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Development Study of Technology-Based Adaptive Learning Modules for Students with Special Needs

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Abstract: This research aims to examine the development of effective technology-based adaptive learning modules to support the learning of students with special needs in the context of inclusive education. Using the Systematic Literature Review (SLR) method, this study identifies, evaluates and interprets evidence from previous research related to the development of adaptive modules. The results show that educational technology, particularly adaptive learning modules, has an important role in improving access and quality of education for students with special needs. The results show that educational technology, particularly adaptive learning modules, has an important role in improving access to and quality of education for students with special needs. Adaptive modules allow for the customization of learning materials, methods and pace according to students' individual needs, which can improve their learning effectiveness and learning outcomes. This training can improve teachers' understanding of interventions for students with special needs and help them design adaptive learning services. It is hoped that the results of this study can make a significant contribution to the development of inclusive education in Indonesia and improve the quality of education for students with special needs through the use of adaptive technology.

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Introduction

According to Government Regulation (PP) article 4 of 2014 number 157, students with special needs consist of speech impaired, barreled impaired, hearing impaired, physically disabled, blind, grahita impaired, slow learners, learning difficulties, autism, motor disorders, victims of drug abuse, and abnormalities. Meanwhile, according to (Jalil et al., 2021) students with special needs refer to students who have visual impairments, hearing impairments, speech impairments, physical disabilities or disabilities.

Students with special needs usually experience difficulties in various educational processes, which can be physical, mental, social, or emotional (Ratih et al., 2021). Assistive technology is a tool designed to facilitate a person in certain situations so that it can facilitate its use. Assistive technology is applied based on instruments, systems and services that are suitable for various conditions of special needs, so that it can form an adaptive and useful tool to improve limitations (Borg et al., 2011; WHO & UNICEF, 2022). Lancioni et al. (2012) write that assistive technology refers to a number of services and devices that are used on a person

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pp. 526-533

with special needs. In addition, this technology is related to specialized education and rehabilitation to make it easier for a person with special needs to perform more daily activities and have a better quality of life.

One of the basic human rights is education. All students, including students with special needs, are entitled to a proper education. Students with special needs can attend public schools in Indonesia. Inclusive schools, which are formally regulated in Law article 31 and specifically regulated in the 2009 Permendiknas number 70, allow them to follow their education. This inclusive education is a step forward in helping students with special needs develop better. This is supported by research by Hamilton and the University of Denver which shows that students with special needs who study in inclusive schools show better development because they have the opportunity to participate in normal classes. (Mulyani, 2020).

Inclusive education is an important agenda in improving access to and quality of education for all children, including those with special needs. Students with special needs often face various barriers in the learning process, be it physical, cognitive or social-emotional barriers. These barriers can reduce the effectiveness of learning and hinder their development if not addressed with appropriate strategies. Research conducted by Putro, E., Simanjuntak, T., & Hergianasari, P. (2023). Presenting the concept of inclusive education is an approach in the world of education that aims to ensure that every child has the same opportunity to get a quality education, without exception. In inclusive education, children with special or different needs, be it physical, intellectual, or social-emotional, are taught together with children who do not have special needs.

Furthermore, the goal of inclusive education is to create a welcoming and inclusive educational environment where every student is valued and respected for their differences. This method also emphasizes how important it is to work together between teachers, parents and everyone else involved in educating a child. The rise of inclusive education shows how important it is to use education methods that are more welcoming and inclusive for all children. (Sutarya, 2019). Inclusive education emerged from the realization that children with special or different needs are often ignored or sidelined in traditional education systems and that they need a more responsive and supportive educational environment. (Hanjarwati & Aminah, 2014). Broader social and political changes led to inclusive education, as society increasingly realized the importance of diversity and inclusion in all aspects of life. (Mubarok, 2022).

In recent decades, the development of information and communication technology (ICT) has offered various innovative solutions to support inclusive education. Technology enables the development of more adaptive, interactive and personalized learning modules according to students' individual needs. Technology-based adaptive learning modules can tailor the materials, methods and pace of learning to students' abilities and preferences, thus improving their engagement and learning outcomes.

