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Using Multimedia Learning Objects in Special Needs Classroom

Joel Suk Mei ONG

University of Technology

Noraffandy YAHAYA

University of Technology

Abstract: The research project highlights the use and creation of multimedia learning objects to improve the learning of special needs students. The researcher investigated how the audiovisual context had progressed into a new approach to learning that sharpens the analytical reasoning and rational social skills of special needs students. This research proposed a two-group pre-test – post-test qualitative research to measure the impact of multimedia learning objects in improving the learning abilities of students with special needs in schools. The experiment aimed to see that a multimedia education paradigm may benefit two groups of students with different learning impairments. It was aimed toward students with Autism or Down Syndrome under the age of 15. Many of these students are taught in ordinary special needs classrooms without special intervention tools. The findings suggest that multimedia technology in learning can assist students with learning disabilities. The well-thought-out system benefited autistic students, demonstrating the educational potential of a multimedia system. A plan targeted to one particular disability group may be more effective than a comprehensive system that tries to fulfill the needs of many different disability groups.

Keywords: Multimedia learning objects, Special needs, Autism, Down syndrome

Introduction

There are millions of students worldwide who are affected by Autism. However, extensive research has been undertaken to provide appropriate techniques, such as therapy and education, to aid children and people with Autism (Cadoni et al., 2014). The Picture Exchange Communication System (PECS) and the Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) were created in the United States and are now widely used across the world to assist persons with Autism in managing (TEACCH). As a result, a large number of people throughout the globe utilize these two applications (Botturi et al., 2008).

Autism affects students in various ways, including their communication capacity. The ability to talk may never develop in some students, while others during their lives. PECS is a technique developed by the Delaware Autistic Program in the United States (Forni, 2008). Through artifacts and symbols, this technique helps children learn to speak. Six primary steps comprise the system, which is considered cost-effective to utilize.

TEACCH, a program developed in North Carolina in the 1960s, is another example. This program aims to equip children with Autism to perform independently at home, at school, and in society. This organized education program can assist in managing the child's surroundings by delivering transparent, tangible, and relevant visual information (Heldsinger & Smith, 2005). Furthermore, the method is founded on the idea that most Autistic persons learn visually rather than via written or spoken data. Even if a child doesn't want to answer a straight question, parents may provide a variety of alternatives for breakfast. Instead of stating what they want for breakfast, the children might point to the image. The researcher designed a series of multimedia learning objects for students with Autism or Down Syndrome. An ed-tech guidebook, best practices, and the results of real-world teaching situations were used to construct the multimedia learning objects (Khan & Knight, 2010). The

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researcher then assessed if there was evidence of diverging levels of study from each set of students to determine how best to serve these individuals. An overview of the study's findings is provided in this publication as an explanation of the research's possible outcomes.

Background

This project aims to create multimedia instruction for students with Autism or Down Syndrome. As a result, it is vital to investigate the theory behind multimodal learning. As defined by Richard Mayer, Multimedia learning is learning through the use of words and images (Mayer, 2001). According to him, "*multimedia messages built with the human mind are more likely to lead to effective learning than those not.*" (p.41) In his cognitive theory, two channels, a finite capacity, and active processing are all assumptions Mayer made by multimedia learning. The research effort is focused on a dual belief, which holds that people have two different ways of acquiring knowledge: visual and aural representations. The Dual-Channel assumption states that there are two other channels of pattern recognition: visual and auditory/verbal. When delivering educational content to learners, it is preferable to use both auditory and visual channels rather than just one. This notion is especially relevant for students with a hearing disability, who depend significantly on their sense of touch. To be clear, the Mayer approach was developed for typically developing children and makes no effort to cater to the requirements of those who have special needs. Consequently, these theories must be tested to see whether they apply to students with special educational conditions, such as Autism or Down Syndrome. They have a greater need to reduce their reliance on their auditory senses.

Cognitive load refers to the total amount of brain processing required to keep our memories operating at a particular moment (Sweller & Chandler, 1991). The cognitive load hypothesis of Sweller and Chandler states that appropriate instructional material increases learning by directing mental resources toward learning-related activities instead of activities that are preliminary to training (Paas et al., 2003). As a result, when inefficient instructional material designs are provided to the learner, it might place an excessive mental burden on their working memory, making it difficult for them to learn. When dealing with autistic students, it is vital to manage cognitive load or Down Syndrome since they have poorer auditory and visual balance than ordinarily developing learners. When creating multimedia communications for students with exceptional needs, difficult or irrelevant material must be minimized further and far more than typically developing learners.

