



The Impact of Universal Design for Learning on Student Learning Effectiveness in Elementary Schools (Process and Outcomes)

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Abstract

This study aims to analyze the relationship between the U.S. learning framework Universal for Design in learning psychology neuroscience to support the program diversity Equality Inclusion that can meet the needs of each individual. This study uses the literature review method by analyzing journals/articles with an adjusted number of research articles, web pages, videos, books, and various reputable journals in order to obtain valid, reliable, and up-to-date information. The major themes that became the subject of discussion were related to neuroscience links in personalized learning especially Universal Design for Learning. The method of learning principles in the learning process, and the strategies to be involved. This study conducts a literature review based on the following research questions; How does neuroscience affect learning Universal Design for Learning? The general goal is to be able to accommodate every student in learning. To do this, the researcher conducted a journal database. Thus, 18 papers were found to analyse, and after applying the criteria. The results show that some of the published works have theoretical conceptions, the results conclude that the Universal Design for learning stimulate the nerves of the brain to be involved in the learning process in exploring learning understandings that are applied in all school inclusions.

Keywords: Universal Design for Learning (UDL), neuroscience, diversity, equality, and inclusion

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INTRODUCTION

In principle, every child is born with diversity like fingerprints, not one human being has the same thing for every child who is born on this Earth. Every child has millions of brain cells that grow and develop. Various brain stimuli grow are influenced by the environment that accompanies them, millions of cells can grow along with their age. The number of brain cells that grow depends on the stimulus given to each child so that it can affect the characteristics of each individual child. The growth and development of children varies in terms of cognitive, motoric, language, logic, art and visual. Child growth different phase of experience, the most development periodde termine.To quote from the article (Khatimah et al., 2022) that there is a phase of child development that is in a unique phase of development, namely between the ages of 0-6 years is the age of development of children who grow according to their uniqueness, because each child has different potential, excess talents , and their respective interests which are developed through the educational process as time goes by the child's development goes too complex growth.

According to Jean Piaget and Vygotsky cited in the article (Agustyaningrum & Pradanti, 2022) which examines in depth cognitive development and its implications for learning outcomes in schools, especially at the elementary school level, which is a phase of

child growth that is in a concrete operational stage. What is further expected is that learning in schools is recommended for student-centered in learning, actively using a variety of media stimulate motivation and student involvement in learning and teaching activities. As well as contextual learning that is relevant to everyday real life in connection with activities and interactions within the community different learning environment, and becomes a driving force for student learning in understanding learning at school. In addition, according to Vygotsky based on sociocultural theory recommend of cooperative and collaborative learning that optimizes scaffolding and social interaction learning.

Thus the link ages of the child's development process and the learning process are very influential in determining the appropriate philosophy and learning model so that it can become needs for each of learner according to their characteristics. Based on previous research, learning models can accommodate individual students to achieve an understanding of learning objectives in schools studied research on personalized learning which is a model that responds to individuals diversity learners. In addition, currently the focus is on the concept of Diversity, Equality and Inclusion (DEI) where from each characteristic and diversity of each individual need equality and inclusion responses are carried out so that each individual can optimize their potential, interests, and talents in the process to learn. This is also stated in the Cambridge Curriculum literature on inclusive education (Dunn, 2023) on inclusive education which states that inclusive education is generally defined as teaching that engages students in learning that is meaningful, relevant and accessible to all. Inclusive education adheres to the view that individual differences are a source of diversity, which can enrich the lives and learning of others as stated in the article (Hockings, 2010).

This inclusive education is related to Special Education Needs (SEN) where the learning process is accommodated in accordance with education that matches the characteristics and obstacles faced by students in the learning process. The various obstacles faced by students in learning vary in terms of literacy, numeracy, motor, language and others, it is necessary to accommodate all these obstacles, both the use of teaching media, especially technology that can stimulate student learning. In this inclusive education it is hoped that students will have access, be involved in participating in the learning process, and be able to progress in the learning achievements of each child. WHO also stated other factors that can affect children's development including health, environment, and personality factors where each person is not fixed and flexible which is contained in the module (World Health Organization, 2001).

