Universal Design Learning: A Strategy to Strengthen the Resilience of Inclusive, Flexible and Accessible Education

Fitria Sari[1], Erwin Salpa Riansi[2]

[1]Department of Primary Education, Faculty of Teacher Training and Education, Banten-Indonesia
[2]Department of Indonesia Language Education, Faculty of Teacher Training and Education, Banten-Indonesia

email correspondence: salpariansierwin@untirta.ac.id

ABSTRACT

The current article employs a methodology of library research, which involves the collection and analysis of information from a variety of pertinent sources. The data utilized in this study are obtained from a range of sources including books, academic journals, articles, research publications, and official documents from relevant institutions. The results suggest that curricula developed using the Universal Design for Learning (UDL) framework offer multiple pathways for students to access information, process content, and articulate their comprehension. Educational resources can be accessed in various formats, such as written text, audio recordings, videos, and visual materials. Moreover, adaptive technologies are utilized to customize learning resources according to the specific needs of individual students. The investigation underscores the importance of curricula that facilitate accessibility through different material formats and the utilization of adaptive technologies to ensure effective learning for all students, addressing their unique needs. Additionally, the study underscores the crucial role of UDL in cultivating an inclusive and resilient educational setting by providing adaptable and flexible learning avenues. The application of UDL principles in academic environments advances a more fair and supportive learning atmosphere, catering to the diverse requirements of the student body. This methodology not only improves accessibility but also reinforces the overall resilience of the educational framework, guaranteeing that all students can thrive irrespective of their distinct challenges and learning preferences. The study concludes with a suggestion to widely implement UDL-based curricula to establish a more inclusive, flexible, and accessible educational system that can better cater to the diverse needs of learners

Keywords: universal learning design, education resilience, inclusivity, flexibility, accessibility

INTRODUCTION

Background of Study

Inclusive education is an educational approach that seeks to accommodate all students, including those with special needs, in the same learning environment. Inclusive education ensures that all students, including those with special needs, have equal opportunities to participate in education and achieve academically. Flexible education also allows teaching methods and curriculum to be adapted to the diverse learning styles and needs of students. (Irmayanti & Yuliani, 2020). So it can be said that inclusive education provides equal opportunities for all students to participate and achieve academically with the aim of ensuring that all students have equal opportunities to learn and develop according to their potential.

Inclusive education is not just about students physically being in the same classroom, but also includes adapting the curriculum, teaching methods and learning environment to meet the needs of all students. This is important because it helps reduce the stigma against students with special needs and fosters a sense of solidarity and understanding among students. With educational flexibility, teachers can adapt their teaching methods to meet the unique needs of each student. Accessibility ensures that every student has equal access to academic resources and facilities, regardless of their physical or intellectual abilities. (Mujiono et al., 2018). Inclusive education means changing the curriculum, teaching techniques and learning environment to meet the needs of each student, reduce stigma and foster solidarity. With educational flexibility, teachers can customize their teaching and ensure that all students have equal access to academic resources and facilities.

The world of education is currently faced with various challenges, especially with regard to inclusive education. In the wake of the COVID-19 pandemic, the main issue at hand is how the education system can adapt quickly to the imminent changes and ensure that all students, including those with special needs, continue to receive high-quality education. During the pandemic, weaknesses have been seen in schools' readiness to transition to distance learning, especially for students who require specialized support. Research shows that many schools face difficulties providing adequate technological infrastructure and teacher training needed to implement distance learning, leading to inequalities in access to education (Paraskevi Chatzipanagiotou & Eirene Katsarou, 2023). Educational institutions must prioritize the advancement of robust and inclusive strategies that utilize technology and thorough teacher training to address these disparities. This approach aims to establish a more resilient and equitable education system that can withstand future disruptions, thus guaranteeing equal opportunities for all students to achieve success.

