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Social Media: Effect, Affect, Teens, and Possible Addiction

Bhairavi Bandekar
Montgomery College Rockville Maryland

Etsube Mesganaw Yitbarek
Montgomery College Rockville Maryland

Karla Lopez
Montgomery College Rockville Maryland

Cathy Tran
UTD

Elizabeth Momoh

SPONSORING PROFESSOR: Shawn Carraher
AUTHOR NAME: Cathy Tran
E-MAIL: cathy.tran@utdallas.edu
TITLE: The Effects of Technology on K-12 Students
ACADEMIC AFFILIATION: University of Texas at Dallas

The Effects of Technology on K-12 Students

Cathy Tran, *University of Texas at Dallas*

Extended Abstract

Purpose

This paper presents a case study on groups of K-12 students who are taught using innovation-centered teaching where curriculum is based on optimizing individual creative inclinations to create a simulation of product development to learn subjects that are taught in traditional classrooms. The groups consist of students from a diverse set of cultural backgrounds to gain a more well-rounded sample of how students learn using technology. The aim of this paper is to showcase methods that teach students to communicate their ideas effectively, formulate designs, and execute ideas by tailoring curriculum to a student's natural aptitudes; students can find more fulfillment and develop critical skills for success after their academic career.

Design/methodology/approach

The data was collected through case studies of groups of 15-20 students from three different student populations. Data was gathered from a group study of Kindergarten to Grade 5, Grade 6 to Grade 8, and Grade 9 to Grade 12. The studies were adapted to the different age groups as well as to students born internationally. Data collected from students that were born internationally are measured to the students who were born in the United States. Fixed variables were the group size of 15-20, education level, and cultural background. The variables that we changed per group study was the method of teaching difficult concepts using the traditional method used in US schools and the other method using technology and artificial intelligence and machine learning. The data was collected both face-to-face and via survey instrument.

Findings

The findings showed that the amount of passion and enthusiasm the students exhibited during the technology based learning strongly correlated to how fast students were able to connect the material they learned and relate it back to their own lives. Students who were more passionate about the topic, learned the material faster and retention was much higher.

Originality/value/contribution

The current study is original in that it uses case studies with little changing variables to find patterns in how students learn and how ineffective the current education is compared to an innovation and project based learning style. The study is also original in the way that it collects data from students living in the US, but may not have been born in the US, these groups are

impacted by influences at home from parents who have their own cultural identity, as such, learning styles are impacted and need to be adapted to these groups.

Introduction

Technology is an exponentially revolutionizing tool that has pushed all aspects of society to adapt and grow in the time known as the "Information Age". The way that humans process information, and the speed at which humans can process information, with technology allows humans to grow more efficiently and effectively. Technology is continually designed to become more optimal in business environments where the amount of money and resources are dependent on the efficiently and effectiveness of product development. Similar methods of innovation using technology can be applied to public education teaching to optimize learning in the traditional grade levels of kindergarten to grade 12 (K-12). Unlike business environments, traditional education environments have been slower to adapt to the usage of technology and innovation-centered teaching. As such, a fundamental weakness of traditional education has been the inability for students to retain information learned past the duration of an academic career in K-12, as well as using standardized examinations as an only means of testing knowledge retention and comprehension of information learned through one's academic career. The structural weakness of a traditional education environment is that it does not have the resources and the means to implement widespread individual based teaching, whereas, technological innovations can provide individualized curriculum using artificial intelligence and machine learning. The ability for technology to learn how a user best processes information and then adapt this to the user allows for optimization of knowledge retention and eliminates the need for less efficient and effective means of measuring knowledge and performance through standardized testing.

The US public education system is traditionally divided into three separate schools for students. Students ages 5-10 go to primary school, also known as Kindergarten to Grade 5, ages 11-14 go to junior high or middle school, also known as Grade 6 to Grade 8; and ages 14-18 go to high school, Grade 9 to Grade 12. The current US public education system is similar to a "factory model" during the Industrial Era.

