The Effectiveness of Using Technology to Teach and Assess Performance in Mathematics among Students with Special Education Needs

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Abstract: Students with disabilities face numerous problems in their learning experiences. For instance, learning Mathematics remains a core subject but a challenge to most of these students. However, technology integration in learning continues to become a major factor considered by curriculum developers. Factors such as proper integration of technology in learning continue to be of great importance in such decisions. Additionally, cooperation among stakeholders including parents, teachers, and administrators is vital on how to effectively utilize technology in helping teach and assess performance in mathematics. Thus, while technology has been found to be effective in helping enhance curriculum development, there is still room to help remove barriers that hinder its optimization.

Key words: Technology, special needs, Mathematics, assessment, effectiveness, math fluency

1. Introduction

Learning Mathematics remains one of the core objectives of most schools. As most researchers examine and illustrate, schooling and the learning of basic Mathematical concepts and procedures remains an essential part in everyday learning. Acquiring basic skills in mathematics not only help in building a good foundation of numeracy skills but also solving day-to-day computational issues. Similarly, as institutions of learning become more diversified and gear towards ensuring quality and competency in learning, Li and Ma (2010) illustrate that computer technology has continuously become a major sector in the education paradigm. Hasselbring, Lott, and Zydney (2005) posit that learning Mathematics and developing a society that has fully embraced the use of Computer Technology (CT) in education, especially for students with special needs has not been well structured. In essence, special education need requires students a platform that requires an integrated approach in learning; an approach that tries to create a curriculum and learning objective that takes into account their needs. Efforts to make learning easy for these students goes a long way in helping ensure that they have a comfortable stay in school and give them a chance to realize that disability is not inability.

In essence, this paper goes a long way in identifying core methods and systems in technology that can help students in special education needs schools to learn and also assess their knowledge in Mathematics.

2. Mathematics Education Practices in Special Education Schools

2.1. Organization of Special Education Curriculum

An important outlook into the core practices of most schools in operating and handling students with a disability is important in helping develop a framework to better their learning objectives. Louie, Brodesky, Brett, Yang, and Tan (2008) argue that as time moves by, schools handling students with disabilities have realized the importance of designing curriculums that help such students best appreciate learning and acquire skills on the same. As a result, the authors studied six special education schools in
the Islands Region and Northeast states on their management and organization with respect to Mathematics learning practices. Their study provides that schools mostly follow the general curriculum provided by the government in teaching mathematics. Such curriculum focuses have over the years been a key focus to help trim and design a curriculum that best fits the needs presented by this group of students.

While Individual with Disabilities Education Act of 2004 requires that schools ensure that they teach students in these schools the same curriculum taught in other institutions, the issue of developing an integration between learning methods used in such schools and individual needs of students remains a vital issue (Louie, et al., 2008). Thus, authors such as Bouck, Flanagan, Joshi, Waseem, and Schleppenbach (2011) assert that it is worthwhile to develop curriculums that ensure an integration between educational settings and environments and performance of students. The author asserts that conducive learning environments and curriculums which are presented in a way students understand best ensures that they improve their math scores. Therefore, it is only worthwhile to first focus on curriculum development in any efforts to improve learning for students in special education schools.

2.2. Administration

Additionally, aspects such as administration of these institutions have been considered as important in ensuring that they meet their purpose and provide this group of students with a rare opportunity to learn. Thus, over the years, administration organization has remained a core practice and focus for such institutions. In particular, experienced administrators who are well versed in the special education sector have been sought to lead most of these institutions (Louie, et al., 2008). With such a move, policy-making and decisions which affect the creation of the best learning environments for students has been a factor that has been of significant importance for these learners. Parents and other stakeholders of most of these schools carefully ensure that those in leadership positions of these schools are intellects who understand various aspects of managing students with special needs. Resource allocation and proper recruitment of staff in addition to capacity management requires careful analysis of the ability of these institutions to handle an ever-growing number of students with disabilities.

3. Challenges Facing Special Needs Schools

3.1. Lack of Competent Staffing

One of the greatest challenges that have continuously faced most schools for students with disabilities has been inadequate specialized staff. The education setting in most of these schools requires that teachers have a one on one conversation or connection with students. Further, the need to help students with more than just learning arises in most cases in these institutions. As such, unlike in other educational settings where a teacher may not have a close relationship with all their students, such settings require that a deep connection be built between teachers and students (Strickney, Sharp, & Kenyon, 2012). In fact, in most cases, teachers end up playing the role of educators and parents. Therefore, this calls for only special attention to these children. Special attention comes with experience, expertise, as well as a passion to help such students. As such, it only becomes relevant and of great importance that such teachers be qualified and equipped with necessary skills that are a prerequisite to ensuring that the best learning, growth, as well as development environment are built. In essence, using teachers from normal schools to handle students with disabilities makes it hard to ensure that their performance is optimized (Gersten, et al., 2009). However, despite calls to have a system that focuses on having more teachers trained to handle these students, most schools still have inadequate facilities and staff to fully implement these policies. An even worse case arises when such students are learning in normal schools. Most of them hardly get a chance to have specialized teachers help them in their day-to-day learning. With expenses associated with special needs schools, institutional learning for these students may be hindered for a long time. Thus, the number of trained teachers continues to become limited since the respective increase in cases of disabled children rises every day.