However, while the potential of technology in supporting the learning of students with special needs is huge, its implementation still faces various challenges. Some schools and teachers still do not fully understand or have the necessary skills to integrate these technologies in the learning process. In addition, there are still shortcomings in the development of content that is truly adaptive and responsive to the specific needs of each student. The urgency of this research is that adaptive technology can help students with special needs to better access education, overcome barriers that they may face in the learning process, the use of adaptive technology can have a significant positive impact on the motivation and learning outcomes of students with special needs. It can help them overcome learning barriers and enhance a more inclusive and empowering learning experience.

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pp. 526-533

Research shows that the use of adaptive technology can have a significant positive impact on the motivation and learning outcomes of students with special needs. Adaptive technology allows teachers to provide more individualized attention to each student, help them overcome learning barriers, and provide a more inclusive and empowering learning experience. However, the development of these technologies requires a systematic and collaborative approach, involving various parties such as educators, technologists, psychologists and families.

Therefore, this research aims to explore the development of technology-based adaptive learning modules that are effective and accessible for students with special needs. It will also examine the factors that influence the successful implementation of the module and identify best practices in the development and use of technology to support inclusive education. It is hoped that this research study can make a significant contribution to improving the quality of education for students with special needs through the use of adaptive technology.

Research Methods

The type of research used in this research is Systematic Literature Review (SLR). Systematic Literature Review research is conducted with the aim of identifying, assessing, and interpreting all evidence from previous research, so as to get answers to existing problems. Researchers collected various journals obtained from Google scholar with keywords used to search journals, namely Module Development, adaptive learning, educational technology, special needs. From this search, we obtained 6 literatures that are relevant to the study to be carried out, namely whether there is an effect of using the Learning Management System on independence and learning outcomes obtained by students, as well as finding out what LMS platforms can be recommended for use in addition to the Moodle LMS Platform and Google Clasroom which are already widely used among educators in Indonesia.

Research Results And Discussion

Research Results

The results of the research, found six relevant studies, as the basis for researchers to examine the development of modules that will be applied to students with special needs.

Author and Year	Research Title	Research Results	Researcher Study
Astuti, W., Friansyah, D., & Salman, E. (2021).	Development of Adaptive Learning Modules for Children with Special Needs in Sekolah Luar Biasa Negeri Lubuklinggau City	Based on the results of research on the development of adaptive learning modules for children with special needs in Lubuklinggau City Special Schools, it can be concluded that this development research produces modules that are valid and very practical, namely: The overall results of	The results of the researcher's study indicate that the adaptive learning module developed has been successful in meeting the learning needs of children with special needs at the Lubuklinggau State Special School. This module can be one of the effective solutions in

Juli 2024. Vol. 9 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 526-533

Author and Year	Research Title	Research Results	Researcher Study
		the validation component of the expert team are included in the very good category with a percentage of 85.63, the results of the practicality calculation of the three criteria get very practical criteria with a percentage of 82.87%.	improving the quality of learning for grade IV students with special needs.
Kurniawan, R., Heynoek, F. P., & Wijaya, M. A. I. (2022).	Development of teacher modules on learning basic locomotor movement material for class II SDLB autism	The results of the study can be said that the teacher's module on learning locomotor motion material for class II SDLB autism is feasible to use in learning. Although it is said to be feasible to use, this teacher module has several limitations, namely the module only focuses on locomotor motion material and is only intended for grade II SDLB autistic students.	The results of the research study indicate that the teacher module developed for learning locomotor basic motion material for class II SDLB Autism is suitable for use in the learning process. This module has gone through the validation stage by media experts, material experts, and experts on the characteristics of autistic children, and has been tested in small groups and large groups. The trial results showed an increase from the valid category to the very valid category, with a high percentage percentage.
Syam, T. A. R. (2018).	Development of a Circuit Learning Model to Help	The results of the development of the adaptive physical	The circuit learning model lesson plan for Down Syndrome

