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Development of an Inclusive E-Learning Platform to Support Online Learning in Indonesia

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Abstract: Technology plays an increasingly important role in contemporary education, particularly through the expansion of e-learning systems. While e-learning has enhanced access to education, it often remains insufficiently inclusive, limiting its effectiveness for students with special needs. This study aims to examine the development of inclusive e-learning platforms to support equitable online learning in Indonesia.

The research adopts a descriptive qualitative approach based on a systematic review of relevant literature. The analysis focuses on identifying key challenges and opportunities in implementing inclusive e-learning within the Indonesian educational context.

The findings indicate that technological advancements have enabled significant innovation in digital education, including the potential to support students with disabilities in accessing learning on an equal basis with their peers. However, multiple barriers persist, including limitations in teacher preparedness, student readiness, infrastructure, accessibility features, and technical support systems.

This study contributes to the literature by providing a comprehensive mapping of systemic barriers within the inclusive e-learning ecosystem in Indonesia. Furthermore, it proposes an integrative framework that incorporates assistive and adaptive technologies tailored to diverse disability profiles, thereby promoting more equitable access to digital education. The findings highlight the importance of aligning pedagogical strategies, technological design, and policy support to achieve truly inclusive e-learning environments.

Keywords: E-learning; Inclusive education; Accessibility; Digital learning; Educational technology.



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印度尼西亚包容性电子学习平台的开发：支持在线学习的研究

摘要：技术在当代教育中发挥着日益重要的作用，尤其体现在电子学习（e-learning）系统的快速发展。然而，尽管电子学习在扩大教育获取方面具有显著优势，其包容性仍然不足，限制了特殊需要学生从中受益的程度。本研究旨在探讨包容性电子学习平台的发展路径，以支持印度尼西亚实现更加公平的在线教育。

本研究采用描述性定性方法，通过系统性文献综述对相关研究进行分析，重点识别印度尼西亚包容性电子学习实施过程中的关键挑战与机遇。

研究结果表明，技术进步推动了数字教育的创新，使残障学生有机会与其他学生在同等条件下获取学习资源。然而，仍然存在多方面障碍，包括教师准备不足、学生适应能力差异、基础设施限制、无障碍功能不足以及技术支持体系不完善等问题。

本研究通过对印度尼西亚包容性电子学习生态系统中的系统性障碍进行全面梳理，为相关领域提供了重要参考。同时，研究提出了一个整合性框架，将辅助技术与自适应技术结合，并根据不同残障类型进行针对性设计，以促进数字教育的公平可及性。研究结果强调，需要在教学策略、技术设计与政策支持之间实现协同，以构建真正包容性的电子学习环境。

关键词：电子学习；包容性教育；无障碍性；数字学习；教育技术

1. Introduction

The increase in the use of information and communication technology (ICT) has now had a significant impact on almost all sectors of society. In terms of technological advances, adaptive hardware and software have made it possible for individuals with special needs to do things that they would not have been able to do as children with disabilities, but thanks to technology, everything is possible today. Even so, the public still does not know that technology such as computers can be operated by most students with disabilities, including those who are blind or have low vision (Usman et al., 2021). As technology becomes more prevalent in enhancing education, there is a growing need for students with disabilities and higher education institutions to confront the task of customizing technology to accommodate students' educational and special requirements. This arises from the fact that the majority of online learning platforms were not originally tailored to cater to the unique needs of students with disabilities. Consequently, it is crucial to explore innovative approaches in the design of online learning systems that can effectively align with the learning models of students with special needs in today's educational landscape (Cabero-Almenara et al., 2022).

Typically, across the majority of European nations, individuals with special educational requirements are typically categorized into the following subcategories: (1) Individuals with learning disabilities;

(2) Visually impaired individuals; (3) Individuals with hearing impairments; (4) Those with delayed cognitive development; (5) Individuals with autism spectrum disorders; (6) People affected by neurological and other medical conditions; (7) Individuals experiencing complex cognitive, emotional, and social challenges; (8) Those with diverse difficulties; and (9) Individuals with speech and language disorders (Dalgaard et al., 2022). The advent of the internet has given rise to a novel educational concept known as e-learning, representing a significant innovation in the realm of education. E-learning is digital learning, in its implementation it can be in the form of audio, video, computer devices, or a combination of these three things. As we know, e-learning is learning that is not limited by space and time where the learning process is supported by an internet network (Ngubane-Mokiwa & Khoza, 2021).