A worse case arises for the availability of teachers tasked with the duty of teaching Mathematics. Louie, et al. (2008) posit that most available teachers in such schools only focus on helping students with reading and basic sciences. However, teaching Mathematics has been a hard exercise, worsened by the inadequate number of Mathematics teachers. Their study established that out of the six schools they assessed, only two had more than three Mathematics teachers. Most of them had one or an average of two. Thus, such levels threatens the sustainability of the education system and poses a critical question on whether enough inputs are made to train such teachers.
3.2. Insufficiency of Assessment Systems

Assessing students with disability remains a great challenge for most educators today. Louie, et al. (2008) illustrate that over the years while most teachers have tools that help them diagnose reading difficulties among students with a disability, few assessment tools are available to help in assessing the performance in mathematics for these students. Further, provision of invention for Mathematics was also established to be a major challenge for most teachers given the diversity in needs that such students have. Assessment of these students is also hard especially with the chances of having students with more than just one disability. In such cases, it becomes even harder for teachers to design effective tools that can integrate more than one factor. In essence, with a lack of or inadequate reading programs, it becomes harder to develop good assessment tools (Gersten, et al., 2009). Thus, most teachers end up using informal assessment including observation of students as they work in groups.

Still, with these challenges, most teachers have resulted to the use of end-of-unit and in-class work assessment methods, both formally and informally. Additionally, Design Your Own Assessment has continued to be a major way used by teachers and other curriculum developers to help stem cases of hardships in assessing students (Louie, et al., 2008). These systems have allowed schools to integrate their own assessment programs into the provided methods in the curriculum. Some of the core Mathematics Assessment programs and tools include the use of statewide assessment programs, which is useful for grade 3-6; benchmark assessment among grades at the start of the school year; daily classroom assessments; and analyses of student data in a school, allowing teachers to develop better teaching methods (Louie, et al., 2008).

3.3. Inadequate Equipment/Technology

While inadequate professional teachers and non-comprehensive assessment tools have been major challenges facing special education needs students, an even greater challenge, inadequate technology, has emerged to in the recent years. The use of technology in helping such students has become a major factor for most scholars to consider with some alluding that effective enhancement of technology in such systems is the key to having better performance for such students. Proper technology use that has been specially developed and engineered for the needs of such students opens up a better understanding of key concepts that determine their ability to understand what they learn (Strickney, Sharp, & Kenyon, 2012). Thus, the fact that such technology is limited to only a few schools and remains unavailable to a larger population makes it even harder to make policies that can be of great help to schools and other institutions. With negative perception on technology, in particular smartphones and the internet in affecting student behavior, the use of technology in learning has received a lot of criticism. However, most scholars have suggested that technology paves way to make learning interesting, real, and enhances research. The cost of equipment and integration of technology in learning in special education schools, especially in developing countries has hindered its effective use. Further, lack of necessary expertise and training of teachers to use and control its use have only escalated related challenges facing these moves (Calhoon, Fuch, & Hamlett, 2000). However, the fact that subjects such as Mathematics require technology use, even in the basic form, such as calculators, makes it a prime necessity to increase their availability in schools.

4. Technology in Helping Students with Special Needs

4.1. Importance of Technology in Learning

Technology not only provides a medium for learning but also ensures that students get a chance to communicate and socialize, which are important attributes for students with disabilities. According to Israel, Marino, Delisio, and Serianni (2014), advancement in technology, cultural changes, as well as a change in perspective on technology has enabled most students in K1-12 schools and other levels of learning to apply different skills in their day-to-day school activities. However, while students in normal schools have had a good reception of the use of technology in learning, Kingsley and Boone (2008) posit that their friends and counterparts in the special education schools have had little to show their ability to enhance effectively technology in making their learning easier. Additionally, a survey by Grunwald Associates LLC (2013) indicates that the use of smart phones among pre-K-12 students and high school students is relatively high, at 43% and 60% respectively.

