

Computer Assisted Education: How Technology Works to Serve Students

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1. Abstract

This paper contains information about computer assisted education and will explain how technology can be used to help meet educational goals. This paper will discuss the problems that new technologies like machine learning, artificial intelligence, robotics, and others may be able to solve, and it will give an in depth explanation on how all of these different technologies are created, how they work, and what they do. This paper will touch on the importance of having access to the technology that is used to deliver computer assisted instruction. It will give an overview of technologies available to assist in educational settings, including; applications, software, online learning environments, 3D printing, robotics, and other technologies. Implementation of computer assisted instruction will also be discussed. In this paper, the best practices for delivering computer assisted instruction will be addressed, as well as, security concerns that may exist regarding computer assisted education and how to provide security to student data. Tools and strategies will be discussed on implementing technology into curriculum. Finally, the benefit that computer assisted education offers to students will be discussed. Finally, this paper will give implications for further work in these technologies so that further development can happen for computer assisted education.

Index Terms—

Software: the programs and other operating information used by a computer.

Hardware: tools, machinery, and other durable equipment of a computer.

computer assisted education: Any use of computers to aid or support the education or training of people

human-computer interaction: the design and use of computer technology, focused on the interfaces between people and computers

Computer Applications: a software program that runs on your computer. Web browsers, email programs, word processors, games, and utilities are all applications.

Computer add-ons: Refers to a product designed to complement another product. For example, there are numerous add-on boards available that you can plug into a personal computer to give it additional capabilities.

2. Introduction

The benefits to computer assisted education are endless. Computer assisted education in classrooms can lead to more motivation and interest in the subject material for students. Computer assisted education can also allow teachers to present information in a variety of ways so that all different types of learners can understand material in ways that make the most sense to them. When computer assisted education is used in classrooms whether it be through video, presentations, virtual reality, 3D printing, or robotics, it leads to higher motivation for students to participate in learning. This may be because the learning is made easier for them due to computer assistance. This higher motivation, though, leads to better engagement, persistence, and effort on the part of the students.

Robots can be used in classrooms to create this type of motivation for students. There have been proven studies where Chinese speaking students are learning English faster and easier with the assistance of robots. These robots engage with students and act as social partners in the learning of the English language. There is also research being done on robots being used to deliver teacher created presentations and material. The robot would be able to combine multimedia objects and engage and motivate students using the material. The robot may also supplement the material with audio (Chin, Hong and Chen, 2014).

There is also a social aspect connected to computer assisted instruction that makes it valuable. Engagement and collaboration play a big role in the educational outcomes of all different types of students. It seems that the more students were able to interact using computers with both peers and instructors the better the educational outcomes were. Computer assisted education supports this type of interaction easily. Synchronous online learning environments are an example of computer assisted education being used to facilitate collaboration that leads to higher engagement of students. Multi-user environments allow for collaboration, and engagement in students is found to be higher when using these types of environments. This is because virtual real time instruction can be provided to students and computer interfaces can be used between students for interaction. These online environments can also be

a place to practice newly acquired skills which is great for the reinforcement of subject material. This shows that a social presence is still important in computer assisted instruction because it leads to higher engagement. When this is coupled with computer generated feedback on learning outcomes, students are really set up for higher rates of success (Claman, 2015).

With the help of computer assisted instruction, classrooms and learning becomes more student centered. There is software available to help students who are struggling in areas like reading, mathematics, and science. This type of software can offer students the supplemental instruction that they need and they can work at their own pace and skill levels. Teachers can also use computer assisted instruction in their own classrooms to offer student paced instruction. A student who is performing well on assignment and moving through material quickly can be easily provided with enrichment activities. A student who is struggling can be offered more time and support to complete assignments. This has been shown to lead to higher performance, as well (Tolber, Ernet 2015). Through using this technology, students learned concepts interactively. There was also a self-evaluation tool available for students to use embedded in the software. After using the software students rated that they had a better understanding and better feelings toward electricity (Tatar, N., Akpınar, E., & Feyzioğlu, E. (2013).

Overall, computer assisted instruction can help students at all levels and with all different abilities and learning styles. This is because computer assisted education provides more opportunity to differentiate instruction for students. There are also higher levels of engagement recorded in the use of computer assisted education for all students.

Computer assisted instruction has also been proven to help students with disabilities and special learning needs. This is because computer assisted instruction is diversified instruction and can help students with autism, learning, hearing, visual, physical, and intellectual disabilities. There are more tools available to these students and their educators with computer assisted instruction, and these tools can be used for intervention (Weng, P., Maeda, Y., & Bouck, E. C. (2014).

This paper will discuss how technologies can be created specifically to assist students in meeting learning goals and for education. I will explore how robotics and software can be created to assist in student learning. I will discuss how artificial intelligence should be used and created for education. I will also discuss how machine learning tools are beginning to alter the education tools that are already available. This paper will go in depth on how artificial intelligence and other technologies can be used to collect data on students, identify their gaps in knowledge, and then create tailored instruction for individual students. Overall, this paper is going to discuss various technologies and environments and give an in depth view on how they work in an educational setting. I will also discuss how these technologies can be tailored to meet the needs of students and teachers so that they can be implemented in classrooms or online learning environments effectively. Finally, I will discuss the future of machine learning and artificial intelligence and how that technology can be leveraged to bring computer assisted education even further and provide more for students by combining educational goals with cutting-edge technology.

3. Literature Review

Computer assisted education is considered a hot topic in computer science right now. There is good reason for this. Computer assisted education can provide a lot of benefits to students and teachers. It transforms education and educational experiences. There is research on the effectiveness of computer assisted education, implementing computer assisted education, and the new technologies that exist. There is also discussion on the future of computer assisted education.

With computer assisted education, educational goals and initiatives need to be addressed first. The question- what enables students to be successful in their learning is essential. Educational technology companies who facilitate computer assisted education software and technologies are looking to implement applications that answer that question. Engagement is something that commonly comes up in computer assisted education research. Chat features are something that can be implemented in the technology to lead to better student engagement. Chat features allow teachers to answer questions and communicate with students effectively. Chat features can also allow students to communicate with one another. Teachers need to be able to keep students on task, though, too in order to keep them engaged. Equipping teachers with features to do this is very important. An example of a teacher being able to keep a student on track through computer assisted education methods would be force closing student tabs, screenshotting student screens, and locking student screens (Sheldon & Aguilar, 2019).

There is a lot of research on what computer assisted education tools exist, but there is not as much discussion on how these technologies actually work. One topic that is touched on is the different types of computer assisted education tools and methods that exist. There is synchronous and asynchronous computer assisted education courses. Asynchronous means that the course is self paced and synchronous is instructor led. One occurs in real time and the other one occurs as the student moves through the material at their own pace. These different kinds of classes are also going to use different types of computer assisted education methods. Synchronous classes will need computer assisted applications like

Skype or virtual classrooms. Asynchronous classes can use discussion boards, videos, or blogs because connecting at the same time is not necessary. There is also linear learning which is computer based training or web based training that a user can go through step by step. Many times assessments are computer scored and immediate feedback is given to the student. Finally, there is collaborative learning. Collaborative learning uses instructional methods to get students to work together with one another. There are many collaborative online tools that exist to help students engage with one another (Braincert Academy, 2015).