Inclusive education, as commonly understood, refers to an educational approach that offers a system of services ensuring that children with disabilities or special needs have the opportunity to receive the same education as their peers in regular schools. In essence, it means that children with special needs are integrated into mainstream classrooms alongside their typically developing peers, without the need for separate specialized classes. However, it is important to note that the implementation of inclusive education in Indonesia is perceived as inadequate, as it does not currently

measure up to the educational experiences provided to students (Page et al., 2021).

Current technology and education are quite good things for the progress of education in the current era, the question is: can e-learning be used in inclusive education? Where students have both physical and mental limitations. However, in reality e-learning itself has started to be implemented in schools and universities that have inclusion services in them (Grynyuk et al., 2022). E-Learning can make it easier for students, if it is not possible for the student to attend class, the student can study at home. This ensures that students continue to receive learning equivalent to regular classes in general. It should be noted that students with disabilities who use e-learning in their learning activities can learn with the same opportunities as normal students (non-disabled) (Azlan et al., 2020).

With the existence of technology, teachers should be able to use it effectively in providing instruction to students who have special needs. Apart from that, it is hoped that this will make it easier for the students concerned to participate in all learning activities in class (Vargo et al., 2021). E-learning can help students with disabilities because it can enable remote and flexible learning activities. Apart from that, e-learning can support students with disabilities/ABK in overcoming obstacles to learning material sources that are difficult for them to access. The existence of e-learning allows students with disabilities to 'break through' the boundaries of their usual way of learning, just like in class (Alzahrani, 2020).

Leveraging E-Learning within inclusive educational settings can support teachers in effectively delivering and conducting learning activities for a diverse range of students, including those without special needs as well as those with special needs, such as individuals who are blind, physically impaired, mentally disabled, and others. However, it's important to note that the implementation of E-Learning for students with special needs should not be arbitrary; rather, the E-Learning platform must be tailored to accommodate each student's specific circumstances and requirements. The media used to deliver material to blind students is certainly different from deaf students, so the tools and media need to be adapted (Miyachi, 2020).

The many options for implementing technology-based learning in inclusive education provide teachers with more teaching options, and it is hoped that this can help both teachers and students in learning activities. However, in its implementation, there are still several problems so it still requires an adjustment stage in the use of e-learning. These problems include teachers, facilities, technical problems, and the students themselves (London-Hays et al., 2020). Given this problem, this research then wants to look at how the development of a platform for e-

learning can be implemented to support online learning in Indonesia.

2. Literature Review

2.1. E-Learning

Across the globe, numerous higher education institutions employ the internet and digital technology to enhance their teaching and learning endeavors. Various terms are utilized to delineate these diverse educational systems, including computer-mediated learning, web-based training, and most frequently, e-learning. E-learning, short for electronic learning, encompasses a teaching and learning approach that relies on electronic media, particularly the internet, as a primary educational platform (Zawacki-Richter, 2021).

E-learning serves as a comprehensive term encompassing a range of ideas and technologies linked to education, including distance, digital, electronic, online, web-based, and mobile learning. E-learning boasts numerous benefits, including the reduction of travel requirements, flexibility and accessibility, potential cost-effectiveness, and the capacity for learners to study at their own speed and from a location of their preference (Nouracy & Al-Badi, 2023). Moreover, e-learning has the capacity to offer tailored content and teaching approaches that align with the unique requirements of learners. It can incorporate a diverse array of multimedia elements, including text, audio, images, and video, to facilitate the acquisition of knowledge and skills. While there may not be conclusive evidence to definitively establish e-learning as superior to traditional learning, the outcomes of systematic reviews do indicate that it serves as an effective alternative learning method. Additionally, it has been found to have a favorable influence on nurses' knowledge, skills, self-efficacy, and overall satisfaction (Liu & Yu, 2023).

