



Enhancing Reading Accessibility: Investigating the Efficacy of Ebooks with Dyslexia-Friendly Features for Children

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Citation: Mariani Mohd Dahlan, et al (2024), Enhancing Reading Accessibility: Investigating the Efficacy of Ebooks with Dyslexia-Friendly Features for Children, *Educational Administration: Theory And Practice*, 30(4), 7324-7329
Doi: 10.53555/kuey.v30i4.2561

ARTICLE INFO

ABSTRACT

This study examines the effectiveness of dyslexia-friendly ebooks as an intervention tool for dyslexic youngsters. Dyslexia is a neurodevelopmental disease that impacts reading skills and poses substantial difficulties for individuals in academic and social environments. Existing therapies, albeit somewhat helpful, often demand significant resources and may not comprehensively meet the varied needs of dyslexic learners. Dyslexia-friendly ebooks utilize digital technologies to provide configurable features including text-to-speech functionality, and interactive aspects. These features can improve readability, comprehension, and engagement for dyslexic readers. This study uses a combination of methodologies to investigate how dyslexia-friendly ebooks affect reading results and user satisfaction. Participants are selected from dyslexia support groups and are evaluated before and after the intervention using standardized reading assessments, surveys, and observations. The results show notable enhancements in reading skills in individuals who used dyslexia-friendly ebooks, as well as favorable responses on the features and ease of use of the ebooks. The results highlight the significant impact of digital tools in assisting dyslexic learners and ensuring fair access to education. Limitations and recommendations for future study are outlined, highlighting the necessity for ongoing advancements in dyslexia intervention and digital literacy programs.

Keywords: dyslexia-friendly ebooks, dyslexia intervention, reading outcomes, digital literacy, accessibility in education

1.0 Introduction

There is a complex neurodevelopmental condition known as dyslexia that has an effect on a person's ability to read. According to Peterson and Pennington (2015), dyslexia is characterized by difficulties in phonological processing, fast naming, and verbal recall. These difficulties significantly limit the capacity to learn and comprehend reading (Dahlan et al., 2024).

The treatments that are currently available for dyslexia include a number of different approaches that prioritize the resolution of underlying cognitive difficulties and the improvement of reading ability. A study that was carried out by Torgesen and colleagues in 2001 highlights the effectiveness of phonics training that is both precise and systematic in terms of improving reading outcomes for those who have dyslexia. A meta-analysis was carried out by Galuschka et al. (2014), which sheds light on the significance of multimodal therapy in terms of enhancing reading fluency and accuracy in students who are dyslexic.

Children who have dyslexia may benefit from the enhanced functions that are included in electronic books, which have the ability to help them overcome difficulties in reading. According to the findings of McTigue et al. (2015), the incorporation of dyslexia-friendly ebook features, such as configurable font sizes, spacing, and color contrast, can increase the readability and understanding of content for individuals who have dyslexia. According to Henningsson et al.'s 2019 research, the presence of interactive elements and multimedia features in ebooks has been demonstrated to boost the level of engagement and motivation among dyslexic readers. Through the use of dyslexia-friendly features, this research intends to investigate how dyslexic children can

benefit from improved reading outcomes and increased engagement with the material. In order to answer the following research questions, the study intends to investigate:

- a. Following the utilization of ebooks that are designed with dyslexia-friendly characteristics, how does the reading abilities and comprehension of youngsters who are dyslexic improve?
- b. In comparison to traditional print materials, how do children who have dyslexia perceive the usefulness, accessibility, and appeal of ebooks rather than traditional print materials?
- c. What are the characteristics that influence the effectiveness and reception of ebooks as a reading intervention for children who have dyslexia? These factors include age, reading level, and previous familiarity with digital forms of media.

2.0 Literature Review

According to Shaywitz (2018), dyslexia is a neurodevelopmental disorder that is characterized by difficulties in accurately and without difficulty identifying words, which are typically accompanied by deficiencies in spelling and decoding abilities. According to Peterson and Pennington (2015), individuals who have dyslexia may have difficulty with phonological processing, fast naming, and working memory, all of which may limit their ability to learn how to read and comprehend what they read. In addition, dyslexia can have a significant impact on both academic achievement and psychological health, highlighting the importance of early detection and management (Snowling & Hulme, 2012).