There are countless technologies that exist, and there is research on computer assisted education methods that include artificial intelligence, machine learning, and robotics. The essential question that exists when it comes to artificial intelligence and computer assisted education is how can it be utilized to help students. Most artificial intelligence technology being used in computer assisted education is to help students who have learning difficulties. Communication difficulties would be an example of something that artificial intelligence can help students with. There is also technology that exists that can help handicapped children with their writing skills by using a specialized pen. These are just some of the fundamental tools that artificial intelligence offers (Howe, 1978). Also, artificial intelligence is getting closer to being able to grade written responses like multiple choice responses can be graded automatically. This will free up time for teachers so that they can spend more time with students. Artificial intelligence can also be used to make enrollment and admission processes better and more efficient. Over time, tutoring will also be available for struggling students and tailored to their unique learning styles (Marr, 2018). Other technologies that can be used to give students computer assisted education in traditional classrooms include SMART Boards. SMART Boards are large interactive whiteboards with touch screen technology. They allow students to interact tactically with information that is displayed on the screen. These boards allow students and teachers to draw, use animation, sound, and interaction cohesively all while providing information. The amount of information that students can learn

can increase with the implementation of this technology (Campbell, 2009). 3D printing can also be considered a part of computer assisted education. 3D printing is when objects are created by laying down layers of filament until an object is formed on an x,y, and z axis. 3D printing can be used to fit different curriculum needs. CAD software, TinkerCAD, and Autodesk are all softwares that can be used to implement 3D printing in the classroom. With this software, one can customize objects, and teachers and students can create them, which can bring curriculum to life. The Smithsonian website is also a great resource for teachers because it provides lesson plans for 3D printing that teachers can use in their classrooms. Also, there is a technology called iSense that uses iPads. Students can create their own renderings by walking around an object and 3D print them (Elrod, 2016).

There is a lot on how computer assisted education methods can benefit students and teachers. The literature that is written on this topic goes in depth into the benefits of computer assisted education. The portion of research that seems to have some gaps is how these technologies work and the implications for security when it comes to student information.

4. About Computer Assisted Education Technology

Computer assisted education is the use of electronic devices and computers to provide educational instruction to students. It can be used in every field of education starting with kindergarten and going as far as assisting medical students in learning complex surgical techniques. This is possible because of the improved visualization and transmission technologies that have been created to deliver computer assisted instruction. Today, computer software programs are created to display and analyze graphic, multidimensional data that can then be used for human interpretation. The overall goal of computer assisted instruction is to simulate and develop the learning capacity of students, increase the effectiveness and productivity of teachers, and provide students with the knowledge they need to succeed.

There are specifically designed assessment tools in computer assisted education. These assessment tools include multiple choice questions, fill in the blank, find the answer, online interactive

chats, drills, webquests, adventure games, and listening exercises. Each of these different assessments will use computer technology in different ways. Drills can be done using software programs that are specifically made for the purpose. Listening exercises can be done using online podcasts or audio streams. Adventure games give students the opportunity to participate in simulated role-plays where they will be presented with a situation, and students will have to use their analysis skills to make decisions in the game. The game will then give them feedback.

Visualization tools are an extremely important technology in computer assisted instruction. Visualization helps all students, especially those who are considered visual learners. With visualization technology, 3D objects can be created and refined by using 2D plots. New visualization tools include 3D computer models, video demonstrations, animations, and colored computer maps. Visualization hardware needs to be portable and the software needs to be able to run on most computers with minimal configuration for it to work well for teachers. The most popular software tool for creating visual programs is JAVA. JAVA be used to easily write and build software that can be run on many different platforms without a lot of modifications. JAVA can also be combined with HTML and VRML to create portable and interactive web-based applications that are perfect for computer assisted instructional methods (Olorunosebi, 2016).

Computer assisted education technology also can give learner feedback, lesson branching, and can keep student records. There are also integrated learning systems that are networked computer assisted instruction systems. They individualize instruction in different content areas that include; mathematics, science, language arts, reading, and writing. Integrated learning systems are more extensive in the way that they keep student records. These systems are sold as packages, and they include hardware and software that can be set up in a computer lab because the computer terminals are connected to a central computer. Integrated learning system developers create instruction that is closely tied to textbooks. This creates a coordinated system that makes it easy for students to use a large selection of software.

Then there is intelligent computer assisted instruction. They are also sometimes called intelligent tutoring systems. They are adaptive systems that adapt problems to the student's learning level. The technology works based on the summary of a student's performance on past tasks. It is an intelligent system that will present problems to the student based on what the student knows. It also can help explain student capabilities more clearly. These systems were developed for mathematics mostly, but it has a lot of applications because it has a focus on modeling student knowledge, and this can be used to teach advanced thinking skills.

Then, there is videodisc technology which combines video features with the flexibility of a computer. It can be used as a tutorial or in an exploratory fashion. The videodisc player enables the user to access sequence visual images that can be still or in motion, and it also includes audio tracks in a nonlinear and selective way. When it is used in with the right hardware and software, videodisc technology can be individualized. It can also be used as an interactive learning tool that combines visual and auditory information with text, too. This way teachers can create customized presentations that allow students to explore a topic using this technology (Chapter II: Educational Technologies Part B, 2001).

In many ways Google, at the elementary, middle, and high school levels, has really taken over and become a lead innovator in providing students and teachers with opportunities to engage in computer assisted education. Google Classroom and Google's collaborative tools including; Documents, Sheets, Slideshows, and more, have enabled about 30 million children to reap the benefits of computer assisted education. Students of all kinds have benefitted from these tools, especially those with special learning needs. Google's voice to text and ability to read text from a screen to students has been incredibly beneficial for all users.

Google Classroom is a main tool that teachers use throughout our nation to deliver computer assisted instruction to students of all grade levels. Through the Google Classroom platform, teachers can create and share assignments, share videos and websites, and give important feedback to students. Even

parents can be invited to a teacher's Google Classroom, which is a great tool for parent involvement, which always helps with students' success in the classroom. Google Classroom is a platform that is really getting students ready for 21st century higher education and the workforce because it allows them to access and complete assignments online while using the valuable resources available to them on the internet.

When it comes to computer assisted education, Google has really transformed the game because it has allowed teachers to create an environment where students are getting to engage in teamwork and problem solving all with the assistance of a laptop, computer, or the Google Chromebook. Many students are taught how to use online tools to help them gain a better understanding of material. It is very easy to look up a word using a Google Document because Google Docs has a define feature, and students can also use the search engines to help them reach conclusions or to lead them on the right path. There are also many educational apps that enable teachers to give better instruction and feedback. Goobric and Doctopus are just one example. With Goobrics, teachers can attach a rubric to student submitted work on Google Classroom. Doctopus, then, enables teachers to grade that rubric right on Google Classroom for each student, and provide students with feedback through a comment section. This is extremely beneficial to students because they are able to see what they are missing in their writing, and they get comments from teachers, which help lead them in the right direction, the next time they go to complete an assignment. This assignment also stays in their Google Drive, so if they want to reference it later on, they have access to it.

Also, if a teacher would rather record their voice and provide feedback to students they can also do that. Google Classroom and the Google Applications provide teachers with an opportunity to provide more differentiated instruction to students. This is extremely important because as class sizes are growing, and students are getting less one-on-one time with students, a method for teachers to give great,

differentiated feedback to students has been made possible again through computer assisted education (Singer, 2011).

Instructional technology is also used as a way to facilitate computer assisted education. This can include presentation technology. Presentation technology is interactive whiteboards and other educational software. Instructional technology in the classroom promotes a universal design for learning or UDL environment. This means that materials are presented in forms that benefit all learners. An interactive whiteboard can display a PowerPoint, videos, and students can even draw on it. Scan and read programs are also very prevalent in delivering computer assisted instruction. Some examples of this software is Kurzweil 3000, Read and Write Gold, the WYNN Reader, and Scan and Read Pro. Customizable keyboards, talking word processors, and word prediction software is also very beneficial in computer assisted instruction (Assistive Technology in School Settings).

