Using technology to provide differentiated instruction for deaf learners

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ABSTRACT

Knowledge is power. Technological devices provide the new pathway to online learning and student retention. This is especially true for deaf learners, who have difficulty learning with the traditional pedagogies used in teaching. Results of studies have indicated that students using the suggested new technologies become more interested and actively engaged in their classes, and have a higher level of retention than students in traditional online and onsite classes. Diverse modalities used in acquiring information have the potential to expand visual creativity and visual intelligence (Smith, 2006). It is important to empower students to become active, involved learners, and provide them with the tools and incentives to achieve academic success.

Keywords: deaf learners, differentiated instruction, technological devices for the deaf, student retention
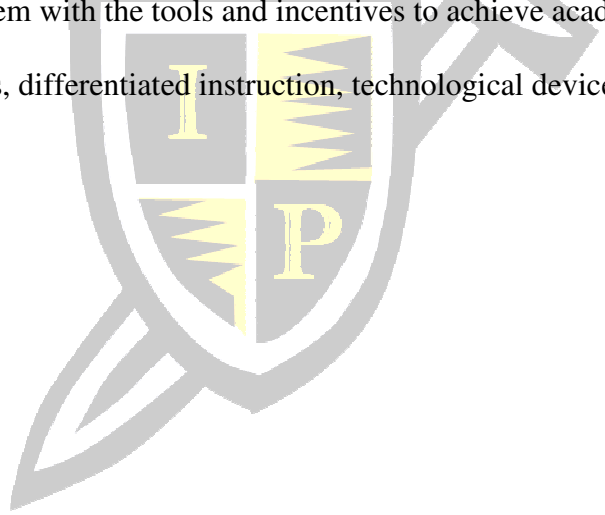
INTRODUCTION

In recent years there has been a great deal of activity in and research about the use of technology and the exchange of information in education. Researchers believe that this new environment can enhance learning (Cleaver, 2008; Jones, 2008; & Maresova, 2009). This is especially true for deaf learners, who have difficulty learning with the traditional pedagogies used in teaching. Howard Gardner illuminated the concept of diverse learning by developing multiple learning theories to support the idea that various individuals learn in somewhat unconventional ways. Using multimedia technology and synchronous text-talking to enhance learning and accommodate the learning styles of various individuals allows students to acquire information at all levels through multiple modalities and provides instant feedback. The instructor must be able to interact effectively and structure appropriate learning activities to encourage higher level thinking (Jackson, Gaudet, McDaniel, & Brammer, 2009).

Universities are adapting to this by changing their curriculum, learning goals, and the way instructors teach online as they establish learning communities in online courses and in virtual space. This puts the emphasis on the instructor as a facilitator, who selects appropriate discussion topics and questions, and stimulates the interest and imagination of the students. This is a constructivist method of learning, which encourages students to create and build their own knowledge (Cleaver, 2008). Within conventional educational contexts, the use of advanced technological tools and virtual environments can support student learning and achievement of goals. Utilization of this concept significantly enhances the learning process (Falloon, 2010; Jones, 2008). Simulations and online discussions created by educational institutions are designed to support student learning by encouraging problem solving, higher level thinking, collaboration, and experiential as well as constructivist methodologies.

Background

David Kolb (1984) is considered the authority on experiential learning, based on the premise that people learn through experience. Kolb's model begins with concrete experiences. From these concrete experiences individuals are able to learn theory and move on to more esoteric learning. Through active experimentation, people reflect on their observations and these reflections are applied to future learning.

The constructivist learning theory is that individuals learn through processing information and building relationships between this new information and information they have previously learned (scaffolding). This process helps to build deep learning, which involves using the newly acquired information to apply to unfamiliar situations and contexts (Jones, 2008). By exploring, experimenting, manipulating, and testing, students actively create the knowledge they learn. Learning is student centered, with the instructor serving as a facilitator.

Student Motivation and Engagement

Research studies show a positive correlation between learner engagement and the achievement of learning goals (Falloon, 2010). The body of research on exploring the use of technology for supporting learning is rapidly growing. The interactivity of synchronous texting accommodates a wide range of learning styles and learner preferences, enabling students to make

meaning, construct understanding, and work toward reflection and improvement of their work (Falloon, 2010). The variation of learning styles is important, as many students are not successful because they are not able to adapt to traditional teaching methods (Perez, 2011).