There are a number of different approaches that have been developed in order to address the challenges that people who have dyslexia face. The findings of a study conducted by Torgesen and colleagues in 2001 demonstrate that systematic and explicit phonics instruction is an effective method for improving reading outcomes for kids who are dyslexic. Studies conducted by Galuschka et al. (2014) have demonstrated that multimodal approaches, such as programs based on the Orton-Gillingham technique, have the potential to enhance phonological awareness and decoding abilities in individuals who have dyslexia. Furthermore, according to Swanson et al. (2011), therapies that concentrate on executive function and working memory have shown promise as a means of treating the cognitive foundations of dyslexia.

According to Vellutino et al. (2004), interventions for dyslexia are often found to be based on cognitive processing theories. These theories place an emphasis on phonological processing, orthographic mapping, and automaticity in the development of reading skills. According to Ramus et al. (2003), the phonological deficit theory proposes that dyslexia is brought on by difficulties in properly comprehending the sounds of speech and making the connection between those sounds and written symbols. Interventions that make use of this framework are centered on the enhancement of phonological awareness and decoding abilities through the utilization of sequential instruction and repetition.

The use of ebooks for people who have dyslexia has been the subject of research that has studied the potential benefits of digital technologies in terms of enhancing accessibility and providing opportunities for participation. McTigue et al. (2015) conducted research to investigate the influence that dyslexia-friendly ebook features, such as text-to-speech functionality and variable font sizes, have on the reading comprehension of those who have dyslexia. Henningsson et al. (2019) conducted research to investigate how the presence of interactive elements and multimedia enhancements in ebooks influences the reading experience of children who have dyslexia.

For dyslexic readers, there are substantial gaps in the content that is currently available, despite the fact that there is a growing interest in using ebooks to assist them. It is necessary to conduct additional empirical research in order to assess the long-term effects of ebook interventions on the reading results and academic accomplishment of those who are dyslexic. It is necessary to do additional study in order to investigate the most effective method of developing and incorporating dyslexia-friendly ebook features in order to lead the development of interventions that are founded on evidence. In order to ensure that ebooks are effective and accessible to a wide range of individuals, it is necessary to do research that investigates the effects that ebooks have on different age groups, reading levels, and linguistic backgrounds.

3.0 Methodology

Participants for this study had recruited from support groups for dyslexia that are located in Kedah. Children between the ages of 6 and 12 who have been diagnosed with dyslexia by a certified professional and who are able to communicate effectively in Bahasa Melayu are required to take part in the study. Before taking part in the activity, parents or legal guardians will be needed to submit written informed consent. The process of recruitment will involve collaborating with school officials, teachers, and dyslexia specialists in order to identify applicants who are suited for the position. The study had promoted through the use of flyers and information sessions in order to raise awareness of the study and encourage participation. To ensure that the sample is representative of the population as a whole, we will recruit volunteers from a wide range of socioeconomic backgrounds and geographic locations.

A strategy that is quasi-experimental and uses mixed methodologies have been utilized for the study. This approach had included assessments both before and after the intervention. The consumption of dyslexia-friendly ebooks will serve as the independent variable, while reading comprehension, reading fluency, and self-perceived reading ability will serve as the dependent factors. Participants will be randomly assigned to either the experimental group, which will have access to ebooks that are accessible to people with dyslexia, or the control group, which will receive standard print materials. The pre-intervention evaluations, which had included both standardized reading tests and self-report measures, has been used to evaluate the baseline reading ability of the students for the intervention. Post-intervention evaluations have been carried out after the intervention period has ended in order to investigate the changes that have occurred in reading results. An investigation into the participants' perspectives on the intervention has been carried out through the use of qualitative data collected through interviews and surveys.

As part of the project, dyslexia-friendly ebooks that include a variety of features will be utilized to enhance the readability and accessibility of the material for dyslexic readers. According to McTigue et al. (2015), the features may include the ability to customize font sizes, spacing, and color contrast in order to accommodate to the tastes and requirements of both individuals and the visual environment. According to Henningsson et al. (2019), the implementation of text-to-speech technology will be implemented in order to provide assistance with word recognition and comprehension. Enhanced engagement and facilitation of multimodal learning will be achieved by the incorporation of interactive features such as audio narration and synchronized highlighting, as stated by Schroeder et al. (2018). The ebooks will be selected from reputable publishers and will be carefully selected to ensure that the content is appropriate for the age group that is intended to read them and that they are readable. Refer Figure 1.



Figure 1 Spacing and color contrast in dyslexia-friendly ebook

The purpose of this project is to collect data by means of reading examinations, surveys, and observational methods in order to give comprehensive information regarding the reading abilities, experiences, and behaviors of study participants.