There is a lot of computer assisted educational technology that exists, but there is room for so much more. The software and hardware that exists is great, and there are a lot of virtual environments that are being used to facilitate computer assisted education. New technology needs to be developed to take computer assisted education further. Artificial intelligence and machine learning could really help students and teachers, and there is development happening in these areas for computer assisted education.

5. Providing Access to Technology

In the United States, access to technology in the classroom is still not where it needs to be. Overall, implementing technology in classrooms can be slow, and many schools have technology implementation on their agendas, but they have not fully created classrooms and opportunities for computer assisted instruction to take place. In order for students to gain the 21st century skills that they need, which include, thinking, problem solving, communicating effectively, self direction, and productivity, computer assisted education needs to be implemented in classrooms, and it needs to happen quickly. Currently, in the United States, there are 3.8 students to every 1 computer in schools. Now, this

varies from school to school, and many schools have been able to create a 1 to 1 atmosphere when it comes to students and access to devices, but this also means that in other schools, the opportunity to use computers in the classroom is lacking.

Beyond access to computers, teachers and students also need access to reliable internet, software, and technical support. This means that schools who are going to use more computer devices on their network need to have the ability to build wireless infrastructures in order to support those devices. Computers and devices are also something that cannot just be bought and never thought about again. Computers need upgrades and ongoing maintenance if teachers and students are going to be able to use them reliably (VanRoekel , Dennis).

Also, an important aspect of computer assisted education is allowing students or giving students access to technology at home or after school hours. Many students do not have access to the internet or computer devices once they leave school. This means that schools need to think about how they can give students computer assisted education opportunities after school hours, too.

Now, access to computers in public schools has drastically increased in recent years. In the United States, schools that serve low income students have almost the exact same amount of computers per student to schools that serve wealthier households (U.S. Department of Education, 2012). The problem is, though, that the quality and technology that is present on these computers may be different. Schools with more funding may be able to update their computers and technology more frequently. They may be able to purchase more expensive software, and they may have someone on staff who is an expert in educational technology that can help teachers and students use computer assisted education methods better.

Now, the second issue to implementing and giving students access to computer assisted instruction is giving teachers the right tools to implement it. Teachers in today's classrooms have all different experiences with technology. Some teachers did not grow up or ever experience a classroom

where technology was integrated into the classroom curriculum. Other teachers grew up with technology and feel very comfortable with it. The problem is, though, that all teachers need more support and instruction when it comes to providing their students with computer assisted instruction. Many colleges and universities still do not prepare teachers for delivering this type of instruction, and even when classrooms and students have access to devices, many times teachers do not know how to best implement these strategies.

Teachers do not always get training in technology that they need in order to be successful implementing computer assisted education in their own classrooms. This means that many teachers feel unprepared to implement any of these technologies that can help students. Overall, teachers need to be shown how to deliver different pedagogy through technology, and this pedagogy needs to include inquiry learning, simulations, models, and higher order thinking. All of this can feel very daunting for teachers who do not have much experience with technology.

Technology and implementing computer assisted instruction means that the way curriculum is delivered to students needs to be changed. This means that there needs to be ways for teachers to be creative and share what they are doing with other teachers, along with their students. Teachers are unsure of the ways that they can combine their curriculum with the technology tools available to them. Many also feel intimidated because students are digital natives and many teachers are not. Professional development does not give teachers enough resources, either. Many teachers need more support than just a conference that takes place over one day. There needs to be time taken so that teachers believe in these tools and believe they can implement them in their own classrooms. There is a lack of support that exists for teachers in empowering them to provide computer assisted education for their students (Hyndman, 2018). The real solution to this would be having a technology expert or experts in schools to assist in delivering these types of methods.

Changes in technology are happening at a constant rate. This means that schools need to be able to keep up with this new technology. Just because a school has a lot of technology does not mean that they are doing it right. There needs to be good systems in place for students, and teachers need to know how to properly implement computer assisted education in their classrooms (U.S. Schools Have More Computers than Ever. But What Are They Doing with All That (Expensive) Technology?).

6. Online Learning Environments

Online learning environments are becoming increasingly more common. Many courses especially at the college level are offered online. Because of this online learning environments have been created. Many online learning environments are considered asynchronous. This means that you do not need to be online or on your computer at the exact same time as your instructor. There are still deadlines to meet, material to review, and discussions or emails to respond to. Basically, the activity of the student and the teacher is taking place at different times. This means that technology needs to be used. Teachers need to have the ability to upload course material, and students need to be able to access it and view it. There also needs to be some way for communication to happen easily. Discussion boards and email are a great way to accomplish this. Now, there are also online tools that help teachers keep track of what their students are doing. There are online learning tools that exist that keep track of the number of postings you have read and posted. This technology can also keep track of the different pages you have accessed in the course. This information has great value to teachers because it can show them what their students are accessing and how often.

Synchronous online learning environments are an example of computer assisted education being used to facilitate collaboration that leads to higher engagement of students. Multi-user environments allow for collaboration, and engagement in students is found to be higher when using these types of environments. This is because virtual real time instruction can be provided to students and computer

interfaces can be used between students for interaction. These online environments can also be a place to practice newly acquired skills which is great for the reinforcement of subject material. This shows that a social presence is still important in computer assisted instruction because it leads to higher engagement. When this is coupled with computer generated feedback on learning outcomes, students are really set up for higher rates of success (Claman, F. L., 2015).

When it comes to creating an online learning environment there are components that are necessary for creating student success. Overall, it needs to enhance the learning potential of all students. The SAMR model is an example of eLearning designing. SAMR stands for substitution, augmentation, modification, and redefinition. The foundation of this model is that it is a direct replacement of a physical classroom environment. The next part is that audio and pictures are included to aid in instruction just like audio and visuals are present in a physical classroom. Now, eLearning environments need to be able to integrate technology in ways that lead to deeper learning for students. A great eLearning environment will give students opportunities for engagement that they may not otherwise get to have in a traditional classroom setting. It is also found that when using a Learning Management System (LMS) for younger students, it is good to integrate a lot of visuals. Icons and images are great tools to help with student understanding. At higher levels, the LMS may have more text based resources, but it is important to understand that visual cues for adult learners are also extremely helpful.

Online learning environments need to allow teachers to easily upload their own materials. Teachers should be able to upload PowerPoints, slideshows, PDFs, as well as, videos and other visuals for students to use. There also needs to be some sort of forum where teachers can communicate with students and students can communicate with one another. Assessments and other assignments should easily be able to be posted and completed by students, and a self-grading function is useful to both students and teachers (McCallum, Deborah, 2017).

The Blackboard Learning Management System is a very popular LMS, and it is used mainly in an academic and educational setting. It is used by many universities for online education, and there is also a K-12 version of the LMS available for educators. Blackboard equips teachers and students with tools and workflows that make teaching and learning easier in the online platform. It allows instructors to grade and post grades, too, and the learning environment is accessible from smartphones, as well. Blackboard also helps organize data in ways that can help teachers decide on instruction and instructional goals. They have a data analytics platform that enables you to place insight from other Blackboard SaaS tools alongside the Analytics for Learn content by using a tool called Pyramid BI (Davis, Torria). There is also something called the Blackboard Open LMS that allows teachers to personalize their learning paths so that they can deliver dynamic content that fits the needs of their individual students. There is also the ability to personalize learning, run advanced reports and grading, and there is improved course design. User interfaces can also be personalized and there is branding potential to attract students and improve engagement and retention which overall lead to better outcomes.

