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Framing Issues:

Technology Equalizing Mathematics and Science Education

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A Description of the Issue

For this assignment, the issue I have chosen is that of "Technology as an Equalizer for Students with Disabilities in the Subjects of Math and Science". My own assumption regarding this issue is that technology can make a great difference in the classroom for students with various disabilities (audio and visual impairments, learning disabilities), sometimes to the extent of making their disabilities almost invisible. For example, students with visual problems can use scanners to scan in textbook readings, as well as computer programs to both read assignments to them and to dictate their assignments. The technology in this example can help students with disabilities to function in a normal classroom, overcoming their visual impairment.

I have developed these assumptions through my work as a student teacher, as well as a year working in the Accessible Learning office at Wilfrid Laurier University. As a student teacher, I often had classrooms containing students with various disabilities. One student in my second placement (grade 6/7), Student A, had dyslexia, which made writing difficult for him and impossible to read for the teacher and I. The parent-teacher association had come together to purchase an electronic typewriter for him. It was not like a computer with a screen, but more similar to a computer keyboard with a single line LCD (Liquid Crystal Display). While other students would write out their work, he would type it on the keyboard. When he was finished, he would plug the keyboard into the classroom computer using a USB (Universal Serial Bus) cable, and the computer automatically transcribed everything to Corel WordPerfect for him to edit and print out. By using this keyboard, he was able to function completely normally in the classroom, overcoming his disability almost completely.

At Wilfrid Laurier University's Accessible Learning office, I worked with many students that had difficulties, such as visual impairments, learning disabilities, and more. One of my functions was working as a notetaker. In my classes I took scrupulous notes on my laptop then emailed my notes after class to other students in the class who had difficulties in taking their own notes (extreme ADD/ADHD, fine motor control issues, visual impairments). Some students only required this small accommodation to function normally in class. One of my other functions in the office was to update the Accessible Learning department's website, to make it accessible for everyone (readable by screen readers, and to make the text size easily adjustable). Another task was transcription, which involved scanning textbooks in to a program such as Acrobat PDF or Omnipage and correcting errors to make a file readable by an OCR (Optical Character Recognition) program. I also worked with programs such as JAWS, Dragon Naturally Speaking, WordRead, Kurzweil, Natural Reader, and more. With the accommodations offered by the Accessible Learning office, I learned that these students could be completely overcome their disabilities within their courses, without having the professor alter the curriculum or assignments at all. Many of these students achieved very high grades, and the accommodations our office offered would not show on their transcripts. They were able to function at the same level as their colleagues, or above that level, with the technology assistance offered by the office.

For me, assistive devices (technology) are a major breakthrough for students that have difficulties in the public school classroom. Students that do not have assistive devices often do poorly, because teachers cannot offer enough accommodations or the proper ones to suit the individual needs of each child. Even when teachers are able to do this, the students' feel that they are not learning the same material, and that they are not as smart as their classmates. As a result they often become melancholic in their attitude towards school. Technology can bring many

students with disabilities up to the same level as their peers, and can allow them to learn at the same level in many cases.

My experiences through the ETEC533 course have led me to investigate this issue further. The first activity I completed was that of an “auto-e-ography”. In this activity I reflected on my first experiences with chatting online. I have always had computers in my household, and thus am very familiar with having electronics / technology in my life. Through the autoeography I think I remembered how important it can be not to assume technology is going to do what you want it to, that you have to know what is going to happen and plan out strategies to use the technology before you give it to someone else (such as your students).

A second activity I was required to do was examine video cases of other teachers and their use of technology in the classroom. While overall the cases I reviewed did not contain much information pertinent to equalizing education for students with disabilities, it did make it clear to me that there are many teachers that are not comfortable with technology. It is necessary that teachers become familiar and comfortable with using the technology themselves, and are trained on how to incorporate that technology into their classrooms, in order for students to be able to use technology as a tool to help them overcome their differences, like learning disabilities.

In a third activity I was able to conduct an interview with my colleague, a grade 6 teacher with several students with disabilities in her classroom. This interview further enforced my assumptions about the use of technology in the classroom. My colleague’s experiences are specifically with providing laptops to students that have dyslexia or fine motor control problems.

She explained that these students use programs on the laptops to type documents and have various texts read to them.

One aspect of the 533 course is the discussion forum. One colleague commented on my interview summary in this forum, stating “I like the fact that your interviewee uses technology to "equalize the balance between some students". With the inclusion of so many students with varying learning abilities and disabilities, it is great to hear that teachers are using technology to equalize the divide.” Another colleague commented that “[a]ssistive technology can actually turn a failing student into an average student or make the difference between having the opportunity to get an education or not get one.” This colleague has a disability, and says that without assistive technology she would not be able to achieve her current educational level (Master’s Degree), and in fact would not even be able to work full-time. The example that my interviewee included is similar to the experiences that I have had with laptops and students with disabilities, and confirms my belief that technology can act as an equalizer in the classroom for students with disabilities.

Analysis of Contemporary Resources

The article “The Future is Now: Application and Innovation of Technology in Special Education” suggests that technology can be used to allow students with disabilities to learn in a “‘socially-acceptable’ and nonstigmatizing manner” (Gray & Silver-Pacuilla, 2008, 2). The article specifically mentions speech technology, smart toys and computers for helping students with disabilities, and also mentions that it is the teachers that need to find ways to implement and adapt the technology for students, to allow them to learn and attain their full potential. The article

does not specifically mention technology as an equalizer in the classroom, but it does seem to convey the message that technology as assistive devices can equalize education for students with disabilities.