Learning is a unique, individual process. To be effective, curricula must be adaptable to individual needs and have a great range of flexible approaches. Three major areas for providing this adaptability are providing alternative ways information can be presented; how it can be taught and scaffolded; and ways students can be engaged in learning (Rose & Strangman, 2007). Such pedagogically effective learning environments can serve both regular and special education students while being innovative and commercially successful. This is often referred to as the Universal Design for Learning (UDL) and involves students who have differences in their ability to hear, see, speak, read, write, comprehend English, move, organize, remember, and engage (Neumann, 2003; Rose & Strangman, 2007). The practice of this UDL concept empowers learners. By linking curricula content to the various elements of youth culture, such as the Internet, television, music, and video gaming, educators are able to capture and hold student attention as well as make learning more relevant for them. Students are guided to develop a sense of ownership of their learning (Kingsley, 2007). Synchronous texting enables deaf students to exchange ideas and exchange in critical dialogue with each other and the instructor in real time (Smith, 2006).

All humans begin their lives with sounds and gestures, the precursors of speech and sign language. The National Instructional Materials Accessibility Standard (NIMAS), approved by the US Department of Education, has enabled accessible digital versions of curricula materials which can be made into digital versions of the necessary formats for students with disabilities and distributed in the classroom (Rose & Strangman, 2007). In addition, automated, adoptive systems are being designed for customizing content to the individual learners to accommodate their unique preferences, styles, and needs. These assistive technologies utilize text-to-speech and voice recognition software, as well as alternative keyboards and universal access stations to support exceptional learners as well as their teachers and caregivers (Kingsley, 2007).

Consolidating visual and audio content into one device, such as an iPad to tablet PC, can eliminate the juggling act that many deaf students experience during a class or meeting. Using a transparent video and overlaid digital ink can reduce the visual distance between the student and the interpreter and the student's notes. Ideally, a student could have a tablet showing the instructor, the presentation, and the interpretation all on one screen (Cavender, 2007). This synchronous involvement in the activity helps to eliminate some of the feelings of isolation often experienced by deaf learners.

At a young age, inclusive programs are being designed for typically and atypically developing young children utilizing assistive technology along with instructional technology that supports the development of critical early skills in these students (Parette, Hourcade, Dinelli, & Boeckmann, 2009). In the middle years, multimodal literacy instruction has been designed to assist and engage English language learners in their development of reading and writing skills. Podcasting has been used to create a third space pedagogy, or classroom environment using multiple mediating tools to assist students in their literacy development. With students able to access and use computers in the classroom, podcasting during free moments is an effective use of time for students to collaborate, play, and be creative (Smythe & Neufeld, 2010). Synchronous texting, or text-talking, can be used as a motivational social discourse tool for not only the deaf, but for all students (Smith, 2006). In online classes, synchronous chat sessions can enable

students to communicate with the instructor and with their classmates on a real-time basis. Whereas people often do not think before speaking verbally, they find that they do think before writing. Thus, text-talking may be a more positive form of communication than verbal talking.

The emphasis is on using text as a motivational social discourse tool. Educators have the responsibility to raise social consciousness by providing appropriate social discourse strategies (Smith, 2006). Deaf learners are at a disadvantage in a world dominated by verbal communication. In a quasi-separate-but-equal environment, deaf students are often educated in schools for the deaf or in separate special education classes in the schools. When in an inclusion class, they sit next to students with whom they communicate minimally (Smith, 2006). It is important to provide all diverse learners with a tool such as synchronous texting that will enable them to socially compete with other learners. Utilizing text-talking can also be a valuable resource in enhancing the writing skills of all students. With most students having cell phones, this form of pedagogy can easily be implemented in the classroom. Students are fascinated and delighted by texting. This is an opportunity for teachers to incorporate the technology of text-talking into their lessons, along with other visual and tactile stimuli. Texting could then become an institutionally sanctioned form of discourse, used to encourage network development and to aid in critical thinking and problem solving knowledge. In the online classroom, synchronous chats can enable students to communicate with the instructor as well as with their classmates. Vividness is created when the brain reacts to senses stimulated during learning. The more senses used in a learning experience, and the intensity of those senses, the greater the student's retention of learning. Visual environments can mentally stimulate symbolic emotional and intellectual scenarios that create responses in the learner and create deeper learning experiences (Atkinson, 2009).

Captioning of video programming, such as television, movies, and the Internet, has become a mandate of the Federal Communication Commission (FCC). By court order, January 1, 2014 was the date set by which IP (Internet Protocol) based programming would be required to have captions that could be viewed by users of smartphones, iPads, tablets, and other portable technological devices. Commissioners commented that captioning served as a benefit to deaf students as well as hearing students by providing an additional sense that was stimulated in the learning process: hearing plus seeing, which enhances comprehension and retention (Anonymous, 2012).