Juli 2024. Vol. 9 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 526-533

Author and Year	Research Title	Research Results	Researcher Study
	Locomotor, Non-Locomotor, and Manipulative Movement Patterns of Down Syndrome Children	education circuit learning model device are the implementation of learning is very well done, the teacher's response is very good and the opinion is very supportive, the development of basic movement patterns is well done. Thus, the product of developing an adaptive physical education circuit learning model device for children with Down syndrome to develop basic movement patterns is categorized as very good.	children in adaptive physical education subjects is feasible to be implemented theoretically and empirically. This shows that the development of this circuit learning model has the potential to improve the learning of Down Syndrome children in terms of basic locomotor, non-locomotor, and manipulative movements.
Kusumawati, O., & Nugroho, A. W. (2019).	Development of an PE learning module through exploring nature around school (AJASS) activities for deaf children at the Extraordinary Primary School (SDLB) level in Bandar Lampung City.	The results of the AJASS module have very good feasibility according to linguists 95.31%, material experts 97.11%, media experts 97.11%, and educators 95.8%. So that this AJASS module is in the "Very Good" category to be used by educators as a teacher's handbook module in teaching.	Overall, the results of this research study demonstrate the successful development of a highly feasible and innovative learning module for deaf students in Physical Education classes. The findings of this study have implications for inclusive education practices and underscore the importance of creating specialized educational materials to meet the unique

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E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 526-533

Author and Year	Research Title	Research Results	Researcher Study
			needs of students with disabilities.
Birriy, A. F., Indahwati, N., & Nurhasan, N. (2020).	Development of pbl-based adaptive physical education learning tools for Down syndrome to teach motor skills and social interaction.	Based on the results of product implementation and data collection, it is concluded that the learning tools developed are suitable for DS children and can be used to teach motor skills and social interaction, and get a positive response from users. Hopefully this product can be useful for the world of education, especially children with Down syndrome.	The findings highlight the successful development and implementation of adaptive physical education learning materials for students with Down Syndrome, emphasizing the importance of tailored educational approaches for individuals with special needs.
Rafikayati, A. (2022).	Training on Adaptive Learning Services for Children with Special Needs in Inclusive Education Settings	The results of the activities achieved consisted of: 1) teachers' understanding of the profile of children with special needs, 2) teachers' understanding of the forms of intervention for children with special needs, 3) teachers' ability to design adaptive learning services for children with special needs in inclusive school settings.	The training succeeded in providing teachers with a better understanding of children with special needs and their interventions in the context of inclusive education and improved their ability to design adaptive learning services for children with special needs.

Discussion

Inclusive education aims to create a welcoming and inclusive educational environment where every student is valued for their differences. It emphasizes the importance of cooperation between teachers, parents and all relevant parties in educating children. The development of

Juli 2024. Vol. 9 No. 3
E-ISSN: 2656-1417
P-ISSN: 2503-0602
pp. 526-533

information and communication technology (ICT) has provided innovative solutions in supporting inclusive education. Technology-based adaptive learning modules allow customization of materials, methods and pace of learning according to students' individual needs, improving their engagement and learning outcomes. Research shows that students with special needs who study in inclusive schools show better development because they have the opportunity to participate in normal classes. This confirms the importance of inclusive education in helping students with special needs develop better.

The development study of adaptive learning modules for children with special needs has produced modules that are valid, practical, and effective in meeting their learning needs. This module can be an effective solution in improving the quality of learning for students with special needs. Training on adaptive learning services for children with special needs in inclusive education settings can provide teachers with a better understanding of interventions for children with special needs. It also improves teachers' ability to design adaptive learning services for children with special needs.

Conclusion

Educational technology, such as the development of adaptive learning modules, has an important role in supporting inclusive education. Technology allows for the customization of learning materials and methods according to students' individual needs, increasing the effectiveness of learning for students with special needs. Students with special needs who study in inclusive schools show better development because they have the opportunity to participate in normal classes. This confirms that inclusive education makes a positive contribution to the development of students with special needs. Training on adaptive learning services for children with special needs in inclusive education settings can improve teachers' understanding of interventions for children with special needs. It can also improve teachers' ability to design adaptive learning services for children with special needs. Thus, the development of technology-based adaptive learning modules can contribute significantly to improving the quality of education for students with special needs through the use of adaptive technology in the context of inclusive education.

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