For example, Second Life is a virtual world where learners are able to create avatars representing themselves and socialize with other users.

The “flipped classroom” is a recent trend in education in which lectures and homework are reversed. For example, teachers will pre-record their lecture and ask students to watch or listen at home instead of in the classroom. Then when they return to school, class time is spent working out problems together and engaging in discussion on the topic at hand. This is especially helpful for teachers whose students don’t feel like they get enough time in class to really understand the subject. Assigning the lecture as homework allows teachers to spend time with students who need more attention or instruction. This increased interaction between student and teacher during class time can also allow for better assessment of student knowledge.
In past years, the availability of technology in schools was a concern. Many inner-city schools did not receive funding for the latest and greatest gadgets, which put some children at a disadvantage. Now, technology is widely available in schools across the country thanks to federal and state grants. “The challenge for schools is not in acquiring computers or obtaining connections but in finding meaningful and useful content or instruction” (Molenda & Sullivan, 2002, pp.15).

Virtual schools are also becoming popular, especially for children with physical disabilities and those who are homeschooled. This can relieve pressure for parents who have trouble with teaching their children but don’t want their children in public schools. But is a fully-online education healthy for elementary-aged children?

The Cons: What Negative Impacts Might Technology Have on Children?

Miller (2005) took a stand against technology in the classroom, stating that the crucial skills children need to develop—including bodily coordination, regulating emotions, and understanding social situations—require personal interaction. He argues that time spent alone playing on a computer or smartphone is time taken away from conversations with parents and other children. Technological literacy at a young age also takes away from creativity, said Miller (2005, pp. 55), “Educators report that many children that are adept at playing video game, pushing buttons, and operating a mouse show an alarming lack of imagination.”

Other researchers also believe exposure to technology at a young age can have negative impacts. As the number of hours spent watching television rises, so does the risk of childhood overweight (Jordan, 2007). This is primarily because watching television is a sedentary activity, and low levels of physical activity increase the risk for
obesity. Although there is a lack of research concerning the number of hours children spend using tablets, smartphones and computers, these are also sedentary activities that could increase the risk of childhood overweight.

When they get older, shorthand language learned through texting and communicating via social media may also affect children in the classroom. Many teachers complain that children are using phrases such as LOL (laugh out loud) and BTW (by the way) in written assignments and emails. Students think using slang words in the classroom is appropriate because they see them online on a daily basis. When teachers allow the use of social media and online applications for school-related assignments, it can be hard to change the way students are used to interacting with one another through these platforms in their personal lives.

The urge to check social media can also be tempting for students when using technology in the classroom. Playing games and surfing the web are also big distractors.

Lack of teacher training is another big concern. Teachers are in control of which technologies they integrate in the classroom, but many schools are lacking in technology training programs for staff. Many times, students are more knowledgeable than teachers when it comes to the newest technologies. This can cause problems if teachers aren’t aware of the games and programs their students are accessing.

**Can the Research Keep Up with the Technology?**

By reviewing the research, we see how various technologies can produce both positive and negative results. But how can we know whether the latest and greatest gadget is harmful for children if we have to wait several years for the research studies to
take place? At the current rate of advancement, there is no way the research can keep up with the technology. New forms of media are often celebrated and adopted without much consideration. Molenda and Sullivan (2002) give a nice summary of the process, whether dealing with film, radio, television, or computers:

“The new medium emerges with great fanfare. Public pressure builds to employ it in education. Schools and colleagues acquire the hardware needed to enter the game. Software lags behind. Instructor adoption lags even further behind, but it eventually grows to substantial proportions before plateauing; however, it never reaches levels predicted by the cheerleaders.”

Instead of adopting new media haphazardly, we can consider what has happened in the past and attempt to build upon it. Our technology grows much quicker than our literary databases, so we must make do with the research we have. For educators and instructional designers, taking a cognitivist approach to technology integration can be of benefit. First, we must understand that each individual has his own interpretation during the learning process. Then we can apply the knowledge we already possess to predict what might happen in the years to come. Surely, future research on tablets will help us understand their impact better, but in the meantime we can use the lessons we have learned about television and computers to make inferences.

A decade ago, Clark (1994) made the same point, noting that instructional designers were more concerned with media and design than learning theory. Each new technology should be adopted with the same basis of research in mind, but instead, “we reinvent the wheel constantly but inadequately” (1994, pp. 8). Instead of focusing on the
process of learning, we feel as though we need new research to discern the effectiveness of the latest and greatest technologies.

More recently, Bennett and Oliver (2011) made the case for a decrease in “hype and excitement” and “common-sense assumptions” in educational technology research. Although practical research can be useful, relating research to theory allows for critical interpretation based on previous work.

**Conclusion**

Technology shouldn’t determine the way we teach and learn. Instead, learning theory should always be the backbone of the lesson. This way, the content stays the same and the method stays the same; the only difference is whether we use technology as a distraction or as an aide in the learning process. The basic subjects we want children to master in grades K-5 have not changed since the invention of the internet. Using technology as a supplement to the core curriculum allows us to connect with them and keep them interested. Refusing to using technology puts a bridge between us. Of course, the challenge is to use it as a supplemental tool rather than letting it distract from (or take over) the content.

There should also be an element of personal interaction to provides students with memorable experiences and a break from the screen. Letting students interact with each other gives the opportunity to develop and cultivate social skills. Incorporating these types of activities also encourages an active lifestyle, which can combat the overuse of technology.

It comes down to moderation and variety. Students shouldn’t be allowed to spend the entire day using technology, but it also wouldn’t make sense to engage in only
interactive group activities. Technology in education is inevitable, and technology literacy is an important skill to have in today’s job market. But variety is key in keeping students active and engaged in the curriculum. Most importantly, the application of learning theories, depending on the learner and the task at hand, is essential whether technology is being used as a distraction or as an aide in the learning process.
References