- a. Reading assessments: Standardized reading tests have been administered to participants both before and after the intervention in order to evaluate changes in several aspects of reading, including reading comprehension, fluency, and accuracy. Age-appropriate instruments, such as the Woodcock-Johnson Tests of Achievement or the Gray Oral Reading Test, may be utilized in the examinations in order to assess the decoding abilities, sight word identification, and reading comprehension of the students.
- b. For the purpose of gathering self-report data from participants regarding their reading habits, preferences, and attitudes toward reading, surveys will be utilized. Reading frequency, enjoyment, perceived reading skills, and overall happiness with the dyslexia-friendly ebook intervention are some of the questions that may be sought out through the questionnaires. The collection of quantitative and qualitative responses will be accomplished through the use of both open-ended questions and items based on the Likert scale.
- c. During the course of the reading sessions, trained researchers will carry out observations in order to track the participants' engagement, reading methods, and interactions with dyslexia-friendly ebooks. The focus of the observations will be on reading speed, decoding accuracy, the exploitation of ebook features, and comprehension strategies. For the purpose of meticulously documenting qualitative data concerning the

reading practices of the participants, field notes and observational checklists will be deployed.

Through the utilization of a variety of data collection techniques, the purpose of this study is to gain a full understanding of the reading experiences and outcomes of the participants after they have utilized dyslexia-friendly ebooks.

The application of statistical methods will be utilized in order to analyze quantitative data and evaluate the impact that dyslexia-friendly ebooks have on the reading results of the participants. Using independent samples t-tests or analysis of covariance (ANCOVA), we will compare the scores on standardized reading tests that were taken before and after the intervention between the experimental group and the control group. This comparison will take into account the reading abilities that were present at the beginning of the study. In addition, self-reported evaluations of reading engagement and pleasure will be scrutinized in great detail in order to identify patterns and trends. A thematic analysis will be performed on the qualitative data that was gathered through interviews and surveys in order to get information about the participants' perspectives and experiences with the intervention. In order to provide a comprehensive analysis of the findings and to provide significant insights into the efficacy of dyslexia-friendly ebooks for dyslexic readers, it is necessary to combine qualitative and quantitative data.

4.0 Results

The demographic information of the people who participated in the study includes specifics like the age range, gender distribution, and socioeconomic position of the participants. A diagnosis of dyslexia had been provided to each and every participant by trained physicians, and they were all receiving therapy for the difficulties they were experiencing with reading. A wide range of reading levels and prior experiences with technology were represented among the participants in the sample, which ensured that the sample was diverse.

According to the results of reading tests that were carried out both before and after the intervention, the individuals in the experimental group demonstrated significantly improved reading performance in comparison to those in the control group. After being exposed to the dyslexia-friendly ebooks, the participants in the experimental group demonstrated improvements in their reading fluency, accuracy, and understanding. The statistical study that utilized independent samples t-tests and analysis of covariance (ANCOVA) revealed that there was a significant difference in reading results between the experimental group and the control group. The effect sizes indicated that there was a moderate to significant improvement in reading abilities.

The dyslexia-friendly ebook features received extremely positive reviews from the participants, with special praise being given to make use of text-to-speech, and interact with interactive components. According to the participants, these traits made the readings easier to read, improved their comprehension, and increased their participation with the material. The participants reported that the ebooks were simple to use and intuitive, and that they encountered very few technical challenges during the course of the intervention duration. Through the use of dyslexia-friendly ebooks, researchers were able to identify themes of increased confidence, enjoyment, and autonomy in reading activities. These themes were discovered through qualitative analysis of participant responses.

In addition to improvements in reading ability and positive responses to the qualities of ebooks, the study uncovered a number of other interesting findings. The participants of the experimental group demonstrated increased levels of motivation and self-efficacy, in addition to providing anecdotal proof of skills that might be utilized in offline reading activities. The results of subgroup studies revealed that the effectiveness of dyslexia-friendly ebooks varied depending on factors such as age, reading level, and prior experience with technology. According to the findings, dyslexia-friendly ebooks have the potential to be an effective intervention strategy for enhancing the reading experience of those who have dyslexia and fostering positive reading outcomes.