Tafiardi's definition of e-learning characterizes it as a form of learning that employs electronic devices as tools. The crux of this e-learning model is rooted in the learning process itself, with the "e" (electronic) serving as a means rather than an end. Peterson further elaborated on this concept by defining the "e" in e-learning from the user's standpoint, emphasizing attributes such as exploration, experience, engagement, ease of use, and empowerment (Dima et al., 2022). Meanwhile, as per Dahiya, e-learning is characterized as an information technology and communication tool that empowers students to engage in learning at their convenience, irrespective of time or location. According to Jaya Kumar C. Koran, e-learning serves as a catalyst for teaching and learning, making use of various electronic means such as LAN, WAN, or the internet to disseminate educational content, facilitate interaction, and offer instructional support (Ali & Maksum, 2020).

Rosenberg stated that the e-learning learning method refers to the use of internet connectivity

combined with electronic devices to deliver a series of scientific materials that can improve knowledge and skills. This is in line with Cambell and Kamarga's statement which essentially emphasizes and utilizes the use of the internet in education as the main strength of e-learning (Dudung et al., 2022). Meanwhile, Onno W. Purbo in his study explained that the term "e" or the abbreviation for electronics in e-learning is used as a term for all kinds of technology that are used to complement learning efforts that use electronic technology that uses an internet connection (Al Rawashdeh et al., 2021).

According to Imaduddin, e-learning represents a manifestation of the advancements in information and communication technology during the era of the Fourth Industrial Revolution (commonly referred to as Industry 4.0). E-learning serves as a platform for conducting online teaching and learning interactions that take place between educators and students, facilitated by computer networks. The form of implementing learning activities through e-learning is not much different from formal face-to-face learning, because learning tools such as syllabus, tests, references, schedule setting, and others can be entered into the e-learning site (Singh et al., 2021). Through the e-learning content system, students can take classes, tests, or exams anywhere as long as they are connected to a computer network. Another advantage of e-learning is that it can upload teaching materials in a wider range such as video, audio, PDF, doc, flash, and others (Rahmani et al., 2021).

So, it can be concluded that e-learning is the development of learning using technological advances that make learning easier, not only done on e-learning sites so that students can take classes, tests or exams anywhere as long as they are connected to a computer network (Stecula & Wolniak, 2022).

2.2. Inclusive Education

Inclusive education represents an educational approach where children with special needs are integrated into regular classrooms alongside typically developing peers for their learning. As per Hildegun Olsen, inclusive education signifies that schools must be inclusive and welcome all children, irrespective of their physical, intellectual, social, emotional, linguistic, or other attributes. This encompasses children with disabilities, as well as those who are exceptionally gifted. It also extends to children from marginalized backgrounds, such as street children and child laborers, originating from remote or transient communities (Florian, 2019). Inclusive education encompasses children from ethnic, linguistic, or cultural minority backgrounds, as well as children hailing from disadvantaged or marginalized regions or communities. It serves as an educational provision designed for students with special educational needs within mainstream schools, including elementary, middle,

high, and vocational schools. These students may be identified as exceptional due to various factors, such as disabilities, slow learning, or other learning challenges (Magnússon, 2019).

As stated by Staub and Peck, inclusive education involves the complete integration of children who have mild, moderate, or severe disabilities into regular classrooms. This underscores the idea that regular classrooms are suitable and appropriate learning environments for children with disabilities, regardless of the specific type or severity of their disorder (Pillay et al., 2022). Based on several perspectives, it can be summarized that inclusive education is an educational approach that offers services to students with special needs, irrespective of their physical, intellectual, social-emotional, linguistic, or other characteristics. These students are provided with educational services within the context of regular schools, including elementary, middle school, high school, and vocational schools, in order to promote an inclusive and equitable learning environment (Heyder et al., 2020).

Education, in its broadest sense, can be defined as a deliberate and organized endeavor to establish an environment and a process of learning where students actively nurture their capabilities, encompassing religious and spiritual values, self-discipline, character development, intelligence, virtuous ethics, and the practical skills essential for their individual growth, societal contributions, and the betterment of their nation and state. Consequently, at the heart of inclusive education lies the fundamental human right to access education (Mofield, 2020). A natural implication of this right is that every child possesses the entitlement to receive an education that is free from discrimination, regardless of factors such as disability, ethnicity, religion, language, gender, or ability. Inclusive education sets forth practical objectives that encompass achievements desired both by students, educators, parents, and society as a whole (Shaeffer, 2019).