Open edX is another LMS that allows students to access online course content. This can include videos and textbooks, and they can check their progress in the online training course. It also has a discussion forum and a wiki that students have whenever they need it. Learners and instructors can all contribute to the discussion forum and wiki. There is also a dashboard where online instructors can enroll online learners and run their reports. There is also a feature called Open edX studio. This is an intuitive tool used for building online training courses and creating the structure of the course and adding the content that one would want. The studio also allows an instructor to manage the course schedule, the course team, set their grading policies, and publish each part of the online training course. There is also a community available to users where they can connect with other Open edX community members, watch webinars, read blog posts, and even gain access to upcoming events. Overall, this online learning environment and LMS has a large emphasis on the learner and the content management. Course teams

easily become self sufficient because there is so much online training content available, and Edx has accessibility checkpoints and requirements that need to be met.

There are also learning management systems that are used in a business setting or from an organizational standpoint. Ongoing education is very important in many different industries, and computer assisted education makes implementing professional development much easier. There is also the SAP Litmos LMS. It allows for delivering online training content, track completion, and assessment progress. It allows for instructional materials to be easily integrated into the eLearning course. It has embedded content creation tools that support multiple formats, and it allows for the user to add online training modules, create online assessments and quizzes, and surveys to gain valuable feedback from learners. It is also customizable and intuitive. It is considered an online blended learning environment that is asynchronous. It also allows one to browse the list of users, there are bulk user actions, and adding a new user is simplified because it can be done through invitation or upload. User profiles are also archived. Manual and self enrollment is also available for users. Within the LMS, role can be defined or assigned, and there are system permissions per role. Team and team hierarchies also exist (Pappas, Christopher, 2019).

The iSpring Learn online learning environment is designed especially for employee use. Online training material can be accessed from any device, even when offline. It also offers detailed statistics that allows a company to keep track of employee data and process. All of this data is great for keeping track of activities that go on in the course, keeping track of employee progress, and even collecting material that has been posted. This LMS also has unlimited storage space. This means that one can add as many videos, courses, and presentations as they like without running out of memory. Finally, this learning management system also offers gamification which makes the LMS more engaging than others. Users can win badges, points, and make it to the top of leaderboards. This creates a sense of community and healthy competition that can lead to higher engagement rates for learners (Pappas, Christopher, 2019).

Now, YouTube is not exactly an online learning environment, but it is used in computer aided instruction, and it is very popular because it is a video sharing application that teachers can use to provide computer assisted instruction to students. YouTube is a technology that can be brought into the classroom to enhance student learning and student learning outcomes. YouTube is a great resource for teachers and students because about 100 hours of video are uploaded to the YouTube platform every hour. YouTube allows for students to teach themselves material, and it can be used to reinforce material that was learned in class. YouTube is really beneficial for students who love the online learning environment. It has been found that the use of YouTube videos in classrooms can enhance the overall student experience and provide better understanding of material. This is mainly because students today are digital natives. They are consuming information in all different forms all day long, and they are used to this medium of information. YouTube can be used as a great addition to any online or traditional set of course material. YouTube also plays a role in the cognitive theory of multimedia education. It enhances instruction because it is a flexible technology that is immersive to students. Videos can also present material in different ways to foster student understanding. YouTube is easy to use and implement in classrooms because it is a website platform that anyone can use, and the search function to find videos is also very user friendly. Any teacher could enhance their instruction with YouTube (Buzzetto-More, 2015).

7. Educational Software

Educational software is a growing industry, and it is going to need experienced developers who understand what teachers and learners need from technology. Educational software is a cross-section of instructional design and software development. In order for educational software to be effective developers and educators need to work together, and developers need to have an understanding of how learning happens. There are also different types of educational software, and students can benefit from each kind because educational software can be used as a powerful tool by teachers. Educational software firms have started created educational apps, too.

When it comes to educational software, an authoring system can help teachers develop their own instructional software. Teachers can build electronic flashcards, multimedia lesson, reviews, and tutorials. There are also web authoring systems where teachers can build their own multimedia content that can be used on a website. Graphic software is used for capturing, creating, and changing images that can be found online. It is useful for building online presentations. There is also reference software which can be used for research projects. Reference software gives students access to thesauruses, encyclopedias, atlases, and dictionaries. Desktop publishing can also be used as educational software because it is used for creating and design newsletter, handouts, and flyers. Teachers can utilize this type of software to inform students and parents on activities that are taking place, and it can even be used for creating in class worksheets. Adobe Create Suite and Microsoft Office would be examples of desktop publishing software. Then, there is tutorial software. This is used where teachers could begin a new lesson, and students can use the platform to move through the material at their own pace. This software also evaluates their performance as they move through the tasks or modules. Educational gaming software is used in classrooms, too. Kahoot would be an example of a game a teacher may use for reviewing important concepts before a test. Simulations also give students a virtual experience. Simulations can be set up to give students an experience like they are flying a plane or walking through Egypt observing the pyramids. Drill and practice software allows students to practice a set of skills. This is good for preparing for tests and exams. Math problem solving software helps students strengthen their problem solving skills, and it gives students immediate feedback on which answers were right and wrong. Utility software helps teachers prepare quizzes, tests, and can serve as a gradebook, too. What is great about utility software is that it is usually easy to use, too. Finally, special needs software has been created to help students with special needs and learning difficulties. It is assistive software that can do things like read text on a screen or students can use voice to text to write out responses. There is also multimedia software that is used to target certain learning disabilities (Nagata, Sharon, 2017).

With the help of computer assisted instruction, classrooms and learning becomes more student centered. There is software available to help students who are struggling in areas like reading, mathematics, and science. This type of software can offer students the supplemental instruction that they need and they can work at their own pace and skill levels. Teachers can also use computer assisted instruction in their own classrooms to offer student paced instruction. A student who is performing well on assignment and moving through material quickly can be easily provided with enrichment activities. A student who is struggling can be offered more time and support to complete assignments. We also see that students feel more positive about the content they are learning due to these types of software. This has been shown to lead to higher performance, as well (Tolbert, Ernest, 2015). Students may also feel like they have more control over their own learning when using computer assisted instructional technologies. In one study, students used educational software to learn about electricity. Student feelings towards this subject matter were taken before students used the technology. After using the technology, students felt better about the material and their cognitive skills had improved. Through using this technology, students learned concepts interactively. There was also a self-evaluation tool available for students to use embedded in the software. After using the software students rated that they had a better understanding and better feelings toward electricity (Tatar, N., Akpınar, E., & Feyzioğlu, E., 2013).

Here I am going to discuss some great Google applications, add-ons, and features that teachers can easily use and implement in their own classrooms and curriculums. The first feature is Google Earth. Google Earth is a computer program that renders a 3D representation of Earth based on satellite imagery. The program maps the Earth by superimposing satellite images, aerial photography, and GIS data onto a 3D globe, allowing users to see cities and landscapes from various angles. Teachers can use Google Earth to help students learn geography and even visit ancient civilizations and landmarks. Overall, Google Earth helps increase students' geographic awareness. Students are able to use Google Earth to visualize certain areas of our world. While using Google Earth, students also learn technological concepts because Google

Earth fosters spatial concepts and helps students develop critical technology and thinking skills. Also, students can use Google Earth if they have computer and internet access at home which brings this computer assisted education beyond the classroom. The only challenge with Google Earth is that educators must learn how to use the software themselves. In order to successfully implement Google Earth geography lessons in their classrooms, teachers need support, resources, and lessons (Patterson, T. C. 2007).

Another great feature offered by Google is the Google Drive. This is a cloud storage drive for file storage, and it is a synchronization service developed by Google. Google drive has unique sharing capabilities that allow teachers and students to share files with one another. This means that teachers can easily create assignments that engage students in computer assisted instruction. Also Google Drive supports about 20 different file formats. That means that media like video, images, articles, and other content can be easily shared. Instructors can offer students access to digital course materials. Also, Google Drive empowers teachers and students to stay organized. Students and teachers can create their own file folders within the drive to easily access materials. Overall, the Google Drive helps teachers facilitate better computer assisted education and create an online learning environment for students that can be easily integrated with Google Classroom (Sadik, A, 2017).