The rapid development of technology poses new challenges for inclusive education. Tailor-made apps and assistive devices for students with special needs are some examples of how technology can aid inclusive learning. However, using these technologies requires significant time, resources and teacher training. Moreover, ensuring that all students have equal access to these technologies is an additional challenge as there are still significant digital divides in some places. UNESCO (2021) notes that governments and educational institutions should work together to reduce the digital divide and ensure that technology is used effectively to support all students without discrimination to achieve inclusive and sustainable education (UNESCO & IIEP-UNESCO, 2021). Technological advances aid inclusive learning with specialized applications, but require time, resources, teacher training and equal access. Addressing the digital divide is a challenge that requires governments and educational institutions working together to ensure the use of technology supports all students without discrimination.

In addition, one of the main requirements of inclusive schools is that teachers must have the ability to provide education to all children, including children with disabilities or special education needs. Inclusive schools rely on teachers who are optimistic and passionate about providing the best for all students but there are obstacles faced by teachers. Research conducted by (Mujiono et al., 2018) when teachers teach in inclusive classrooms with students with special needs, teachers are not sure they can make learning suitable for students' special needs because accessibility is a relatively subjective variable, difficult to define and achieve. For

students with special needs, the learning environment and learning materials must be adapted to their characteristics. Teachers' inability to handle students with special needs includes teachers' professionalism, as there are still teachers with non-exceptional education backgrounds, and teachers' lack of ability to plan inclusive education programs. In addition, parents also play an important role in teaching their children certain skills that they may not have. (Rusmono, 2020). Inclusive schools need educators who have the ability to educate every student, including those with special needs. While teachers need to be optimistic and passionate, they face challenges such as professionalism, lack of training, and difficulty adjusting the learning environment and parents also need to take responsibility for teaching their children skills.

The curriculum system does not fully meet the needs of children with special needs. The current curriculum is mostly designed for students without special needs, making it difficult to adapt teaching methods for students with special needs. (Sholihah & Chrysoekamto, 2021). In addition, another major challenge is the negative stigma from society and the lack of support from the surrounding environment. Students with special needs are often seen as a burden and discriminated against in school.

In order to achieve a truly inclusive education, there needs to be a framework like UDL that can help address the challenges that exist in education today. (Sholihah & Chrysoekamto, 2021). Applying Universal Design for Learning principles can help address the issue of diverse student characteristics in an inclusive classroom. Universal Design for Learning (UDL) is a theoretical framework for the conception of teaching that addresses how learning content is accessible and accepting of student diversity. The focus of various approaches to implementing inclusive teaching is to ensure that all students can participate in learning. The concept of universal design can also be applied to education because "*Universal design for learning (UDL) encompasses an effective approach to classroom procedures, which ensures that teaching is designed to be accessible to all potential learners, including those with disabilities and who are at risk of failure in school*" (Almumen, 2020).

Inclusive education based on Universal Learning Design (UDL) is essential to improve the resilience of education. UDL is an educational framework that focuses on providing equal learning opportunities for all students, including those with special needs, through flexible and accessible teaching methods. By applying UDL principles, such as providing multiple avenues for representation, action, expression and engagement, teachers can customize learning to meet each student's specific needs and create a welcoming learning environment (Roski et al., 2021). This methodology facilitates the establishment of an inclusive and hospitable learning atmosphere, while also enabling the educational framework to better adjust to forthcoming obstacles, thus advancing fairness and resilience in all educational contexts.

This article aims to explain how the application of Universal Learning Design (UDL) principles can help address the diverse characteristics of students in an inclusive classroom. In addition, the article shows how UDL can increase the flexibility and accessibility of education so that all students, including students with special needs, can participate and succeed in the learning environment.