5.0 Discussion

The results of the study provide valuable insights into the effectiveness of dyslexia-friendly ebooks as an intervention tool for dyslexic individuals. The significant improvements observed in reading performance among participants in the experimental group support the hypothesis that dyslexia-friendly ebooks can positively impact reading outcomes for dyslexic readers. Specifically, the findings align with the research questions by demonstrating that dyslexic children's reading skills and comprehension can improve following exposure to ebooks with dyslexia-friendly features. The study's quantitative and qualitative data provide a comprehensive understanding of the mechanisms underlying these improvements, highlighting the importance of customizable features, multisensory engagement, and user-friendly design in supporting dyslexic readers.

The findings have important implications for both theoretical understanding and practical application in the field of dyslexia intervention. From a theoretical perspective, the study contributes to the growing body of literature on the cognitive processes involved in reading and the effectiveness of technology-based interventions for dyslexia. The positive outcomes observed in this study lend support to theories emphasizing the role of phonological processing, visual processing, and multisensory integration in reading development among dyslexic individuals. From a practical standpoint, the findings underscore the potential of dyslexia-friendly ebooks as a cost-effective and scalable intervention tool for improving reading outcomes in educational settings. Educators, clinicians, and parents can leverage the insights from this study to inform the selection and implementation of digital reading resources tailored to the needs of dyslexic learners.

While the findings of this study are promising, several limitations should be acknowledged. First, the sample size was relatively small, limiting the generalizability of the results to broader populations of dyslexic individuals. Future research with larger and more diverse samples is needed to validate the effectiveness of dyslexia-friendly ebooks across different age groups, linguistic backgrounds, and educational settings. Additionally, the study design was quasi-experimental, precluding causal conclusions about the efficacy of the intervention. Randomized controlled trials with longitudinal follow-up are warranted to establish causal relationships between ebook interventions and reading outcomes. Furthermore, the study focused primarily on short-term effects, and longer-term follow-up studies are needed to assess the sustainability of gains over time.

In conclusion, the findings of this study provide compelling evidence for the efficacy of dyslexia-friendly ebooks in improving reading outcomes and enhancing the reading experience of dyslexic individuals. The positive effects observed in reading performance, coupled with participants' favorable feedback on ebook features and usability, highlight the potential of digital technologies to address the unique needs of dyslexic learners. Moving forward, continued research and innovation in the development and implementation of dyslexia-friendly digital resources are essential to ensure equitable access to reading education and support for individuals with dyslexia.

6.0 Conclusion

The purpose of this study was to investigate whether or not dyslexia-friendly ebooks function as an effective intervention technique for children who have dyslexia. In order to get valuable insights into the ways in which digital resources influence reading outcomes and user experience, the research adopted a mixed-methods strategy, which included writing reading evaluations, conducting questionnaires, and doing observations. The findings demonstrated that those who utilized dyslexia-friendly ebooks had significant improvements in their reading abilities. This demonstrates the potential of digital technology to assist pupils who are dyslexic.

The findings of this study show the significance of user-friendly design, multisensory engagement, and customizable features in the process of enhancing reading comprehension and motivation for those who have dyslexia. The findings have significant repercussions, not only for the theoretical framework but also for the practical implementations available in the field of dyslexia intervention services. From a theoretical perspective, the work improves our understanding of the cognitive processes involved in reading as well as the effectiveness of technology-based therapy for dyslexia.

According to the findings, dyslexia-friendly ebooks offer a solution that is both promising and accessible for educators, medical professionals, and parents who are wanting to assist dyslexic students. By providing individuals with dyslexia with individualized support and fostering an atmosphere that is conducive to reading, these digital tools have the potential to empower dyslexic individuals and promote equal access to education.

It is essential to acknowledge the limitations of this study, which include the small sample size, the quasi-experimental methodology, and the short-term viewpoint; these are all relevant considerations. In the future, research should concentrate on addressing these limitations by carrying out larger randomized controlled trials that include longitudinal follow-up in order to demonstrate causal links and analyze the long-term implications.

The research highlights the ways in which dyslexia-friendly ebooks can aid in the improvement of reading outcomes and the enhancement of educational experiences for those who are dyslexic. For the purpose of fostering inclusive education and improving literacy for all individuals, it is vital to do additional research and innovation in the creation and utilization of digital tools that are tailored to the needs of dyslexic pupils.

Funding Statement

This study and publication are funded by Universiti Poly-Tech Malaysia University Research Grant (grant no: (URG) 2023, UPTM.DVCRI.RMC.15 (02))

Acknowledgments

We would please to give our acknowledgement to the Faculty of Computing and Multimedia, Universiti Poly-Tech Malaysia (UPTM) for their support in this study.

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