The special education system in the United States is for students who have difficulties with staying focused, as well as difficulties with reading, comprehension, or writing. As such, the special education system in the United States can be limited in how it can provide quality education for students in public special education programs. These students do not have as many opportunities to work with projects utilizing technology compared to students not in the special education program. These students learn in different ways, but can still benefit from utilizing project based learning to cultivate their innovative skills as well as to help them develop their cognitive skills, or "21st century skills". "Development of *inclusive special education* aims to provide a vision and guidelines for policies, procedures and teaching strategies that will facilitate the provision of effective education for all children with special educational needs and disabilities." (Hornsby, 2015).

Literature Review

Students who are placed in the English Second Language program, referred to as the ESL program, are often children of parents who did not grow up in the United States. There are cultural differences that need to be taken into consideration when teaching students in the ESL program.

For example, in Hong Kong, a project called The Dim Sum and Chinese Restaurant Project involved children working with each other to create a Dim Sum restaurant. A group of 20 kindergarten teachers created a program to teach using a project based learning approach. The kindergarten students were able to create their own concept using the theme of "China" and the students discussed with each other until they began to share their experiences of going to dim sum restaurants with their parents. The importance of the Dim Sum Restaurant Project is that the students were able to develop skills because they were passionate about their project. (Katz, 1995). The ability to tap into the passion of an individual allows them to be more innovative because they are willing to work harder on their project and invest more into it.

Pellegrino and Hilton support the idea of "deeper learning" in classrooms, and they define deeper learning "as the process through which an individual becomes capable of taking what was learned in one situation and applying it to new situations" (Pellegrino & Hilton, 2012). Deeper learning allows students to develop critical thinking and problem solving skills that give students the ability to learn more efficiently and effectively.

However, the US public education system is limited by the methods it can teach students innovatively. According to the National Center of Education Statistics, the existing "educational policies and associated accountability systems" utilize standardized assessments and examinations to assess what knowledge students are retaining. However, the limiting factor of these assessments is that they teach students to put more importance into rote memorization and their knowledge is limited to what is needed to succeed on the standardized tests, rather than understanding concepts and theories in ways that are important to students. As such, students will forget the "knowledge" that they learned if it is not utilized. Applied knowledge in different, but similar scenarios that they have learned allow students to truly learn rather than focusing primarily on recollection of facts and procedures.

Children are naturally innovative and have a natural inclination towards creative thinking. However, the current implementation of the United States public education system puts more value in a generalized understanding of a diverse set of subjects, rather than an individual's natural inclination towards a subject they are passionate in. For example, students take a minimum of five classes each year starting from Grade 1. The majority of K-12 academic institutions are required to have 180 days of instructional time, and these days are divided into two 18 week semesters. As such, students will be required to take a mathematics, social studies, english, science and other elective classes. This system of education can make it extremely difficult for students to learn concepts because it forces students to go from subject to subject each academic year, rather than allowing students to have a smooth continuation of what they learned in their previous academic year to transfer into their coming academic year. The skills that are acquired in a professional career are useful and valuable because it allows for a

continuation of knowledge to be transferred and utilized, which enables the "deeper learning" that Pellegrino and Hilton supported.

The findings of the case study found that students, specifically Kindergarten through Grade 12 showed that the amount of passion and enthusiasm the students exhibited during the technology based learning strongly correlated to how fast students were able to connect the material they learned and relate it back to their own lives. Students who were more passionate about the topic, learned the material faster and retention was much higher.

The topics that students were tested on in the case study were the 7 main courses that students take throughout their career in the US public education system as mandated by the government. These were: Science, Mathematics, Literature, Languages, History, Government, and Music. These were topics that found significant improvement in retention and what the study found as "passion learning" measurable by three factors. The willingness of students to spend their own free time on the topic after implementing the technology aspect, the innovative solutions that came out of that and we measured this through the amount of tangible projects that came out of the learning and this was measured through the course of 8 months, which is typically two semesters. Thirdly, we measured the optimistic attitude of students before and after the study.