RESEARCH METHOD

This research uses a literature study, which collects and analyzes information from various relevant literatures. All data used in this study came from books, scientific journals, articles, research reports and official documents from relevant institutions. Data were collected from books and scientific journals that discuss the concept and implementation of UDL, inclusive education and educational resilience. The main data sources were academic articles and research reports. The collected data were analyzed through a descriptive analytical approach. The data processing process included: Identification and Classification Identification and Classification: Identification and Classification according to Elo and Kyngäs (2008) is the process by which data are grouped according to the main relevant topics or categories. The first step in content analysis is the grouping of data, which is intended to organize the data for easier analysis (Elo, S., & Kyngäs, 2008). Data were categorized based on key topics relevant to UDL, educational resilience and educational inclusion. Content Analysis: According to Krippendorff (2004), content analysis is a technique often used to find themes or patterns in data. Content analysis allows researchers to discover information hidden in qualitative data. The data is examined to find important patterns, relationships, and results that support the research objectives. To find out how UDL can be used in inclusive education and how it can improve the resilience of the education system, content analysis was used (Krippendorff, 2004). Synthesis and Interpretation: According to Creswell (2014), the last step in qualitative research is data synthesis and interpretation; in this step, the researcher combines results from various sources to get a complete picture. The results of the data analysis are combined to make an overarching conclusion about how UDL can be applied in inclusive education. To do this, the theories and results of the literature that have been analyzed are used (Creswell, 2014).

RESULTS AND DISCUSSION

Resilience in Education

Educational Resilience is a term that can refer to the ability of students, teachers and educational institutions to cope, adjust and thrive in the face of challenges and adversity. Educational resilience includes the development of social, emotional and academic skills that enable people to survive and thrive in challenging environments. The ability of education systems to survive and recover from major disasters such as natural disasters, economic crises or pandemics is also part of educational resilience. Educational resilience is essential for creating a resilient and adaptive learning environment. According to Waxman, Gray and Padron (2003), this allows students to learn how to face and overcome various difficulties and also results in increased academic success and emotional well-being (Kratzer & Teplin, 2007). The focus of inclusive education resilience theory is the ability of individuals and systems to adjust to and recover from difficult situations. According to Hendriani (2017), positive adaptation to academic resilience is essential to help students cope with academic and emotional stress. This involves strong social support, self-regulation exercises, and a supportive environment. (Andriyan, A., Hendriani, W., & Paramita, 2023). Resilience can help students overcome negative experiences by providing positive responses to stressful situations (Hendriani, 2017). Resilience will help people have hope that they can face challenges and survive them (Roellyana dan Listiyandini 2016). Resilience is being defined as a person's ability to deal with life's problems and adapt to difficult events, as well as the ability to survive adversity and traumatizing situations (stated by Reivich dan Shatte, in 2002) at (Astuti & Rusmawati, 2022). Educational resilience pertains to the ability of students, educators, and educational

establishments to effectively deal with, adapt to, and succeed in the face of obstacles and hardships. This resilience entails nurturing social, emotional, and academic competencies that empower individuals to traverse and prosper in challenging circumstances.

Educational resilience and Universal Design for Learning (UDL) are two important concepts in inclusive education that work together to create adaptive and inclusive learning environments. Their focus is on ensuring that every student, including those with special needs, has equal access to education and success.

Universal Design for Learning (UDL) Concepts

The concept of Universal Design for Learning (UDL) first emerged in the field of architecture, where buildings were designed to support accessibility for people with disabilities by providing ramps, lifts, or automatic doors. It was later discovered that universal design could be applied to a wide range of people, such as pregnant women, mothers with strollers, and older adults with canes. In reality, universal design can be applied to everyone. Because the concept of universal design includes approaches that "Universal design for learning (UDL) includes effective approaches to classroom tasks, which ensure that teaching is designed to be accessible to all potential students, including underachieving and disabled students. UDL is a framework that enables change to make general education core curriculum and instruction accessible and applicable to students with different backgrounds, learning preferences and abilities in different learning contexts. It is used to afford all students, including those with special needs, a range of opportunities to engage in learning.(Almumen, 2020).

The Center for Applied Specialized Technology (CAST) developed Universal Design for Learning (UDL), which allows for a variety of instructional adaptations for each student regardless of their needs. UDL-based instruction offers various ways to display information (the "what" of learning), process information and display learning outcomes (the "how" of learning), and promote learning engagement and motivation. Furthermore, the three principles are divided into nine guidelines, which are explained to show that the focus is on the individual, so that accessibility constraints can be reduced. Therefore, it is not the student who has to adapt, but the surrounding environment such as the lecture hall, curriculum and so on. UDL principles can be used by educators to create flexible learning paths to achieve their learning goals. It allows each student to choose different methods, materials, and assessments according to their needs. However, UDL principles do not have to be applied digitally as the main goal of education is to reach all students (Roski et al., 2021). It is because the principal objective of Universal Design for Learning (UDL) is to guarantee the accessibility and full engagement of all students in the educational process. This necessitates fundamental alterations in instructional planning, comprehensive teacher preparation, and the establishment of a supportive educational framework.