While the use of smartphones continues to gain a high level of acceptance among learners and curriculum developers, it is the use of smartphones that has over the years become a major focus for most institutions. The cases of smartphones brought to schools was also noted as a key factor in most schools with over 51% of students using them in schools. Therefore, while measures have been put in place to reduce such cases and discourage the use of phones in class, it only calls for a much wider and broader perspective to handle such matters. Thus, Isaac, et al. (2014) assert that while the use of technology is majorly abused in schools with students without disabilities, its usefulness in special education needs schools is of great importance.
Therefore, it only calls for a spirited effort to place measures that are dubbed at increasing their efficiency in schools. The authors identify the importance of using instructional technology and assistive technology in helping learners through aspects such as voice recognition apps, dictionaries, and advances planners.

4.2. Assistive Technology

Marino, Coyne, and Dunn (2010) argue that assistive technology or AT has been a common norm in most institutional learning areas. The authors progressively identify that high-tech software as well as low-tech devices have been influential as learning essentials in modern institutions. Such devices include special recognition software and pencil grips. Further, Isaacs, et al. (2014) assert that ATs include devices that are meant to improve, maintain, or increase a disabled child’s functional capabilities. The device used can be in form of a customized, modified, or even commercially acquired product system, equipment, or “any” item (Isaacs, et al., 2014). These devices are commonly integrated into or from common IT equipment. For example, students with dyslexia or dysgraphia are commonly using speech recognition software to help them in their day-to-day learning activities (Isaacs, et al., 2014). A major problem with reference to AT is the presentability that the name has had with most curriculum developers. While devices like mobile phones are in this category, most educators have not known that they can effectively help students in their learning.

4.3. Instructional Technology: Use of Universal Design for Learning

UDL offers a broad instructional framework that has been tested and noted to be effective in helping students who have exhibited diverse instructional needs (Isaacs, et al., 2014). UDL uses diverse technologies that are aimed at making learning interesting. UDL provides flexible engagement methods thus supporting affective learning, enhance recognition, and further support strategic learning. In creating readability, UDLs help students relate with daily activities they engage in. For instance, learning Mathematics through multimedia software has been shown to help students effectively solve basic and complex problems. Additionally, UDL provides virtual learning environments, which can help in numerical presentation (Strickney, Sharp, & Kenyon, 2012). Similarly, such platforms are influential in ensuring that students discuss solutions with peers and get instructions from tutors and educational helpers. Moreover, computerized mathematics practice has been shown to effectively help assess learners’ math automaticity and computational math.

4.4. Web 2.0 Tools

Web 2.0 tools have also been shown to be effective in helping deaf students (Russell, et al., 2011). The authors note that most students had a preference in increasing their experience in the online environment. In essence, technology still has a great relevance in helping revolutionizing the learning experience for students with disabilities.

4.5. Case Study: The Use of iPads to Build Math Fluency

The use of iPads as a modern technological tool in learning continues to attract interests from different curriculum builders. Thus, (O'malley, et al., 2013) studied the impact of using iPads to help students with disabilities improve in their performance as well as tested barriers to its effective use. Thus, the study was exceptionally important in helping highlight core issues that would help curriculum developers integrate this technology in learning. They found the use of iPads useful for moderate to severe cases of disabilities with respect to teaching Mathematics as most students increased their level of efficacy. Additionally, this study showed that the use of iPads in learning was widely accepted and welcomed by teachers. As such, the authors posit that it is of great importance to make technology a core component in helping students
gain professional development from a tender age. In essence, the study further notes that in order to integrate technology in learning, collaboration among parents, administrators, as well as teachers is needed to ascertain that such efforts bore fruit. The authors found that despite the effective use of technology, barriers such as inadequate or lack of a high level of technological support lacks in most institutions. Additionally, some of the teachers were not entirely receptive on the use of computer technology in learning and expressed fears that they did not have the necessary expertise to build a formula to integrate it in learning. Further, limited technology availability was found to be a factor that hindered its effective use. Lastly, logistics difficulties with a lot of time needed to ensure that students learned how to use iPads became a major challenge.

5. Conclusion

In essence, technology remains a core factor that should be considered in learning. The use of technology in helping students with disabilities remains a great area that curriculum developers must look into. In particular, students with disabilities face a hard time in having a curriculum, which allows them, integrate learning and assessment of Mathematics. Learning Mathematics requires that students become acquainted with the necessary tools that ensure their smooth understanding of concepts and ability to solve them. Studies such as the efficacy of using laptops in teaching Mathematics show that indeed there is a great opportunity provided for in the use of technology in learning. In addition, there is a need to ensure collaboration among parents, administrators, teachers, and curriculum developers for the effective use of technology in learning.

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7. References