From *A Systems Perspective on Creativity*, Csikszentmihalyi states that "at the level of the individual, individual people (or groups/teams) produce creative work, ideas, art, or new discovery. But creativity does not happen there alone. Creativity is affected at the level of domains, which are areas of specialized knowledge (e.g., mathematics, biology, physics, art, law, and more)." (Csikszentmihalyi, 1999). This is where the case study pulled the idea to measure innovative creativity using technology and having statistics that take the level of creativity gauged when students learn in a classroom setting. This is important because as Csikszentmihalyi mentions, creativity does not happen alone. The back and forth of innovation is necessary and this is often only be done by having fellow peers to improve one's ideas.

However, creativity is difficult to assess due to its nature. As such, Henriksen developed an array of assessments such as, psychometric vs. behavioral, process vs. product, individual vs. group, domain general vs. domain specific. These assessments were used to develop the database of curriculum used in the case study for students to accurately replace standardized tests as a means of assessment.

Further developed by Henriksen for each assessment: "Psychometric vs. Behavioral, most creativity research has focused on identifying psychometric characteristics of creative individuals. At the other extreme are behavioral measures of creativity." (Henriksen, 2016). "Process vs. Product, this distinction is important in the classroom where the teacher may focus learning processes for creative solutions. A product is concrete and more amenable to evaluation, but process may be more important to teachers since its respects the whole learner." (Henriksen, 2016).

One of the most influential findings of the case study was that each student has their own natural inclination to what is most effective to their learning curve. As such, a diverse array of

assessments is crucial to effectively assessing a student's ability. However, our current education system only utilizes the method of standardized testing, where in a majority of educational facilities, they use pencil and paper with a choice of multiple choice or essay style short and long questions. "In considering both creativity and technology, assessment has to consider how to navigate between and consider both product and process, for effective, creative uses of classroom technology." (Henriksen, 2016).

There is also "Individual vs. Group, this is particularly important in contexts where teachers give students open-ended, group projects. These projects are more authentic, but prevent the easy assessment of the individual contribution, which has typically been the mainstay of assessment in schools." (Henriksen, 2016). Lastly, Henriksen uses "Domain general vs. domain specific, this is an ongoing problem and dispute among most creativity researchers. Evaluation becomes more challenging unless we start from a place of solid agreement on whether creativity is located specifically within domains, or whether it is a more general and extendable thing." (Henriksen, 2016).

These four assessments allow for a well rounded assessment that encompasses a multitude of student inclinations. Although, this is not the most comprehensive, it can be a start and with technology and artificial intelligence, assessments can be made for students rather than students learning towards the assessment. Sternberg noted that "creativity is available to everyone, but is most prevalent in young children. As he states, creativity "may be harder to find in older children and adults because their creative potential has been suppressed by a society that encourages intellectual conformity" (Sternberg, 1999, p. 93).

Project Based Learning

Project based learning (PBL) has been implemented in most public schools throughout the nation, and the effects of PBLs support the idea that students are more passionate about project based learning because they get hands on experience and more control over their creativity. During the case study, multiple researches were reviewed on the effects of project based learning and it was found that, "PBL has been widely used in medical and postsecondary education to develop learners' abilities to apply their knowledge in real-world settings by working collaboratively on meaningful problems. However, relatively few studies have investigated uses of PBL in science and mathematics education at the primary to secondary levels (ages 5–14)" (Merritt, 2017). There is some difficulty with assessing PBL and as such it was studied that in order to determine the effectiveness of project based learning. "Four main themes emerged: (1) academic achievement, (2) knowledge retention, (3) conceptual development, and (4) attitudes." (Merritt, 2017).

In *Children First: an alternative approach to assessment,* Peacock analyzes the assessment culture and its effects on children. She mentions that grades set a ceiling for children and that they create limitations on learning. "In terms of assessment, my intention is to lead a school where the art of the possible feels within reach, where amazing things can happen if we refuse to set a ceiling on children's learning." (Peacock, 2016). This is an important step to recognizing that the US Public Education system could heavily benefit from utilizing new technologies to change the way that we teach our children. Peacock states that, "we recognise that children

rehearse, refine and extend their thinking when they express their opinions or seek to explain ideas." (Peacock, 2016).