Principles of UDL

CAST (2020), in the (Almumen, 2020) states that multiple ways of engagement is the first UDL principle that is based on the affective network of the brain. This first principle of UDL states that students should be given multiple ways to engage in learning. The aim is to encourage students to be actively involved in the learning environment.

UDL's second principle, "provide students with multiple representations of learning content", is supported by the recognition network. The second principle emphasizes that there are many ways to deliver learning materials. To ensure that all students understand what is being taught, teachers use a variety of instructional approaches and strategies. Teachers deliver learning materials to students with various strategic and instructional techniques until all students understand the meaning of the materials. To help students gain more resources and knowledge, information and learning materials will be presented in various ways and methods. The third principle of UDL centers on providing students with various ways to convey their knowledge. This allows students to speak and apply their knowledge in various ways.

This principle states that students should have many opportunities to communicate what they have learned. To communicate what they have learned, students should be able to choose projects, hands-on activities, reports, and technology tools. By differentiating the ways in which they can communicate what they have learned, students will be strategically directed towards the goal. The basic goal of UDL is to design a flexible learning environment where all students can acquire knowledge and develop their learning skills. These principles allow UDL to achieve equality of access to learning contexts.

Implementing UDL in Inclusive Education

Representation Strategy

One important part of Universal Learning Design (UDL) is representation strategies, which centers on providing information in multiple formats to meet the needs of diverse students. Utilizing different types of media, including visual, text, and audio, allows students to access information in a way that best suits their learning style. For example, in an inclusive classroom, a teacher may present lessons through written text, instructional videos, and audio recordings, so that students with different access needs can better understand the material (Meyer, A., Rose, D. H., & Gordon, 2014). This is especially important for students with dyslexia or visual impairment as they may need audio-based instruction or a different text format to understand the subject matter well (CAST, 2018). Teachers may improve student knowledge, raise engagement, and guarantee that every student has fair access to learning opportunities by offering different representations of the same topic. In addition to accommodating a diverse student body, the use of a variety of media types promotes an inclusive and productive learning environment.

Techniques of Drawing and Expression

UDL emphasizes the importance of providing a variety of evaluation methods to effectively evaluate students' understanding in terms of action and expression strategies. For example, teachers can replace written exams with multimedia projects, portfolios or oral presentations. This allows students to demonstrate their understanding according to their strengths and interests (Meyer, A., & Rose, 2005). In extension, students with special needs can use assistive technology tools such as screen reader software or helper apps to write and organize ideas. These technologies allow students with motor impairments or cognitive disabilities to participate more actively in learning activities and better demonstrate what they know (Al-Azawei, A., Serenelli, F., & Lundqvist, 2016). Incorporating diverse assessment techniques with the the use of assistive technology guarantees equal possibilities for every student

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105

to showcase their learning, which in turn promotes a more welcoming and encouraging learning atmosphere. An evaluation system that is more comprehensive and equitable is facilitated by this inclusive approach, which acknowledges and validates the variety of methods in which students can demonstrate their academic accomplishment.

Provision of Various Evaluation Methods

By providing a variety of evaluation methods, such as portfolios, multimedia projects, oral presentations, and performance-based exams, it can ensure that students can demonstrate their knowledge in a way that suits their strengths and preferences when using Universal Design for Learning (UDL). Studies show that providing these assessment options, which demonstrate student understanding more broadly, can increase student engagement and assessment accuracy (Meyer, A., Rose, D. H., & Gordon, 2014). For example, students who may face difficulties in writing long essays may demonstrate their understanding through visual presentations or creative projects, while other students may opt for more traditional written assessment methods (CAST, 2018).