Literature Survey

A literature study was done for the objectives of this fact sheet to analyze existing approaches for developing and designing multimedia projects. Moreover, multiple studies addressed different areas of multimedia development in higher levels of education, and a concise set of rules depicting the creation process for multimedia learning objects is lacking.

Models for Multi-media Development

A paradigm would provide an organized structure for the practice of design curriculum, which can be a daunting endeavor. Stoney and McMahon (1998) in one growth strategy, utilized Gould's (1995) model of multimedia development and classified the four primary phases as follows: (1) information design, which includes content planning and audience analysis, (2) interface design, which helps connect the student with the subject matter in the most workable and straightforward way possible, (3) navigation, which connects the pages of content in a structured way, and (4) interaction design, which defines how the program works as well as how the student uses the program. Alessi and Trollip (2001) developed a four-phase approach that included (1) delivering knowledge, (2) directing the learner, (3) practicing, and (4) monitoring learning.

Multi-Media Learning

Among several, Clark and Mayer's (2003) work mentions multimedia creation and has made substantial contributions to our knowledge of how the cognitive functions of processing visual and audio information might affect learning. Their instructions on combining pictures, audio, video, textual and spoken narration are critical to constructing multimedia learning objects. With this basic knowledge, practitioners may critically assess multimedia components to avoid cognitive overload, inhibiting teaching (Clark & Mayer, 2003). Aside from the

learning issues, there is evidence that multimedia training may be more motivating, entertaining, and available at any time and location than traditional learning approaches (Zheng, 2009; Astleither & Hufnagl, 2003). Furthermore, Bernard and colleagues (2004) found that students who were actively interested in their homework were more driven to achieve higher levels than those who were not engaged. Lui, Toprac, and Yuen (2009) highlighted five components that contribute to intrinsic motivation to promote this engagement: (1) problem-solving skills, (2) having a great time or playing, (3) data processing, (4) self-restraint or voluntarily acting, and (5) socializing.

Table 1. Multi-media learning principle

Principle	Description
Personalization	A more meaningful learning experience is provided to the audience when the speaker speaks in a conversational rather than formal way.
Redundancy	People learn more effectively from multimedia lectures when visuals are communicated only through audio narration rather than voice and on-screen text.
Modality	When audio storytelling is utilized to explain visuals in multimedia classrooms rather than on-screen text, students learn more effectively and retain more information.
Coherence	Students learn more effectively when the distracting narrative, graphics, and music are eliminated from multimedia lectures.
Contiguity	Similar printed words and visuals are displayed on the screen near one another or when audible words or visuals are shown simultaneously.
Multimedia	Exposure to both words and visuals makes them more likely to retain information.

Methodology

One week of research was conducted in a Malaysian school for students with moderate learning disabilities (MLD). This specific institution caters to the special educational needs of students as young as fifteen. In this case, frequent contact with the end-user was inappropriate due to their communication difficulties (Sutton, 2011). Instead, requirements were generated from user observations, discussions with classroom teachers, and other research. Regulators forbade audio recording, so these remarks had to be recorded verbatim. Four of the school teachers were questioned on the best ways to instruct their students, and the researcher gleaned their advice from them. Teachers who worked with students with learning problems were well-versed in Autism and Down Syndrome (Yim et al., 2019). The school's comparable ability courses formed two groups of seven students. Despite the lack of pre-testing or profiling for this planned research, the school had included these students in the sample. It determined that they were at comparable ability levels in the particular domain of the Ecosystem without prior teaching.

Data Collection

The school watched a group of Autistic and Down Syndrome students to determine if they utilized different learning tactics for various obstacles. Teaching and communication methods, including Makaton symbols and phrases, were the most often used for Autistic and Down Syndrome students. Both groups of students like and understand these tactics. The teacher also promised to use the same instructional techniques for students. Everyone used the same instructional methods (Kopp & Forni, 2012). Also, both teams are instructed to use the same techniques. Teachers and administrators at the school endorsed Makaton symbols, commonly used for homework and classroom assignments. The most effective teaching method included pictures and Makaton signs with words, similar to Mayer's multimedia approach.

Research Result

Experiment 1:

In Experiment 1, the researcher looked at how long it took students on average to answer a set of questions after learning the strategy and how many times they had to try until they got it right. In this post, you will find the

results. Compared to individuals with Down Syndrome, students with Autism made much fewer efforts to respond correctly. Once, an autistic student had to make two attempts before answering correctly. Autistic students answered faster than Down syndrome students.