The premise of the article "Using an Assistive Technology Toolkit to Promote Inclusion" is that technology can help children with disabilities to feel included, in and outside of the classroom, but that the technologies that make this possible are very underused in those students' IEPs (individual education plan) (Judge, Floyd, & Jeffs, 2008). The authors believe that this may be due to the difficulty in compiling a list of what sort of assistive devices are needed (called AT for assistive technology), as this can change from year to year, as well as the financial expenditure in acquiring the needed devices. They recommend creating an "AT Toolkit", which contains somewhat low-tech devices, such as certain software, touch screens for electronics, talking books, and adaptive keyboards, so that certain devices are always readily available and usable by any student that requires them. This article looks particularly at special education students, and students with IEP's, but I believe the advice is applicable to any classroom that has a student with a disability. The article specifically says that through the use of (assistive) technology, students with disabilities can have the same experiences and benefits as other children.

Cullen, Franks, and Richards article, "Using Software to Enhance the Writing Skills of Students with Special Needs," contains references to many different studies conducted on the effectiveness of incorporating software to support students with disabilities (Cullen, Frank & Richards, 2008). The article specifically mentions spell-checking software, talking spell-checking software, as well as word prediction software. The authors also conducted their own study and have published the results in this article, comparing students before they used certain

software programs, after the incorporation of one software program, and after the incorporation of a second program. In general the report indicates that before using the program students would not write much, and much of what they did write was incorrect. After they began using the program, the amount they were writing increased, and the number of mistakes decreased. The article shows that incorporating assistive technology, such as software programs and computers, can greatly increase the skills of students with disabilities and can allow them to be "effectively included in writing activities in the general education classroom" (Cullen, Frank & Richards, 2008, 42). This indicates that they are able to function at a similar level as their non-disabled peers, making technology an equalizer in the classroom.

Bouck and Bouck (2008) conducted a study testing to see if calculators helped both non-disabled students and disabled students with problem-solving questions in mathematics (Does It Add Up? Calculators as Accommodations for Sixth Grade Students with Disabilities). The result of the study was that while calculators do help students in the classroom, calculators improved the scores of the students that are not disabled more than the students that are disabled. The students that are disabled had problems with the questions themselves, specifically the problem-solving aspect, and so the calculators did not actually help them much. In this instance, this particular use of technology in the classroom actually furthered the disparity (Bouck & Bouck, 2008).

Puckett's article, "Integrating Assistive Technology with Curriculum Standards," explains that when students with disabilities are given access to assistive technology, their academic success increases (Puckett, 2006). Puckett specifically mentions that for students that have reading disabilities, scanning the text into a program to be read by an OCR is a great alternative to trying to read the text themselves. This article also explains that much of the

process for acquiring assistive technology is geared towards getting devices for students with physical or sensory disabilities, which explains why for many students with learning disabilities the devices simply are not available. The article is about a study that Puckett performed to find out what teachers know about assistive technology for students with disabilities, and then filling in some of the gaps in that knowledge. Many teachers were impressed with the possibilities technology holds for their students with disabilities that they had not been known about previously. Puckett's article seems to emphasize the necessity of instructing teachers on the uses of various technologies, and supporting the use of those technologies in their classroom.

Odubo (2008) emphasizes the need for teachers to support students with disabilities, specifically in the mathematics classroom. Odubo's article shows that while teachers have to have the necessary documentation (a bachelor's degree, certification and subject knowledge), they often come to the classroom ill prepared to teach students that have learning disabilities. He cites research that teachers should be better equipped with strategies and practices in how to provide education for students with learning disabilities. Odubo goes on to say that assistive technology, particularly computers, can help students with learning disabilities by increasing their ability to perform basic math functions with automaticity. The emphasis in this article is the combination of knowledgeable teachers, effective strategies, assistive technology, and an effective curriculum (Odubo, 2008).

Overall, contemporary resources seem to agree that technology, particularly when used as assistive technology / devices is very important in the classroom for students with disabilities. In most cases, technology can help students compensate for their disabilities, by providing written text in audio form for students with visual problems, or by providing neat text for students with dyslexia or fine motor control issues. Technology is not always useful, as seen with the article by

Bouck and Bouck (Bouck & Bouck, 2008). Sometimes it can further the performance gap between students with disabilities and students without disabilities. As well, teachers are not always prepared to incorporate technology for students with disabilities, or may not even be aware that it is possible in some cases. Many school boards may not have the funding to provide the assistive technology to all the students that need it, or provide the training and support for the teachers to use it to its full potential. All of these issues with technology in the classroom confound the problem for these students. The articles do seem to agree as well that when used appropriately in the classroom, technology can be an equalizing force; it can enable students to work past their problems and become functional in regular classroom settings.

Conclusion

Looking in depth at some of the contemporary articles on the subject of technology assisted learning for students with disabilities, it cements my belief that technology can act as an equalizing force. However, it also makes me realize some of the problems with providing that technology that I had not previously considered. I had not thought that certain technologies in the classroom could increase the disparity of students with disabilities. I was aware before that certain technology can be very expensive for school boards to provide, such as laptops for every student that could benefit from it. My time at the Accessible Learning office taught me much about money and technology. Often my employer would put in for a new laptop for students to use for writing exams, and by the time the funding was approved she would almost be able to buy two. Many school boards do not have the funding available to them that a university does, and must decide often between providing for the majority of students, or providing for those with

disabilities. I still believe that technology can help equalize the abilities of students in the mathematics and science classrooms, but I do realize more so now that when considering technology in a mathematics or science classroom, more than just the students and the technology needs to be taken into consideration. Teachers need training with the technology to be able to use it well, and they also need to be supported in their endeavors. Finances also become a consideration, and can be a problem if there are students with disabilities in a classroom than the school or school board is prepared to handle.

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