In an effort to design a way for deaf students to be integrated into the hearing community, another program was developed to aid in synchronous communication between learners. *Technabling,* which is an affiliate group associated with the University of Aberdeen, in Scotland, developed a software application for deaf students that can be used with smartphones, iPads, tablets, and computers. It is based on British Sign Language (BSL). The student signs in front of a camera on the device, which gets instantaneously translated into words that can be easily read by the person communicating with the deaf individual. The program enables the deaf student to actually create special signs for words not typically included in BSL so they can be translated into text to be read by others. The program is called the Portable Sign Language Translator (PSLT), designed to empower sign language users to communicate in real time with hearing individuals. This allows deaf students to fulfill their educational potential, and to effectively enter the job market. The PSLT is a work in progress and has the potential to be used with other sign languages than BSL. The creators of the program hoped to have the product available for mass usage in 2013, and in 2012 were actively campaigning for sign language users

from the Aberdeen area to become involved with the development and use of the program (New Mobile Software, 2012).

One of the most recent programs that has been developed to enable the deaf to communicate effectively with the hearing has been designed for use with smartphones and other mobile devices. *Transcense* is the name given to a new smartphone application that transcribes speech into written words that show up on a smartphone screen. Conversely, a deaf person can use the same application to speak for them in a digital voice, or to get the attention of hearing people present. This new application was created by four students from Berkeley and the University of San Francisco, all of whom have experienced various forms of hearing loss. *Transcense* works by using a newly devised voice recognition algorithm to separate individual voices in a group; then assigns each voice a color on their smartphone screen so the deaf person can determine who is speaking, and thus can be actively involved as a participant in the conversation. This is the first mobile application that has made it possible for the deaf to engage in synchronous conversations with their peers (App That Enables, 2014).

Technology has made it possible for deaf learners to interact with their hearing peers in an educational setting, allowing synchronous communication between all students. The developments have been extremely beneficial to the learning and self-esteem of the deaf students, and beneficial in many ways for the hearing learners. However, the manipulation of the programs and devices can be challenging for the educators involved. So much is new, and instructors must learn to be competent in the use of this new technology.

Technology is Not for Everyone

Conversely, there is reluctance on the part of many individuals to engage in the world of technology. This technophobia relates to the loss of control and the fear of the unknown (Elund, Clayden, & Green, 2010). It also relates to the excessive amount of time and the steep learning curve for Prensky's digital immigrants, those who were not born with a technical device as a cradle toy. Many seasoned educators find it challenging to even operate their smartphones.

This is an age when it is a full-time job to stay abreast of all the new hardware and software which impacts the techie world in both private and professional lives. Daily, there is a media blast for the latest must-have applications for smartphones, electronic readers, tablets and iPads, to improve lifestyles or increase efficiency. The media has created a phenomenon that has captivated the population, whereby people are led to believe they need things they never even knew existed.

Educators, too, have been impacted by the use of technology. A visit to an elementary school will reveal instruction using the *Smart Board*, with all-student response systems and students creating their own *PowerPoint* presentations. At the high school level, schools offer virtual classes and tutorials. Teachers at every level are integrating technology into their instructional process and having students demonstrate their comprehension of skills and concepts using technology.

Educators at institutions of higher learning are all on a learning curve. Today, most colleges have migrated from only offering onsite classes to increased enrollment for their online classes. The expectation is that professors will master the use of the programs and create online classes that are as academically challenging and engaging as classes held in mortar and cement buildings. Educators may not have the confidence or experience to effectively utilize the

plethora of available digital tools (Kingsley, 2007). Professors need to learn a multitude of new skills. In exploring alternative methods to the traditional method of teaching online classes, there is a great deal of adaptation. The goal is to promote an innovative teaching experience that is both collaborative and interactive. It requires a combining of pedagogical knowledge and technology skills (Ellis & Anderson, 2011).

At times, this learning curve seems unmanageable and never-ending. Some instructors question whether this emphasis on technology is truly increasing student and instructor success. As educators, professional determination regarding the effectiveness of the best practices in technological innovation must be made (Parette, Hourcade, Dinelli, & Boeckmann, 2009). Today's learners will continue to be exposed to new and innovative learning technologies. As more schools offer such technology, and as technological development accelerates, the cost will decrease and the ability to accumulate and store data will increase. This will ultimately raise expectations for problem solving and new research (Jackson, Gaudet, McDaniel, & Brammer, 2009). As researchers, we seek to establish a body of knowledge based on scientifically controlled investigations and studies, and then proceed to analyze and interpret the data in an attempt to draw relevant conclusions.

Many of the above mentioned contentions are not scientific, but are based on personal anecdotes of colleagues as well as common sense. Although there is a body of research to support that the use of technology increases student success, motivation, and retention of knowledge, there seems to be a number of substantial detractors to embedding it into online classes. More research is needed in this area, to determine the optimal criteria for using technology in online and onsite classes.

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