Two other unique features that Google offers are Google Hangouts and Google Sites. Google Hangouts allows for collaboration because it is an interactive chatting platform. This is a great tool for blended learning because students can communicate in groups effectively even outside of class. Teachers can also offer small group instruction over Google Hangout. Google Sites is valuable to teachers and students because it allows students to gain some of the fundamental skills for website creation. Using Google Sites, students can combine content knowledge and information with technical skills. Google Sites is also user friendly, and does not require coding, but students can still publish and edit sites (Cahill, J. L. 2011).

There is software that exists that can aid in the implementation of computer assisted education in math classrooms because these softwares and disks are specifically designed to teach math principles. When evaluating pre and post test scores of students who used mathematical software to learn math concepts, it was found that students who used the software understood mathematical concepts better and performed better on the post-tests. This type of software can also be used so that students can cooperate with one another to learn these concepts. Students also have a greater ability to form mental images as they learn new skills when using computer assisted education. This type of software can also individualize mathematical learning and allows students to work at their own pace. It has also been found that negative beliefs about math have been reduced when using computer assisted instruction. Also, overall when using computer assisted instruction in mathematics students performed better than those who did not use it (., M. F., ., E. E., & ., M. R. F. (2007).

Now, as a shift has happened in teaching more classes online, it has become more and more obvious that e-learning tools and educational software is based on more than just user satisfaction and learning outcomes. With anything in life and in education there is a multidimensional construct. The efficiency, effectiveness, and satisfaction in which a student, teacher, or user can navigate a course is called usability. Usability is a way that e-learning tools are quantitatively evaluated. Usability testing needs to be used during the design and development stages of software development for e-learning tools. It is essential that this is done before the e-learning tool is released for use. In some studies, it has been found that evaluating usability has been overlooked. A solution to this problem would be developers engaging in usability testing during all stages of an e-learning tool's lifecycle (Van Nuland, S. E., Eagleson, R., & Rogers, K. A., 2017).

8. Robotics & 3D Printing for the Classroom

3D printing and robotics, lead to higher motivation for students to participate in learning. This may be because the learning is made easier for them due to computer assistance. Robots can be used in classrooms to create this type of motivation for students. There have been proven studies where Chinese speaking students are learning English faster and easier with the assistance of robots. These robots engage with students and act as social partners in the learning of the English language. There is also research being done on robots being used to deliver teacher created presentations and material. The robot would be able to combine multimedia objects and engage and motivate students using the material. The robot may also supplement the material with audio (Chin, K., Hong, Z., & Chen, Y. (2014). There is also a social aspect connected to computer assisted instruction that makes it valuable. Engagement and collaboration play a big role in the educational outcomes of all different types of students. It seems that the more students were able to interact using computers with both peers and instructors the better the educational outcomes were. Computer assisted education supports this type of interaction easily.

Robots are made up of components that are similar to the way our own bodies and minds work. Most robots have a movable physical structure, a motor, a sensor system, a power supply, and a computer or brain that controls all of these different parts. Robots are machines that are used to replicate human and animal behavior. Robots are machines that are programmable by a computer.

There are many educational robots that exist, and they each have their own purpose and goal. One example of an educational robot is called Root. Root was developed by Harvard University, and Root helps students learn how to code. Root includes over 50 sensors and actuator motors. Root utilizes magnets to operate on a vertical surface like a whiteboard. Students can program Root to follow lines, avoid certain colors, and solve mazes, and even race on a track. Root connects by Wi-Fi to a mobile device so that a link can be made to control the robot in real time. Students can see their programming

immediately because they see the physical movements of Root working. Root also has an intuitive interface that students can adapt quickly. There is also a coding app called Square that takes a multi-level approach so that students of all learning levels can participate.

There is also a robot names Cubelet. Cubelet is created by putting together different blocks and modules. Each block and module is actually a separate, smaller robot, and by combining them, students can create different types of robots. Each kit has between 6 and 20 blocks, and the blocks are categorized as Think, Sense, and Action. Think blocks are logic circuits that determine what the robot can do. Sense blocks respond to touch, visual, and auditory stimuli. The action blocks allow the robot to respond and move. Cubelets train students to plan and think logically so that they can build the type of robot that they want. It also does not require electronics or programming because the components come together with magnets. The robot is also controlled by an application called Blockly. Blockly is a graphical tool that allows the user to manage and determine the robot's behavior.

Then there is the mBot. mBot is a robot kit that helps students learn the different parts of robotics: electronics, assembly, and programming. It is also pretty simple for children to use. It follows a modular approach where students can put the robot together in as little as ten minutes. It also does not require coding, but it uses a drag-and-drop feature so that students can assemble different types of patterns to create the types of programs they want. Arduino, an open source electronics project platform that some students are already familiar with makes it easy to use the mBot and mBlock.

Robotics can give students unique experiences. It is hands on, and students learn basic design, engineering, and programming skills. They also get to think logically because they want their robots to perform certain tasks. Child-friendly software also exists with kits so that students can develop their logic and problem solving skills. They are highly engaging (Dimick, Patricia, 2016).

A 3D printer operates a lot like an inkjet printer that you would use with your own computer. To make the 3D print out in the first place, a 3D blueprint is used by utilizing computer aided design (CAD)

software. CAD software for technology design uses technical documentation to replace manual drafting. It basically automates the whole process. Some examples of this software are AutoCAD and AutoCAD LT software. These types of software help draft construction documentation, explore design ideas, visualize concepts, and even create photorealistic renderings before they are used for 3D printing. Creators can make these blueprints however they like using the software. It works by building one 3D model layer at a time from the bottom up. It does this by printing over the same area over and over, and this method is known as fused depositional modeling. It works automatically, and it creates the model by turning a 3D CAD drawing into lots of 2D and cross-sectional layers. Then it will separate the 2D prints and sit them on top of each other without the paper in between them. Also, instead of using ink, it deposits molten plastic or powder, and then it fuses them together. It fuses layers together using an adhesive (How 3D Printers Work).

3D printing allows students to create their own computer aided design files. Students can learn technical skills by adding in their own modifications to designs to be printed on the 3D printers. Students learn the 3D printing design process which is a great 21st century skill. Designing models allow students to bridge their ideas with the physical world. Students can also develop engineering skills in classes they never would have been able to do this before. 3D printing unites STEM initiatives with curriculums that already exist in classes like art, English, and the social sciences. Overall, students learn how to replicate a consistent and accurate scale while displaying detail and craftsmanship with design quality and model making techniques (Greenhalgh, S. (2016).

When it comes to using 3D printers in K-12 classrooms, it is important to note that 3D printing can be implemented in any classroom. 3D printing, though, has a special role in social science and science classrooms because of its capability to bring artifacts and anatomical models to life. In social science, 3D printing can be used to design artifacts. This can be very exciting and interesting to students because they are able to combine technical skills with archeological and historically accurate skills. An example of

something a student could print in a social studies classroom would be George Washington's false teeth. This would bring the artifact to life for all students in this classroom. Historians, archeologists, and paleontologists even spend their own time creating models of artifacts that they have found or are studying. 3D printing can bring history to life within a classroom (Printing the Past, 2017). Also, when it comes to the sciences 3D printing can be used to create cellular or anatomical models. This is innovative because it allows for models to be created instead of schools and classrooms using cadaver or human structures. This combats ethical, legal, and cultural problems associated with using those structures. This allows students to study these models in ways they may not be able to otherwise. This also means that the studying of these models can be easily implemented in K-12 classrooms (Yousef AbouHashem, Manisha Dayal, Stephane Savanah, Goran Štrkalj. (2015).