Peacock goes on to give examples of several ways that learning assessments can take place without grades and this is a crucial step in her way of finding methodologies for teaching children that do not include graded assessments. "In our Year Two class recently, the children were all filmed individually for several minutes talking about their learning. These mini films were then shown on the teacher's laptop at the beginning of family consultations. Whether or not the child was present at the meeting, the tone was set for a discussion about learning as opposed to grades." (Peacock, 2016). Similar to our case study that included the variety of students from K-12, this mini study utilized Grade 2 students and heavily emphasized the goal of learning rather than testing. She used films which are a combination of auditory and visual senses for students to draw from.

"In Year Five and Year Six, we arrange Learning Review meetings twice a year. These meetings take place in the head teacher's office, with the child leading a discussion about their learning challenges and successes using several PowerPoint slides that they have compiled. This prompts a rich and very positive discussion between the child, the head teacher, teacher and parents about how everyone can support the child's future learning." (Peacock, 2016). She utilized Grade 5 and Grade 6 students in a more advanced way than she did for Grade 2 students by utilizing Microsoft PowerPoint in her projects. These tools like Microsoft Word, Excel and PowerPoint enable students to combine what they have learned and then implement it into a completed solution that is tangible like a PowerPoint slide.

Lastly, Peacock tied all of the learning materials that she used in class and used detailed feedback from families in a concise conference meeting. "...grades are not part of the discussion. There are several examples of these films on the school website, along with films of children talking about our approach to choosing tasks as opposed to being placed in 'ability'-based groups." (Peacock, 2016). This can be useful for younger students, especially before high school, which is Grade 9 to Grade 12. Younger students can receive a lot of support from their guardians and by having schools supplement what students are being taught in school with what they are being taught at home, it can prove to be a powerful foundation for learning. However, this method of including family feedback may not be as powerful within older students in high school or beyond.

Case Study

The data was collected through case studies of groups of 15-20 students from three different student populations, total 51 students participated. Data was gathered from a group study of Kindergarten to Grade 5, Grade 6 to Grade 8, and Grade 9 to Grade 12. The studies were adapted to the different age groups as well as to students born internationally. Data collected from students that were born internationally are measured to the students who were born in the United States. Fixed variables were the group size of 15-20, education level, and cultural background. The variables that we changed per group study was the method of teaching difficult concepts using the traditional method used in US schools and the other method using technology and artificial intelligence and machine learning.

As aforementioned, the findings of the case study found that students, specifically Kindergarten through Grade 12 showed that the amount of passion and enthusiasm the students exhibited during the technology based learning strongly correlated to how fast students were able to connect the material they learned and relate it back to their own lives. Students who were more passionate about the topic, learned the material faster and retention was much higher.

The topics that students were tested on in the case study were the 7 main courses that students take throughout their career in the US public education system as mandated by the government. These were: Science, Mathematics, Literature, Languages, History, Government, and Music. These were topics that found significant improvement in retention and what the study found as "passion learning" measurable by three factors. The willingness of students to spend their own free time on the topic after implementing the technology aspect, the innovative solutions that came out of that and we measured this through the amount of tangible projects that came out of the learning and this was measured through the course of 8 months, which is typically two semesters. Thirdly, we measured the optimistic attitude of students before and after the study.

All the data was collected both face-to-face and via survey instrument. One example of a curriculum developed using technology to teach a topic, Computer Science, is linked below. The code is to teach students how to encrypt a message or text and this was beneficial because students were able to learn at their own pace and use different messages of their own choice. This was only one of many methods that we used to study how students learn with hard topics such as Computer Science. Often in classrooms, Computer Science is only taught in high schools for Grade 11 and Grade 12 because of the difficulty level. We used this one students from elementary, middle school, and high school with the only changing variable being the way it is taught. Elementary and middle school students are taught concepts rather than actual code. High school students get taught the conceptual background and then implement it using code. We found that it was harder for students to implement it than to understand it and that during the transition between middle school and high school, which is typically Grade 8 to Grade 9, that the learning maturity of students increased and that it was much more effective to have students implement during Grade 9 through Grade 12.