The hypotheses were tested using a t-test. The tests compared the number of tries made by Autistic and Down Syndrome students to answer problems correctly. It was shown that there was a significant disparity between the cognitive efficiency of the Autism and Down Syndrome groups (number of attempts). There were two different groups of 7 students in each group. The amount of time it takes for participants with Autism and those with Down Syndrome to deliver their replies varies widely. A two-tailed test was used in the hypothesis with $t=2.449$ and $p=0.05$. As a result, both data demonstrate considerable differences in learning performance. There is evidence that students perform differently when using the same multimedia learning objects. The learning objects were created to accommodate both categories of students based on research, observations, and interviews.

Revised Learning Objects

The learning objects were rebuilt based on the findings of a usability study and observations made to determine where potential difficulties could arise in the future. Following this, the plan was modified following the results.

Experiment 2:

The multimedia learning objects were modified, and the test was carried out once more. The time and number of tries were both recorded under identical conditions. The Autistic group just needed one effort to provide answers accurately. It was more difficult for those with Down Syndrome to answer questions accurately. Compared to students with Down Syndrome, the participants with Autism took less time to complete the questionnaires. The hypotheses were once again tested using an independent t-test. The multimedia learning objects were tested using the same students. The results, with $p=0.05$, are as follows. As a result of this initial test, it may be concluded that there is still a significant gap in the learning abilities of students with Autism and those with Down Syndrome. There was a substantial difference in the time it took the two groups to respond to questions in the second trial (time taken). To conclude, the findings reveal that the null hypotheses have merely been rejected to establish that there truly is a difference in the performance level of the students when the same multimedia technology is utilized for learning.

Experiment 1 and Experiment 2 Paired t-tests:

Two t-tests were performed to compare the results of the Downs Syndrome cohort using the first system (Experiment 1) to the group's performance using the dual system. This test used the number of tries and the time it takes (Papagno, 2014). There is no significant difference in learning performance for the Down syndrome group for the first and second systems (Experiments 1 and 2) depending on the number of tries. Because the hypotheses were two-sided (the t was estimated at 2.35), the critical threshold of 3.182 is substantially lower than obtained.

Time:

It is clear from the estimated **t-test** value of 3.000 that it is significantly less than the critical value of 3.182, indicating that there is no statistically significant difference between the Down Syndrome group's performance in learning from the first and second systems on the time it takes to respond to questions (Furukawa et al., 2016). To conclude, both findings suggest no real learning is taking place. There is inadequate data to demonstrate that the second method improved learning performance in the Down Syndrome group.

Research Discussion

The statistical findings indicate that the two groups should not utilize the same system. There is substantial evidence that when groups with varying learning needs use the same multimedia learning objects, the learning performance varies significantly. Despite the modifications to the second procedure to make it more acceptable

for the Down Syndrome group, no statistically significant variations in their academic performance were found (Eristi, 2007). However, it has been identified because the outcomes of tests 1 and 2 demonstrate advantages. The multimedia learning objects benefited Autistic students.

According to the research, this could explain why autistic students performed better than those with Down Syndrome. As the first experiment results demonstrate, students' reliance on the teacher's aide to repeat the questions supports this assumption. This has been noticed several times. When answering questions in the second trial, it was found that the students often used the repeat button. If this is the case, it might be because they had difficulty hearing the question read aloud (Baddeley et al., 1998). By not overburdening their auditory channels and providing them with a minimal story, the strategy helped the students. Unluckily, the students require additional acoustic help to overcome their challenges.

According to Portsmouth University, short-term memory loss is common in children with Down Syndrome. This is another factor that may have had a role in the exam failure of these students. Using less text and more screen graphics, the system tried to assist students in this area (McEwan et al., 2006). Several learning objects that presented much information were problematic for the students in this initial testing. Consequently, when the learning objects were updated, some content was deleted to lessen the cognitive burden on students' working memory (Crichton et al., 2006). Moreover, there was always a sign at the bottom of each frame to remind the students of the task that they were doing. This is done so they don't have to recall what they're doing.

Despite efforts to assist the students and prevent this issue, their performance was impacted. This finding shows that students with Down Syndrome require improved cognitive load control. Students with Autism, on the other hand, benefited from the multimedia learning objects (Sasaki et al., 2008). The literature and background study revealed that they use visual strategies to aid their learning. As a result, the multimedia learning objects used a range of visuals, symbols, and animated representations to assist the students (Frey et al., 2007). Furthermore, the ideas of cognitive load theory were used to help autistic students effectively meet the challenges of the class, considering that working memory is highly restricted.