9. The Role of Machine Learning & Artificial Intelligence

One technology in particular that could really impact students is developing artificial intelligence. This is something that is currently being worked on to assist both students and teachers. Artificial intelligence is already being used in some capacities in education and in our lives. Personal assistants through artificial intelligence help us keep track of our lives and the tasks we need to accomplish. They can also help students stay on task. Artificial intelligence is already helping us with parking, and the hope is that technology in artificial intelligence will also be able to pinpoint gaps in knowledge for students, and in some cases it is already doing that. The future of artificial intelligence in education includes helping students with higher order thinking and creativity skills. Artificial intelligence already exists to assist students in learning basic skills, but as the technology develops more it will be able to help students with things like written responses and the formulation of ideas. The future of artificial intelligence is also about helping teachers craft their courses based on their students needs. This type of artificial intelligence will be able to pinpoint the needs to students, help teachers identify them, and even craft curriculum specific to these individual students (10 Roles For Artificial Intelligence In Education, 2018).

Artificial intelligence is a new frontier being explored in the delivery of computer assisted education. Artificial intelligence could be used to help teachers build procedures and use technology to better assist students in their learning. Through the use of artificial intelligence in computer assisted instruction, learners will gain new skills and a new understanding of important concepts. Artificial intelligence can mimic the actions of a skilled human tutor and provide one on one instruction to students. Artificial intelligence can adapt the way they teach to a student's prior knowledge, skill, and preferred way of learning. When it comes to artificial intelligence and what is needed, there needs to be a model for the domain being learned, a model of the learner's current understanding, a model of the pedagogy so that the artificial intelligence can make sensible tutorial moves, and there needs to be one or more interfaces through which the artificial intelligence and the student or learner can communicate (du Boulay, B. (2016).

Education needs to be adaptive in order for it to really impact students in the most beneficial ways. This is difficult for educators to accomplish on their own because they cannot possibly collect and analyze data on each of their individual students, especially as class sizes become larger. This is where artificial intelligence in the classroom and in education can really change the learning outcomes for all students. Students have different learning styles. These are ways in which students learn best. Some students are visual learners, some auditory, some tactile, and some kinesthetic. It is impossible for teachers to provide this level of differentiated instruction for all students, but with the use of artificial intelligence, learning styles for individual students can be pinpointed and software can be developed to aid students in their learning. This type of artificial intelligence would compare different learning models and determine the best learning model for the student in their environment. Artificial neural networks could aid in the determining of these different learning styles of students. This means that personalized learning could be available to students anytime and anywhere. Artificial intelligence in education would enable us to push different content to different students based on their interests and needs. It would also

keep track of their learning style over time and make adjustments as needed. Artificial intelligence could be used to create better e-learning environments that combine a virtual teacher and text, multimedia, online aptitude tests, and voiced based artifacts. This is an adaptive technology that could reach a very wide audience and impact education in a major way. Overall, student learning attributes could be tracked and personalized so that the most optimized learning is happening (Bajaj, R., & Sharma, V. , 2018).

Artificial intelligence and machine learning technologies are beginning to alter the education tools that are available to us. Companies like Content Technologies and Carnegie Learning are some of the leaders in technology for artificial intelligence for education. They are creating artificial intelligence for intelligent instructional design and digital platforms. With artificial intelligence, educators will be able to provide better learning, testing, and feedback for their students. This is because artificial intelligence will collect data on students and identify their gaps in knowledge. It can also create ways to fill those gaps and alert teachers to the needs of their students. As artificial intelligence becomes even more developed it may be able to read the frustration on a students face and provide better explanations of difficult material. Presentation Translator is a plug-in for Microsoft PowerPoint that is already creating subtitles in real time for students as a teacher is speaking. This is an amazing technology that benefits students who speak different languages or have hearing impairments.

Overall, artificial intelligence and machine learning can change our education system as we know it for the better. It will be able to automate grading and take care of teacher tasks, allowing for a better experience of students. A professor is even noted with using a chatbot to help him communicate with his students. This allows for better teacher interaction, planning, and the needs of students being met. Artificial intelligence can also become educational companions for students. There is technology being developed for students that will know the student's personal and school history. This means that it will also know the student's strengths and weaknesses. Artificial intelligence will allow for materials to be adapted to student needs. Also, teachers will easily be able to see what questions their students are

missing, and what may need to be retaught. Google Forms is already providing teachers with information like this. Artificial intelligence can place students on learning paths that make learning happen faster. Enlearn is an artificial intelligence software that coaches students in areas they are struggling in before it allows the student to move on in the material. The Center for Game Science Technology has also found that artificial intelligence has been proven to improve student master of seventh grade algebra by 93% after just one and a half hours of use.

Finally, artificial intelligence can be used to provide students with safer online environments. URL filtering of websites is not very good when it comes to keeping students safe online, and it can even lead to educational material being blocked because it is just based on the URL. GoGuardian uses machine learning technology to improve the accuracy of its cloud based internet filtering and monitoring software for Chromebooks. GoGuardian looks at the actual content on a website to determine the appropriateness for students (Pierce, Dennis, and Alice Hathaway, 2018).

10. Tailoring Technology to Meet Educational Needs

Technology can be tailored in many different ways to meet educational needs. One example of this would be completely online classrooms that many non-traditional university students utilize. For this type of distance learning to really work, platforms need to be all encompassing. This means that there needs to be the ability to upload materials, answer questions, engage in discussion, and have contact with the teacher. This is really just one of the ways that technology needs to be created and designed to meet educational needs.

Overall, computer assisted instruction can help students at all levels and with all different abilities and learning styles. This is because computer assisted education provides more opportunity to differentiate instruction for students. There are also higher levels of engagement recorded in the use of computer assisted education for all students.

When looking at a group of students with reading difficulties, student reading abilities improved with the help of computer assisted instruction. These were students who were receiving special education services. Students had been put into 3 groups, and students who engaged in computer assisted instruction had drastically improved reading scores one year after using the computer assisted instruction. They had more improvement in their reading scores than students who had taken part in different types of interventions. After a full year of using computer assisted instruction, the majority of students no longer needed special education services (Fälth, L., Gustafson, S., Tjus, T., Heimann, M., Svensson, I., Utbildningsvetenskap, . . . Psykologi., 2013). This really highlights the impact that computer assisted instruction can have on students with certain learning needs.

Computer assisted instruction is also proven to be very effective in helping students on the autism spectrum. It has been proven that computer assisted instruction helps students with delays in language, those having trouble with social skills, and those who have difficulty following instructions. Through computer assisted instruction, students with autism spectrum disorder have been able to improve their literacy skills and academic skills. This is because computer assisted education can be used to design interventions for students, and that is extremely beneficial for these students because it allows for their specific needs to be targeted through the use of technology (Root, J. R., Stevenson, B. S., Davis, L. L., Geddes-Hall, J., & Test, D. W. , 2017).

Now, when it comes to technology, and the technology that needs to be created for classrooms, there are many features that are helpful to students and teachers. For example, software packages like Kid Pix 3, Appleworks, Inspiration/Kidspiration 2, and StoryBook Weaver Deluxe have tools, buttons, and menu selections that allow text to be read aloud electronically. The latest Macintosh operating system, OSX, provides speech and other free or low cost utilities that can read highlighted text out loud to students. These types of innovations are what need to be integrated into educational software.