Another study that was done using History as a topic had influential findings. We took the majority of students who were middle school students and high school students and had them choose a topic of their choice from any historical nonfiction event. It could be from any country and about any person as long as it was historical. We had them make a poem about their person and perform it, similar to how spoken poetry works. We introduced project based learning through this because students were able to have complete creative control over what they wanted to research and by presenting it, it gave them ownership over their project, which in resulted in much more high quality work. Some students presented in traditional outfits from other countries, they learned a breadth of knowledge from their topic and things surrounding their topic. It was found that a majority of the students in the case study learned more efficiently when allowed to do their own research on their own topic of choosing. They were more passionate about their topic, willing to spend more time and effort into their work, and they were excited about presenting. This matched three of our measures for successful learning.

From this curriculum, languages like Python, HTML, CSS, and other high demand and difficult topics were taught to high school students in preparation for their academic college careers outside of their K-12 careers. These were open source and this allowed students to work on their own projects at home at their own pace. Similar to how individuals enjoy the ease of utilizing Google to find answers or YouTube to search for a quick instructional video, education should utilize emerging technology to maximize its effects on students and allow students to maximize their potential in academia and as future resources to the workforce to create highly skilled, creative and talented critical thinkers.

Findings

Aside from the findings of the case study that found that students in K-12 showed an increased passion and enthusiasm for their typical school courses in 7 main courses that students take throughout their career in the US public education system as mandated by the government. These being: Science, Mathematics, Literature, Languages, History, Government, and Music. These were topics that found significant improvement in retention and what the study found as "passion learning" measurable by three factors.

Utilizing three main factors: (1) The willingness of students to spend their own free time on the topic after implementing the technology aspect, (2) the innovative solutions that came out of that and we measured this through the amount of tangible projects that came out of the learning and this was measured through the course of 8 months, which is typically two semesters. (3) We measured the optimistic attitude of students before and after the study through a survey.

Aside from the three main factors that were utilized for measurement, a comprehensive survey was made that helped to measure how students felt the program affected their project management skills, design skills, marketing, communication, team work, and deliverable results. This impacted students better at the higher level in high school, as they found that having deliverable reports was very important to them since they wanted to know that what they were learning actually made an impact on their lives and would benefit them after their K-12 career.

Bauer found that "utilizing metaphor analysis, students' elicited metaphors were studied to determine their conceptualizations of technology in order to gather useful information about how technology is impacting their literate lives and how educators can best bridge common out-of-school literacy practices with academics" (Bauer, 2017).

Additional findings from the case study found patterns in how to stimulate students best. For most developing individuals, there are 7 main senses that people use on an everyday basis for the general population. These include, but are not limited to: spatial, auditory, linguistic, kinesthetic, mathematical, interpersonal and intrapersonal senses. The general definition of these senses for visual learners is when visual learners learn best through pictures, images, and spatial understanding. Aural learners learn best through sound and music. Verbal learners learn best through words, verbal and/or written ideas. Physical learners learn best through experience and rely on their sense of touch. Logical learners learn best through logic and reasoning. Social

learners learn best through group interaction and thrive in peer groups. Solidarity learners learn best through self-study and learning on their own.

Through the case study, it was found that students must have at least two senses met in order to learn effectively. This means that if a student is naturally inclined towards being a visual learner, and this can be measured if a student find that they learn best, for example, when a professor writes problems on the board and the student finds it best for them because it "clicks" when they see what they are being taught. However, only having their natural inclination met will not enable students to learn to the maximum of their potential. Further research will be conducted, but this is theorized to be because cognitively, students must engage several parts of their brain when learning in other to properly absorb and understand topics. This was found in their introductory survey at the beginning of the program to find what they learned best with and what style of learning best suited them and then also if the current education system fit those needs for them.

In further study, I would like to accurately identify exactly how many senses should be activated in order to reach maximum potential. The general idea from this case study is that the more senses that are successfully engaged, the better for a student. In career environments, adults are challenged every day with different sensory tasks and because of this, adults are able to excel. These sensory tasks should be brought into the classroom environment, so that students can become more familiar with what works best for them as a unique individual.