The characteristics of inclusive education encompass several aspects, including interpersonal relationships, individual abilities, classroom seating arrangements, learning materials, available resources, and assessment methods, which are elaborated as follows:

- a) Connection
Inclusive education promotes a warm and welcoming environment. For instance, in the case of deaf children, teachers are consistently present nearby, facing the child with a friendly smile. Additionally, class assistants, often including parents, offer praise and support to deaf children while also aiding other students as needed (Costa & McMullen, 2021).
- b) Ability
Inclusive education involves teachers, students with diverse backgrounds and abilities, and

parents collaborating as companions in the learning process (Agostinelli et al., 2022).

c) Seating arrangement

Inclusive education embraces flexible seating arrangements, which may include students sitting in groups on the floor in a circle or on benches together to ensure they have visual contact with one another (Starkey et al., 2021).

d) Study materials

Inclusive education incorporates a diverse range of materials for all subjects. For instance, in mathematics, learning becomes engaging, challenging, and enjoyable through activities such as role-playing. Language lessons are enriched through the use of posters and puppets to make the learning experience more interactive and engaging (Murniarti et al., 2023).

e) Source

Inclusive education entails teachers devising daily plans that actively involve children. For instance, teachers may encourage students to contribute by bringing affordable and readily accessible learning materials into the classroom for use in specific lessons (Ferri et al., 2020).

f) Evaluation

In the context of inclusive education, assessments, observations, and portfolios are meticulously gathered and evaluated, encompassing children's work spanning a specific period of time (DeLuca et al., 2020).

In inclusive education, both typical students and those with special needs coexist. To nurture well-rounded individuals, it becomes imperative to offer student guidance. This guidance aims to facilitate the development of students, equipping them with optimal skills for their growth and potential (Florian, 2019).

The curriculum in inclusive education should be tailored to accommodate the diverse needs of children, rather than forcing children to conform to a fixed curriculum. Thus, there should be opportunities to customize the curriculum for each child. According to Tarmansyah, curriculum modification is a model employed in inclusive schools. The first modification acknowledges that theoretical models are always simplified representations of complex realities. The second modification pertains to curriculum aspects that are specifically geared towards learning and will be further discussed in the context of practical learning. In inclusive schools, the curriculum utilized is typically the standard curriculum designed for typical children, but it is adapted and modified to suit the individual abilities and characteristics of the students (Kaffenberger, 2021). Moreover, in accordance with the Special Education Directorate, modifications can encompass various aspects, including adjusting time allocation, modifying content and materials, adapting the teaching and

learning methods, making changes to facilities and infrastructure, shaping the learning environment, and refining classroom management techniques. The curriculum is designed to offer each child the chance to fully realize their potential, aligning with their unique talents, abilities, and individual differences (Jauhiainen & Guerra, 2023).

3. Method

This research was conducted using a **descriptive qualitative approach**. Data were gathered through **literature study methods**, collecting and processing results from previous research related to inclusive education and technology. The study focuses on Indonesia because the current implementation of inclusive services fails to meet standard educational expectations. The object was chosen due to the growing need for adaptive online systems that align with the specific learning models of students with special needs in the modern era.

4. Result And Discussion

4.1. Problems in Inclusive e-learning Platforms

There are still obstacles in implementing E-Learning in inclusive education. In this research, it was found that there were problems in using E-Learning, such as teachers who still did not know the appropriate needs of ABK students. Apart from that, teachers are also less interested in helping their students succeed in learning because educating ABK requires extra effort in providing understanding to the child. For example, teaching Braille letters to blind children takes quite a long time because they need time to remember new words which must use Braille letters (Humaira & Rachmadtullah, 2021).

Apart from teachers, problems in using E-Learning lie with students. Even though some students can operate E-Learning smoothly, there are still students who are still unable to use it. There are still some of them who are not familiar with technology, so there are still some who are not proficient in using it. Children with mental and intellectual disabilities may have difficulty using it because they are mentally and emotionally unhealthy, so teachers must be able to take an extra approach in teaching them how to use E-Learning.