11. The Future of Artificial Intelligence in Education

Artificial intelligence and the use of computer assisted education is needed to make education a more personalized experience for students. These computer systems provide us with valuable data on students, and it needs to be used to help us organize it and deliver the best instruction possible for students. The foundations for these tools exist, and once they are developed they will impact the education of students in major ways.

One of the most interesting technologies being talked about in artificial intelligence for education is in pinpointing student learning styles and developing a curriculum that is specifically tailored to that student's learning style. Artificial intelligence would use machine learning to understand student learning styles. A software would need to be developed in order to pinpoint the learning style of the student. The artificial intelligence would use this software to determine the learning style best suited for the student. The suggestion is that this artificial intelligence would exist in a cloud environment so that the learning style could be identified quickly and effectively. Once the learning style is identified, the artificial intelligence would then choose what type of educational materials the student receives and engages with (Bajaj, R., & Sharma, V. (2018). This is a solution to providing all students with differentiated instruction using computer assisted education through artificial intelligence.

Once artificial intelligence is at the level where it can complete more complex tasks, it will be able to further the achievement of all students with the support it can provide. this is because it will be able to identify student needs in learning like never before. Adaptive education for all students is the future of computer assisted education. Also, artificial intelligence will also give teachers tools that they need to better do their jobs. Artificial intelligence can take over administrative work like grading work and organization assignments. Artificial intelligence is already being used to grade multiple choice responses, and it provides teachers with the information they need to identify where students are struggling. The hope for the future is that this artificial intelligence will also be able to grade written

responses. This will free up teacher time and allow for more interaction between students and teachers which has also been proven to be beneficial.

Artificial intelligence can also make use of neural networks for computer assisted education. Neural networks are a machine learning model that is based on the neurons of human brains. Machine learning gives computers the ability to learn without human intervention. With neural networks, artificial neurons transfer knowledge to other artificial neurons, and it makes them smarter through past experiences. Deep learning allows pre-trained networks to be created, and they do not need to be supervised. Convolutional neural networks can be used to analyze visual imagery. Recurrent neural networks that can use their memory to process a sequence of inputs such as handwriting recognition or speech recognition, and then the recursive neural network can make structured predictions, and this can be useful in natural language processing. Deep learning neural networks can make artificial intelligence tutors smarter with time as they continue to self-teach. In computer assisted education systems, the virtual tutors and mentors that possess deep learning capabilities can adapt to the needs of different students and give them the type of personalized instruction that they need.

An example of using artificial intelligence for computer assisted education is when a professor named Ashok Goel at the School of Interactive Computing at Georgia Tech surprised his students when he shared that his teaching assistant that had been answering questions online was actually built on IBM's Watson Platform and was a virtual teaching assistant with artificial intelligence. This virtual teaching assistant was so successful that they were able to increase student engagement.

Virtual Mentor version 2.0 is another example of Artificial Intelligence that is a talking entity. It answers entrepreneurship related questions based on the advice of real mentors. Even AI services like Siri of Apple and Cortana of Xbox could be used in the future to help students by offering customized instruction that meets their learning style. Online learning platforms that use virtual mentors provide instant homework help to students. They do this by interpreting the question through natural language

processing methods and processing them to extract relevant information from the resources they have access to (Singhal, 2018).

12. Computer Assisted Education Implementation

With the increase in the use of devices on school wireless networks, networks need to be expanded in order for students and teachers to use this technology. When wireless networks cannot handle the traffic on their networks this technology is less effective because students cannot access the technology to use it. When this happens instructional time is actually lost because students and teachers become frustrated with the technology not working.

Also, schools need to have access to the latest devices in order to deliver this type of instruction to their students. Teachers need access to 3D printers, laptops, virtual reality, and other computer assisted instruction devices. Without access, students cannot benefit from this instruction.

When it comes to developing new technologies, it is very important to work with both teachers and students to pinpoint the areas in which students most need and benefit from computer assisted instruction. This will allow better technologies to be incorporated into classrooms and make positive impacts on students. There are many tools that exist for computer assisted instruction, but students could benefit even more from newer and more cutting edge technology.

Implementing these technologies can be challenging to implement in classrooms due to teachers feeling like they do not have the understanding to implement these technologies, poor networks, and lack of available devices for this type of instruction. Teachers need support and training in order to understand how to best implement these technologies and the training needs to be ongoing because technology is constantly changing and evolving, and teachers and students cannot use these technologies if they do not understand how they work. Also, with more devices being used on school networks, networks need to be expanded so that the technology can run effectively and the networks do not crash due to overuse. It is

also important that schools have access to the devices that can best support teachers in delivering computer assisted instruction.

Overall, the benefits of computer assisted instruction for students are numerous. Students are able to learn information more quickly in ways that make the most sense to them and better fit their learning needs and styles. There are also countless tools that exist that enable students with different learning disabilities to succeed in the classroom and receive a better education. Computer assisted education also provides teachers with better data that informs better instruction. Computer assisted instruction can be used to help fill gaps in students' knowledge, and it is found that by using this technology students gain a stronger understanding of material that they were struggling with. Computer assisted instruction is able to get students who are struggling caught up faster than students who are trying to get caught up using other methods. This really speaks to the power computer assisted education has in our education system as a whole.

Students also learn important skills for the 21st century when they have had experience using computer assisted educational. This is because computer assisted instruction provides students with technical skills that they cannot get anywhere else. Students can build on these skills over time which leads to them being better prepared for college and the workforce.

When talking about education, access to education is always a huge topic. This is where computer assisted education methods really come in. Computer assisted education can provide students with more access to information, education, and teaching, and the future of all of this is with the cloud and anywhere access. In the future, technology can be used to connect students in classrooms with students around the world and give teachers the ability to educate both due to computer assisted education methods. This is happening with massive open online courses or MOOCs. Technology really can be the link between teaching and learning, and the cloud can be used to remove some of the barriers to teaching and learning that exist. To do this, the right software needs to be installed along with servers and local file storage.

Internet connection will also need to be improved, and infrastructure is essential. Connectivity needs to be fast and reliable. With the cloud, teachers can collect and grade work online. Students will have instant access to their grades, comments, and work on computers, smartphones, or tablets. Services like the educational social network Edmod is offering this for free, currently (Britland, 2013).

There are so many great tools that already exist for computer assisted education, but the development of new and better tools is still needed. We need computer assisted education to be more intuitive and provide us with more support. We need to create better online environments for students and teachers to use. These environments need to be smarter and provide us with more tools to deliver instruction. With these online environments, the capability to create plugins so that new features could be added for use would be very beneficial to computer assisted education as a whole because it would allow for these environments to adapt and change as new technology is developed. As technology becomes more intuitive and is able to provide us with more data, computer assisted education will become even better.

13. Security Concerns

Just like most businesses and organizations, schools, universities, and educational institutions have adopted technology as the primary way they organize, save, and access information. Sharing information via computers and networks is a cost-effective way of getting things done, and information is power. Because information is power, it needs to be protected. In schools, their power is in making the educational process more effective, and as has been talked about throughout this paper, technology is the way to do that. Information about students, staff, courses, programs, facilities, and fiscal activities is collected and maintained so that schools can organize their services, offer them to students, measure learning progress, and assign and monitor staff responsibilities and resources to use. They, then provide all of these services to their communities in which they operate. Most educational institutions understand

the importance of securing their computer equipment. They barcode the equipment, and they have systems in place to make sure that they do not get stolen because the equipment is expensive. The data that is on all of these devices, stored in software, and stored in the cloud, is also extremely valuable, and it needs to be protected. Information about students, staff, and other resources is valuable to the operation of school buildings, campuses, and district and state education agencies. All of this information is considered an asset.