Mathematics is one of the most difficult topics to teach in K-12 and it has shown in the US comparative to other countries the struggles that our students face with logical classes. Most of the issues are with the way that students are taught conceptually and it starts within the classroom and with the teachers. Often times, in K-12 education, teachers and instructors do not have an impact on the curriculum, standardized tests or what and how they can teach. "Research shows, contemporary students favor communication when using technology, whether by computers, social media, handheld devices, or instant messaging, and this study reinforces the need to explore the variables that may contribute to maximizing the learning potential for students in mathematics." (Letwinksy, 2017). As such, it is important to take away from this case study that teachers and instructors should be able to give real time feedback and given more control over the structure of curriculum because teachers are the only ground level assistance available to struggling students. Teachers understand exactly what their students need because they work with their students on a daily basis.

Utilizing machine learning, teachers can even find statistics and test several methodologies throughout the course of their academic school year and this will help teachers become more effective and efficient when teaching their students. However, as curriculum builders, there is some negative aspects over technology as the negative effects such as: apathy, boredom, and arrogance can come from the high usage of technology within today's society. "The discrepancy revealed by this study between teachers' attitudes towards technology and technology use deserve a deeper examination to determine why mathematics teachers are not integrating more communication technology into their mathematics practice and how teacher beliefs play into this shift." (Letwinsky, 2017).

Technology can be extremely beneficial in a classroom environment or for curriculum makers to take into consideration how technology could change the way that students learn, read, and contribute.

For example, in a gym setting where physicality is the learning goal, technology can be used to benefit students. “Dartfish is a popular motion analysis software program. It is essentially a video-recording technology package that allows for immediate feedback to learners (and/or subsequent movement analysis) using digital video” (Robinson, 2017). This game was able to improve physical education and help students learn much better because of the interactive nature, which comparing to our findings in the case studies, show that the multiple senses engaged helped improve student retention and passion. The Dartfish game was able to engage visually, physically, and socially.

As part of planning, the teachers needed to choose a specific area of inquiry into their practice, such as an area of need. The teachers decided to inquire into the flipped approach in the mathematics classroom. The aforementioned study is similar and has similar goals to the case study of technology’s impact on K-12, but that study used it in the specific environment of math.

“Higher-order thinking has long been confirmed as a critical predictor of success, both in academia and the workplace. Widespread endeavors to foster higher-order thinking have involved implementing instructional design interventions that engage learners in complicated cognitive activities.” (Choi, 2017). Higher thinking and deep thinking are important and are not fully utilized in the current education system. Students need to be able to tap into their cognitive environments in order to fully learn material effectively.

Similarly, studies have shown that well-designed technological tools, when used correctly and effectively in educational environments, there are positive impacts for students conceptually and cognitively. (Sen, 2017).

“Teacher trainees and lecturers clearly indicated that solving problems in multiple ways is valuable in developing thinking ability for both students and teachers, encouraging creativity and increasing the quality of teaching”(Stupel, 2017). This similar study showed that it is important for teachers and students to be both in the interactive process of learning. This will increase the quality of education and cultivate innovation.

Earlier, mathematics was mentioned as a difficult topic and one that the education system struggles relentlessly on to find curriculum to that is suitable for the majority of students. Science is another difficult topic, that has the same pitfalls as math in classrooms. In a study, science and rational thinking was practiced through unconventional methods utilizing technology to model virtual projects and this allowed students to be more comfortable with science and to enjoy it. “Scientific reasoning skills can be acquired through technology-enhanced inquiry tasks or video modeling examples showing how to conduct virtual experiments”(Kant, 2017).

It was found that focus was one of the struggles that both teachers and students face in a traditional classroom setting. Students spend an average of 9 hours a day in school for classes, lunch and breaks in between classes. 9 hours is a typical working day in the American culture. Students get worn down in these long and tedious hours and their creativity and engagement drop as the day gets closer to the end. “Temporal focus is understood as one component of an individual's time perspective, and is defined as the attention individuals devote to thinking about the past, present, and future”(Chishima, 2017). Focus is crucial in order to successfully teach children and individuals.