The next problem comes from the school facilities. The facilities and infrastructure in schools play a very important role in the continuity of learning. Schools that implement inclusive education must have facilities that support implementing E-Learning for children with special needs. This includes the lack of

equipment facilities such as computers and so on that support ABK's learning in using E-Learning.

An internet network is certainly very important in implementing E-Learning today. With the internet network, ABK students can explore learning materials that suit their conditions but are still under the supervision of teachers to help them in their operation. However, not all inclusive schools have an internet network specifically for students, so students need to purchase the internet service themselves. If a school has an internet network specifically for its students, usually that network is very slow to use. Apart from internet problems, website facilities for learning for ABK students have problems. This problem includes learning materials and the website system which may be somewhat difficult for students with special needs to access.

4.2. Benefits of the Presence of an Inclusive E-Learning Platform

Learning using E-Learning is an innovation that has quite an impact in the current era. With E-Learning, learning is not only focused on one place and time, because this type of learning can be done anytime and anywhere. Today's teachers must be able to adapt to advances in technology to make it easier for them to teach today's children, where it could be said that their daily lives today are never out of reach of technology. Now many educational institutions such as schools or universities are starting to try to apply the use of E-Learning to their learning. Schools that have inclusive education services are starting to try to implement them. E-learning has great potential to help students with disabilities in their learning process and also facilitate equal education with other normal students. The adoption of e-learning yields several advantages for individuals with disabilities. These benefits encompass peer support, enhanced proactiveness, flexibility regarding time and location, and the positive influence of information and communication technology (ICT) on the overall educational experience (Costado Dios & Piñero Charlo, 2021).

A key advantage of e-learning is the near-universal accessibility it offers, allowing students to engage in education at nearly any time and place. For students with mobility impairments, often with a support system in place, the ability to access learning from home eliminates the need for arduous travel, which can be particularly inconvenient for individuals with disabilities. This convenience factor renders e-learning an appealing alternative. Moreover, students with disabilities who rely on specialized software or hardware may find greater comfort and familiarity when using their own equipment within the confines of their homes.

In the traditional classroom learning model, teachers must divide their attention among many

students. They may not have the opportunity to give individual learners the special attention they need to complete a lesson, no matter how much they want to. However, when it comes to online learning, educators can provide more time for students with special needs by scheduling additional time with them. With this, teachers can work on lessons or give light assignments to meet their abilities. This additional attention means that students with special needs do not get 'lost' in a learning system like this.

4.3. Problem Solutions in Developing an Inclusive E-Learning Platform

To make it easier to solve existing problems, various obstacles in developing e-learning platforms can be divided according to the location or source of the problem. In this way, the solutions found can be created more easily and precisely (Almaiah et al., 2020). Some obstacles in implementing E-Learning in inclusive education according to the division are as follows:

a) Teacher/Lecturer/Professor

The role of the teacher is very important in learning activities regarding inclusive education. In implementing E-Learning, sometimes teachers are still not very proficient in using this system because teachers are used to using traditional learning systems which emphasize a direct approach between teachers and students. The role of teachers in E-Learning is quite important because teachers play a role in being the creators of E-Learning or actors in e-learning itself. The role of the teacher plays an important role in the implementation of E-Learning learning in inclusive education. These problems could be poor use of e-learning by the professor, difficulties, and technical problems when connecting to the course website. This shows that the role of teachers is still minimal in operating e-learning websites that will be used for students with disabilities. To overcome this, schools or universities can provide their teachers with training to use e-learning with students with special needs. With training for teachers, it is hoped that they will be able to master and apply it to the students concerned during the learning process.

b) Students

Problems do not only occur with teachers, students can also become an obstacle to implementing e-learning in inclusive education. This problem usually takes the form of students' lack of ability to operate e-learning. As is known, students with special needs have shortcomings that are not like normal students, so when given a device, normal students can immediately use it, while students with special needs need quite a long time because they get

used to it. Students with special needs should be given e-learning learning materials that are appropriate to their conditions. In this case, the teacher must be able to provide understanding to the student slowly and adjust to the student's condition. In general, providing understanding to students with special needs requires extra effort and patience so that these children will eventually be able to use e-learning for their learning.