Assistive Technology for Special Needs

Assistive technology tools designed to support students with special needs can help implement Universal Design for Learning (UDL) in Indonesia. Assistive Technology tools are essential to creating an inclusive learning environment and ensuring that every student has equal access to the classroom. The use of screen reader software and augmentative communication apps that support students with visual impairments and communication difficulties are some concrete examples of the use of these technologies in Indonesia (Dewi, S. R., & Sari, 2020). In addition, augmentative communication apps such as *Proloquo2Go* have been used in inclusive schools, such as SMK Negeri 1 Yogyakarta, and help students with speech or language impairments communicate better. This app allows students with speech impairments to participate in class and express their opinions more easily (Yuliana, 2019).

Engagement Strategy

Student engagement strategies in the learning process are an important aspect of education. One effective strategy is through collaborative and interactive activities. This method involves students in group work and discussions that allow them to interact actively with classmates and teachers. Research shows that collaborative activities can improve student engagement and learning outcomes (Ismail, 2018b). Student engagement strategies in the learning process are an important aspect of education. One effective strategy is through collaborative and interactive activities. This method involves students in group work and discussions that allow them to interact actively with classmates and teachers. Research shows that collaborative activities can improve student engagement and learning outcomes (Putri, R., & Handayani, 2020).

UDL as a Tool to Strengthen Education Resilience

UDL encourages a variety of teaching methods and media. This is especially important during the COVID-19 pandemic as it allows for a faster transition from face-to-face to online

learning. UDL helps students access learning materials according to their preferences and abilities by providing them in various formats such as text, audio, video, and interactive (Ismail, 2020). A Curriculum created using UDL principles can be quickly adapted to suit changing situations, such as school closures or distance learning. This allows teachers to customize teaching methods and learning materials according to the needs of different students while still motivating and engaging with students (Putri, R., & Handayani, 2019).

UDL provides a framework for supporting students' unique needs. Teachers can use UDL strategies to provide additional support and customize tasks or evaluations to suit students' conditions when they face emotional issues or learning difficulties (Susanti, 2018). Teachers should be educated to understand and apply UDL principles. They should be trained on the use of educational technology, differentiation strategies and inclusive assessment methods. To improve teachers' ability to apply UDL in their classrooms, regular seminars and drills can be held (Rahmawati, 2021)

UDL implementation can be supported by educational technology. Features such as learning aids, adaptive assessments, and accessible content can be found in e-learning platforms that support UDL. In addition, machine learning software can provide personalized feedback to students and analyze their learning data, helping them continue to improve in difficult situations Involving parents and communities in the learning process is essential to support UDL implementation. A parents' orientation program on UDL principles and how to support children's learning at home can increase their involvement and support (Haryanto, 2019b).

In addition, if not supported by a universal learning design, the inclusive learning environment (inclusion classroom) cannot achieve the expected learning objectives. This is because the program can only be understood and applied by regular students. As a result, the inclusive learning environment does not allow for diversity in the classroom. Thus, universal learning design (UDL) is used as the inclusion classroom design in this study. UDL is considered as a learning design that facilitates student diversity, especially students with special needs (Muslim, 2022). The COVID-19 pandemic has demonstrated the weakness and unpreparedness of many education systems around the world to deal with significant disruption.

To handle these challenges, Universal Design for Learning (UDL) offers a flexible and adaptive solution. UDL can help deal with the pandemic and other changes by providing a framework that allows learning to take place even in non-ideal conditions. UDL encourages a variety of learning resources and teaching methods. UDL's principle of encouraging the use of different media and formats for learning materials is particularly relevant during the pandemic as many students have to shift to distance learning. For example, providing information in the form of text, audio, and video can help meet the needs of different students and ensure that learning continues when online platforms are used (Rose, D. H., & Meyer, 2002). UDL also emphasizes the importance of giving students a variety of ways to demonstrate their understanding. According to their preferences and abilities, students can demonstrate their knowledge through projects, video presentations or written assignments during online learning (CAST, 2018). UDL also emphasizes the importance of giving students a variety of ways to show what they understand. Students can use projects, video presentations or written

assignments during online learning according to their interests and abilities. The flexibility of UDL is its main advantage. A curriculum based on UDL can be adapted quickly to the pandemic or changes in education policy. A flexible curriculum allows students to engage with the material in different ways, such as using interactive technology, accessible teaching materials, and various teaching approaches (Hall, T. E., Meyer, A., & Rose, 2012). Flexible teaching methods also allow teachers to adapt their methods to the unique needs of students. For example, some students may experience emotional or psychological difficulties during the pandemic, which may affect their ability to learn. With UDL, teachers can adjust their workload to help students stay engaged in learning (Smith, 2020). Overall, UDL's flexible and inclusive approach not only enhances the resilience of education systems but also fosters a more equitable and supportive learning environment for all students.