These similar studies show similar patterns and findings to the case study that was conducted on a smaller scale with 51 students across the range of K-12.

Conclusion

In conclusion, education should incorporate at least 2 major senses in order to effectively teach students and as students get older and are placed in higher level learning, these senses will become more complex and cognitively used.

A possible technology that can be implemented in classrooms to be powerful than current tools is visual learning aids utilizing virtual reality to reach more sensory perceptions for students. The usage of of Virtual Reality to give students more sensory fulfillment. Artificial intelligence and machine learning are two emerging technologies that can be used to heighten student engagement and retention when learning. Utilizing bots and having a cloud database for student statistics to be reached anywhere could help students find their weaknesses and strengths and align their decisions with these statistics to become a better academic scholar.

Pulling in more networking professionals from companies and adding outside classroom supplements, this can be beneficial to add to the study because students will be able to connect to interpersonal and intrapersonal senses and also get real world experience from industry professionals.

Additional aids to provide the emotional impact and supportive community needed for students to thrive. This can be found in their fellow peers or teachers. Aids in giving the value and impact of learning, where students can create projects that they take in pride in can be powerful and effective for students to learn tangible skill sets like project management skills, design skills, marketing, communication, team work, and deliverable results. “Individual preparation has been shown to motivate participants, activate prior knowledge, reduce process losses and promote unbiased arguments. Argumentation scripts can support quality of argumentative discussions and evidence-based argumentation.” (Tsovaltzi, 2017).

In the future, this study can be performed on university students, undergraduate and graduate level students to see if this is applicable to them. If this study were performed, it would need additional information like age groups and personalities of those age groups since every generation has a different understanding and grasp of technology. University has a larger and more diverse pool of participants than K-12 because K-12 students are typically age 5 to age 18,

whereas university students can be any range of ages and that would need to be taken into consideration.

Future recommendations for study is to dive deeper into the creativity of students and find tangible metrics to accurately measure how students can apply their innovation to a project and how the government can centralize learning, but not stint it. “Three components: person, field and domain, each component is a necessary factor in creativity,but not sufficient in itself to produce impact or valuable novelty. Creativity exists as a dynamic process emerging through a system of interactions.” (Chi, 1999).

Research in education is extremely crucial and as Beall mentions, many different countries are pooling money and resources into education because education is a foundation for a country. All citizens learn and have had mentors and teachers by their sides, it is important to maintain an educational system is always adapting and flexible to the needs of the people (Beall, 2017).

Additionally, the study had differing results for students that were in English Second Language programs or disability programs; however, in a future study, additional metrics and assessments can be made to help work with these groups effectively because all students are different and this case study has shown that individuals respond infinitesimally better when they feel that a system is made for them personally. For future studies on disability students specifically, “assistive technology interventions can be helpful for adolescents and adults with learning disabilities, but interventions need to be carefully compared, and customized to the individual.” (Gordon, 2017).

Our case study results show that students thrive in environments that are unconventional, utilize technology and play to their strengths. Individualistic technology and methods work best with students instead of a one size fits all type of education. Often times the standardized tests only engage one sense, the visual sense of writing and reading, but it is unable to fully capture the focus of students due to its nature. “Results showed that students experience increased involvement and interaction, that they found the didactical use pleasant and that they were convinced of the need for future use of mobile technology in daily education practice” (Daele, 2017).

Lastly, a finding that was common in other studies and proved true in our case study was that students will inevitably struggle at certain topics while other students excel at them. Inclinations are important to analyze and to understand that some individuals will never fully be comfortable with math and another may never be fully competent at literature. These need to be taken into consideration to formulate assessments that capture all student needs. A study found that, “students were competent when replicating demonstrated pattern making procedures, but struggled to transfer knowledge to different situations” (Cavanagh, 2017).

In conclusion, students need stimulation and an environment that cultivates the desire to find, understand and question topics. Our K-12 public education system is unable to provide this at all times to all students, but through the use of technology, new methodologies and assessments can be made to help all students of all backgrounds, mentalities and strengths to reach their maximum potentials.

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