Conclusion

To summarize, the findings suggest that there can't be two different special needs groups using this approach. Because of the visual-oriented design and extra assistance for cognitive loading, both students found the multimedia learning objects fun and intriguing. On the other hand, the Down Syndrome group could not convert their pleasure into educational opportunities, and having fun was the only thing on their minds (Yim & Samuel, 2009). Even though all groups were considered equally competent by the school, the data suggest that each group needed a different approach to learning. According to the research, they have different learning needs, yet both groups may benefit from the same instructional methods. It has long been accepted that a single treatment may be given to those with Autism Spectrum Disorders and Down Syndrome. According to the findings, this method is not beneficial and is especially problematic when developing computer-based learning objects utilizing the same multimedia learning system (Churchill et al., 2016). Abstract thinking is a problem for students with Autism Spectrum Disorder. Thus, they require concrete items to help them. Students with Down Syndrome have additional challenges such as hearing impairment and decreased short-term memory, necessitating other care in these areas. According to the findings, improved diversity of learning methods is needed for students with Autism and those with Down Syndrome since they cannot use the same multimedia system (Leacock et al., 2007). According to the research findings, multimedia learning objects may help students with disabilities if the programs are sufficiently specific and concentrated because diverse diseases, although appearing to have comparable learning demands, necessitate specialized and unique teaching support.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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References

- Baddeley, A., Gathercole, S., & Papagno, C. (1998). The phonological loop is a language learning device. *Psychological Review*, 105(1), 158 - 173.
- Barker, P.(2001). Models and methodologies for multimedia courseware production. *Association for the Advancement of Computing in Education (AACE)*,79-84.
- Cadoni, E., Botturi, L., & Forni, D. (2008). The temas multimedia learning objects for civil engineers. *TechTrends*, 52(5),17- 21.
- Chapman, N.P., &Chapman, J.(2004) . *Digital multimedia*.Cambridge :Wiley.
- Chiu, T.K., & Churchill, D. (2016). Design of learning objects for concept learning: Effects of multimedia learning principles and an instructional approach. *Interactive Learning Environments*, 24(6), 1355-1370.
- Crichton, S.,& Kopp, G. (2006). Multimedia technologies, multiple intelligences, and teacher professional development in an international education project. *Innovate Journal of Online Education*, 2(3), 1-8
- Kristi, S.D. (2007, May 3- 5). *The effectiveness of interactive instruction cd designed through the pre-school students* [Conference presentation]. International Educational Technology Conference, Nicosia, Turkish Republic of Northern Cyprus.
- Frey, B.A., & Sutton, J.M. (2010). A model for developing multimedia learning projects. *Merlot Journal of Online Learning and Teaching*, 6(2), 491-507.
- Heldsinger, D., Smith, R., & Knight, C. (2007). Empowering classroom teachers to create multimedia learning objects: Developing learning objects. *International Journal of Learning*, 13(12), 135-141.
- Khan, T.M.(2010). The effects of multimedia learning on children with different special education needs. *Procedia-Social and Behavioral Sciences*, 2(2), 4341-4345.
- Kilonzo, S.M., Sandfort, J.R., & Liu, H.K. (2016). Using multimedia learning objects in public affairs classrooms: Global experiences with Hubert Project e-cases and e-studies. *Journal of Public Affairs Education*, 22(3), 345-362.
- Leacock, T.L., & Nesbit, J.C. (2007). A framework for evaluating the quality of multimedia learning resources. *Journal of Educational Technology & Society*, 10(2), 44-59.
- McEwan, T., & Cairncross, S. (2004). Evaluation and multimedia learning objects: Towards a human-centered approach. *Interactive Technology and Smart Education*, 1(2), 101-112.
- Sasaki, S., Arai, M., Furukawa, F., &Watanbahe, H.(2008). Web-based Learning material development with less experienced staff participation. *In Proc. of International Conference on Computers in Education*, 445-449.
- Stoney, S., & McMahon, M. (1998, June 20 - 25) . *An alternative model of multimedia development: Small projects within an Academic Environment* [Conference presentation]. ED – MEDIA/ ED – TELECOM 98 World Conference on Educational Telecommunications Proceedings, Freiburg, Germany.
- Yim, S.(2009). *The Challenges of Culture-based Learning: Indian Students' Experiences*.USA : University Press of America.
- Yviquel, H., Lorence, A., Jerbi, K., Cocherel, G., Sanchez, A., & Raulet, M. (2013). Orc: Multimedia development made easy. *In Proceedings of the 21st ACM International Conference on Multimedia*, Spain, (863-866).

Author Information

Joei Suk Mei Ong

University of Technology Malaysia
School of Education,
Faculty of Social Sciences & Humanity, Malaysia
Contact e-mail: drsmjoei@gmail.com

Noraffandy Yahaya

University of Technology Malaysia
School of Education,
Faculty of Social Sciences & Humanity, Malaysia

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