Providing Accessibility to All Students

UDL Universal Design for Learning (UDL) is an educational approach that aims to ensure that every student has equal opportunities to learn and develop, regardless of their ability or background. A key component of UDL implementation is accessibility, which allows every student to access and utilize adult learning materials. This is very important because accessibility ensures that every student has an equal opportunity to learn and reach their full potential (Smith, 2020). In addition, students can more easily engage and participate in the learning process if the learning environment removes physical, cognitive, and emotional barriers (Putri, R., & Handayani, 2019). For this reason, several tools are needed that can support students to eliminate these obstacles, namely:

Learning software: E-learning applications and platforms that have accessibility features such as subtitles, screen magnification, and text to voice (Wulandari & Kurniawan, 2020). Visual and Auditory Aids: The use of aids such as projectors, interactive whiteboards, and headphones that help students with various sensory needs (Rahmawati, 2021). Assistive Technology: Technology tools such as voice recognition devices, customizable keyboards, and alternative input devices for students with physical disabilities (Susanti, 2018)

Empirical studies show that using UDL improves student learning outcomes. A study by found that, compared to students learning with traditional methods, students using UDL approaches showed significant improvements in their academic engagement and achievement. UDL increases inclusion and equity in the classroom and reduces achievement differences of students with and without disabilities, according to additional research conducted by Ismail (Ismail, 2018a). By using UDL principles, learning experiences may become more customized, which will improve students' chances of academic success. Therefore, in order to boost diversity, close achievement disparities, and enhance overall student performance, instructors are urged to implement UDL principles. By coordinating instructional strategies with the objective of offering fair learning opportunities to every student, this strategy makes the educational system more efficient and inclusive.

The research conducted by Dewi (Dewi et al., 2018) The results of the meta-analysis show that the implementation of UDL principles can improve the quality of students' learning process. In addition, a case study from a junior high school in Yogyakarta shows that the implementation of UDL is successful. This school uses a variety of educational technologies to deliver lessons. These include adaptive software, web-based learning modules and

interactive videos. In addition, teachers are educated to use UDL strategies in their teaching, including providing various assessment methods and providing personalized feedback to students (Haryanto, 2019a). The school's instructors are also educated in UDL methodologies, which include a variety of techniques include using a variety of evaluation techniques and giving tailored feedback. By using these strategies, teachers may better meet the requirements and preferences of each unique student, creating a welcoming and encouraging learning environment. These approaches highlight the use of a variety of teaching strategies and resources to improve learning outcomes, reflecting the broad application of UDL concepts. They also stress how crucial it is for teachers to receive training in UDL methodologies, since this equips them to use adaptable and successful teaching techniques. All things considered, these approaches show how UDL may be used to enhance inclusion, academic accomplishment, and student engagement in learning environments.

CONCLUSION

To enhance the resilience of inclusive, flexible and accessible education, Universal Design for Learning (UDL) is an important approach. In inclusive education, UDL aims to ensure that all students, including those with special needs, have equal access to learning and opportunities for academic achievement. By providing a variety of teaching methods and media, UDL allows the curriculum and teaching methods to be tailored to students' learning needs and preferences. By using assistive technology and tools, UDL addresses the challenges of inclusive education. Empirical studies show that UDL is effective in improving student learning outcomes and reducing achievement differences between students with and without disabilities. Recommendations for further research are Research into curricula that provide multiple ways for students to access content, process information and communicate what they understand. Course materials can be accessed in a variety of formats, such as text, audio, video and images. Adaptive technologies are used to tailor learning materials to the unique needs of students.

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