Education information is also considered to be sensitive information. This information identifies students and staff, and by law it needs to be protected under the Family Education Right and Privacy Act of 1974. This is to protect the privacy of students, and it applies to all schools that receive funding from the U.S. Department of Education. Institutions are responsible for the integrity and security of their data and its organization. Management needs to take steps to make sure the equipment and information is adequately protected. It is very problematic if student aptitude scores are accessed improperly or a student manages to modify report cards or attendance data.

For educational institutions, a security plan needs to be created. This should include a risk assessment and an action plan. Security policy also needs to be implemented. This includes everything from password creation and management to staff training. Also, during this process sensitive information and critical systems needs to be identified. Local, state, and federal laws, as well as ethical standards need to be incorporated. Institutional security goals and objectives need to be defined, and a course for accomplishing these goals should also be laid out.

Security managers can also be very helpful when it comes to the security of computer assisted education. Security managers communicate to staff about protecting the system, and they are able to combine the interest of an organization with the interest of its users. They also increase staff awareness to security issues, which is great because this has been proven to increase the security of systems. They also

provide staff training, and they monitor user activity to assess security implementation. They can really be used as a guide within educational organizations.

Physical countermeasures are also very important in the securing of computer assisted education devices. Identifying vulnerabilities is the first step here. Some physical threats could be natural events like hurricanes or fires, extreme temperatures, intentional acts of destruction like theft or vandalism, and unintentional acts of destruction like a spilled drink. Physical countermeasures start with low visibility. This means that one does not want to call attention to critical facilities. There should not be signs that announce expensive equipment or sensitive information in any way. Maximizing structural protection is also important. Full height walls and fireproof ceilings are a good idea. Minimizing external access, and securing the room by making sure doors are locked, solid, and the area is fireproofed is great. Also, limiting access to the room is a good idea. Some other physical security measures can include motion detectors, magnetic key cards, anti-theft cabling, and window bars.

Now, for protecting the system and implementing information security, it is important to focus on three things: confidentiality, integrity, and availability. Confidentiality is preventing unauthorized disclosure of information. Integrity is preventing unauthorized creation, modification, and deletion of information, and availability is preventing unauthorized delay or denial of information. Information threats to be aware of are natural events like lightning strikes and aging and dirty media, intentional acts of destruction like hacks and viruses, and unintentional acts of destruction like the accidental downloading of computer viruses, programming errors, and accidental use of magnetic materials near equipment. Some ways to implement information security practices are using email only for routine office communication and not sending sensitive information over email. If this type of email is necessary, encrypting the file is a good idea and send it as an attachment. Also, encrypting everything is so important. Passwords need to be encrypted or else they can be intercepted as they travel network connections. Physically protecting data is also a good idea by using data encryption devices and keys.

Storing them away from the computer is also good practice. Inform staff that all messages sent with or over the organization's computers belong to them. This means that everything is subject to monitoring. Confirm outside networks from where there are dial ins satisfy your organizations security requirements. Installing automatic terminal identification, dial-back, and encryption features are key here. Finally, verify the receivers authenticity before sending information anywhere. This makes sure that users on the receiving end are who they say they are. This can be done by them knowing a password or encryption key or having an electronic keycard or smartcard, though, this is more expensive.

Software that schools use is also vulnerable to acts like hacking, viruses, and programming errors. There are great countermeasures that can be implemented to protect software. A central control on all critical system software is good because it will know what programs are being added, deleted, or altered. It can also control these additions, deletions, or changes. It will also take steps to make sure that new and old software can interface. Informal testing is also helpful and certification procedures for new and modified software should be implemented. This requires that new or changes software be tested and certified before it is used. Maintain an off-site location for critical backup copies of software, databases, and information that is for critical functions is a great countermeasure. These backups do require the same level of protection as master files. Securing master copies of software and the associated documentation is essential because if master copies and their instructions are lost, the entire system can be in big trouble. Documentation is always important and should be protected. Only allow approved software on office equipment because this ensures that a virus could not be downloaded. Monitoring software use and hard drive inventories helps protect the entire system, too. Authorized personnel should be the only ones to install software so that it is know what is being introduced to the system and that it is being installed correctly. Never lend or give proprietary software to users who are not licensed because it is essentially not yours to give. Finally, training staff on software use and security policy will help the system remain secure.

The last step in implementing better security for educational organizations is staff training. Many people do not know the importance of cyber security, and it is important that awareness is raised on this matter. Make sure that staff are aware of local, state, and federal laws and regulations that include confidentiality and security. Go over organizational security policies and procedures. Stress that security is a team effort and each person has a role to play in meeting security goals and objectives. Implement training for staff for specific security responsibilities of their positions. Tell staff members that reporting potential and realized security breakdowns and vulnerabilities is important, and that they must do it if they notice that something is off. Finally, communicate the organizational goal of creating a trusted system (Training: A Necessary Investment in Staff, from Safeguarding Your Technology).

14. Conclusions and Further Work

There are so many great tools that already exist for computer assisted education, but the development of new and better tools is still needed. We need computer assisted education to be more intuitive and provide us with more support. We need to create better online environments for students and teachers to use. These environments need to be smarter and provide us with more tools to deliver instruction. With these online environments, the capability to create plugins so that new features could be added for use would be very beneficial to computer assisted education as a whole because it would allow for these environments to adapt and change as new technology is developed. As technology becomes more intuitive and is able to provide us with more data, computer assisted education will become even better.

Computer assisted instruction provides students with opportunities to learn skills that they may not gain otherwise. Students who engage in computer assisted education gain a better understanding of technology and its uses. By using these programs and features in their classrooms, students are prepared to go onto college and take part in online classes and be successful because they have been equipped with the tools to succeed.

This is where artificial intelligence is really going to come into play. Once artificial intelligence is at the level where it can complete more complex tasks, it will be able to further the achievement of all students with the support it can provide. This is because it will be able to identify student needs in learning like never before. Adaptive education for all students is the future of computer assisted education. Also, artificial intelligence will also give teachers tools that they need to better do their jobs. Artificial intelligence can take over administrative work like grading work and organization assignments. Artificial intelligence is already being used to grade multiple choice responses, and it provides teachers with the information they need to identify where students are struggling. The hope for the future is that this artificial intelligence will also be able to grade written responses. This will free up teacher time and allow for more interaction between students and teachers which has also been proven to be beneficial.

Overall, computer assisted instruction provides teachers and students with tools that can help make learning easier for students with disabilities. Again, capabilities like voice to text, video, animation, and paced learning is very beneficial for students with learning struggles. Computer assisted instruction also makes it easier to pinpoint interventions that students need, and give them the tools that they need to effectively communicate, analyze, and understand inside and outside of the classroom.

The future of computer assisted education is extremely promising. We are already seeing great results when it is being used in classrooms at all levels from preschool through medical school. As technology becomes more advanced it will be able to offer students greater support, and students will be able to learn material faster and more completely than ever before because it will be specifically tailored to their learning styles, needs, and interests.

There are definitely some gaps that exist in computer assisted education, and technology can be used to fill these gaps and solve more problems than ever before. The first step to creating better computer assisted education is giving teachers the tools and support that they need in order to implement computer assisted instruction into their classrooms. Computer assisted education is something that needs to be

implemented at all educational levels, and teachers need to be provided with the training to use these technologies in their classrooms. This training also needs to be ongoing because technologies are constantly changing. Teachers need to be provided with professional development opportunities specifically on computer assisted education tools and practices that they can implement in their classrooms with their students.

Artificial intelligence could help teachers with grading work or identifying students who are underperforming. Data analysis tools can be created to help teachers pinpoint areas where students need extra help or attention. Intuitive technology could help teachers with lesson planning. The opportunities for designing new and better computer assisted education methods are endless.

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