Apart from using e-learning, other technology that can support the use of e-learning can also be used, perhaps some hardware that has been modified (adaptive technology) to suit the needs of students with special needs. There is also a category known as assistive technology, which refers to technology utilized by individuals with disabilities to accomplish tasks that may otherwise be challenging or impossible for them to perform. Assistive technology encompasses various aids, such as mobility devices like walkers and wheelchairs, as well as hardware, software, and peripherals designed to assist individuals with disabilities in accessing computers or other forms of information technology.

c) Facilities and Accessibility

Facilities pose a significant challenge in the implementation of e-learning. Unfortunately, e-learning remains largely inaccessible for people with disabilities, who continue to encounter numerous barriers in fully embracing this learning model. This facility can be in the form of a lack of computers to access and create e-learning learning activities. The lack of devices such as computers will make it difficult for teachers to create learning materials for students. Inclusive education requires more than just ordinary computers, namely computers that have been modified to suit the circumstances of students with special needs.

Furthermore, the shortage of essential adaptive technology, limited availability of computer lab facilities, an insufficient supply of adaptive keyboards for children with special needs, and challenges in installing software tailored to support the learning needs of students with special requirements contribute to the hurdles faced in inclusive e-learning environments. The use of technology for inclusive education depends on the type of disability a person has, as well as the availability of supporting technology, and this technology may be difficult to access. Apart from that, there are various types of accessibility, even though people with disabilities have and can access the Internet, hardware, or software, these have not been

configured to suit the circumstances of students with disabilities.

d) Technical Issues

Technical problems here mean problems that refer to the internet network. An internet network is a very important component in the implementation of e-learning activities. With the internet network, teachers and students can access this service. Internet connection is an obstacle in the operation of e-learning because the internet connection is used to access learning materials sourced from online sites. The students used in the study explained that there were technical obstacles in using e-learning and experienced problems connecting to the website. Apart from that, their course material management system also experienced problems downloading and opening files. They also experienced difficulties with web pages not loading, and videos taking a long time to download on e-learning website pages.

To overcome technical problems in e-learning related to internet networks, the first step that needs to be taken is to improve the quality of internet connections available to teachers and students. This can be done by investing in a faster and more stable network infrastructure. In addition, there needs to be technical support ready to help teachers and students when they experience technical problems, including problems accessing websites and downloading learning materials. Furthermore, it is important to carry out regular monitoring and maintenance of the learning material management system as well as the e-learning server to ensure optimal performance. To reduce problems with web pages that won't load and videos that are slow to download, choosing a lighter, more bandwidth-friendly e-learning platform can be considered, as well as providing offline access alternatives for the most important materials. With these steps, it is hoped that the e-learning learning experience for teachers and students can be improved.

5. Conclusion

With advances in technology, innovations have been created in the world of education, namely e-learning, online, or technology-based learning that can support students with disabilities in getting learning that is equivalent to normal students in general. E-learning is a challenge for teachers, where teachers have to adapt to current technological advances. This e-learning-based learning is intended to make it easier for students with special needs to study from home if they can't attend class. This allows students with special needs to have the same learning opportunities as other normal students.

Technological developments have created various types of software and hardware that can be used for students with disabilities. Adaptive technology and assertive technology are technologies that play a significant role in helping students with special needs learn in the learning process. However, even though the use of technology and e-learning is quite significant in the field of education, it is still found that the use of e-learning in inclusive education carried out in several countries in the world encounters several obstacles in its implementation. There are several important problems in implementing e-learning for students with special needs, namely problems from teachers, the students themselves, e-learning facilities and accessibility from educational institutions, and technical problems. These problems are quite an obstacle in carrying out e-learning-based learning in inclusive education because all of them have an important role in the continuity of learning for students with special needs.

Academically, this research expands the inclusive education framework by integrating assistive technology concepts into mainstream e-learning systems within the Indonesian context. The innovation of this work lies in the identification of multifaceted solutions that focus not only on software but also on strengthening the teacher's role as an inclusive content creator. This addresses a gap in existing literature which often overlooks the intersection of technical readiness and pedagogical adaptation in remote learning for students with special needs.

Educational institutions should establish dedicated technical support units and perform regular server maintenance to ensure stable accessibility.

Future studies should investigate the effectiveness of Artificial Intelligence (AI) platforms in automatically customizing materials based on a student's specific disability profile.

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