According to the book (Tomlinson, 1999) there are examples of good practice in elementary school education that focus on individual students. Each student has different skills in applying research skills, writing skills and sharing what they have learned. Another example in the classroom is that a teacher applies different talents in art, sports, visual arts or writing according to his talents and curiosity. Moreover, explained by (Smith & Throne, 2007) in his book using technology to accommodate classroom learning, in this case focusing on a variety of digital media according to students' interests in exploring learning. Reflective changes in teaching practice described in the book (Perner & Darlene, 2004). In the next book, it is explained that teachers must be able to face various challenges at each grade level to deal with various individual students (Tomlinson, 2001).

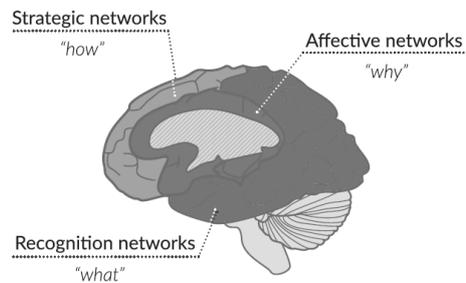
Inclusive learning has increaseand how the Universal Design for Learning (UDL) principle is carried out, where one of its characteristics is prioritizing learning activities and teach in flexible. Universal Design for Learning (UDL) principles consist of diversity access to information and knowledge, Diversity expression to show or demonstrate what students know, and a variety of engagements to motivate them from the way they learn. This Universal Design for Learning (UDL) learning approach applies curriculum and learning environment for all students as much as possible to reduce the need for individual adaptation. In addition to the Universal Design for Learning (UDL) model that accommodates inclusive learning where differentiation learning accommodate each individual student based on their

learning styles, interests, talents and student profiles. Learning differentiation places great emphasis on the learning process compared to learning outcomes. This learning model can increase the efforts to keep power of students as well as ability to think in their own way to do differentiation of learning. Furthermore, the Neurodiversity learning model which recognizes the fact that our human brain naturally has differences which helps teachers to be able to adapt to cultural influences and the learning environment in various ways. This study was studied with the aim of knowing the implementation of Universal Design for Learning (UDL) and differentiation on its influence in neuroscience in learning activities to improve students' understanding of learning in elementary school education. Get to know student profiles is the first step in identifying each individual student with a variety of readiness, interests, talents, and learning styles. Teachers respond to the characteristics of students in teaching and learning activities there is no specific standard.

Literature review research was done to review the implications of learning the framework (*Universal Design for Learning*) in elementary schools on curriculum design and learning. The purpose of this literature review is to identify the stages of learning Universal Design for Learning (UDL) on brain development. As mentioned by neuroscience there are 3 brain networks: **recognition** (*what of learning*), skills and strategy (*how for learning*), and care and primacy (*why of learning*). Like one size is not enough for all, buildings and frameworks Universal Design for Learning (UDL) designed with flexibility in accordance with the objectives, methods, materials and learning assessment. By determining what goals students will study for minimize obstacle among them based on stages **representation** (showing information in various ways), **actions and expressions** (Allowing students to approach the task and demonstrate in different ways by using modes and providing input in the learning process, and **Multiple Agency** by giving them choices and ensuring that children are interested in learning it is stated in the Web Page (CAST, 2020).

Framework Universal Design for Learning (UDL) designed towards learning for diverse learners, who have the diverse needs of all students (Lee et al., 2018). The UDL framework comes from the term architecture, but when in terms of education it means designing learning for all students. Meanwhile, in the world of architecture, Universal Design only relates to people with disabilities (Heelan et al., nd; Izzo, 2012). Framework Universal Design for Learning (UDL) inspired by cognitive development research neuroscience which offers an integrated learning framework of what is known about development the brain to design student-centered of learning. Talking about parts of the brain, there are generally sensory parts that can be used for vision and hearing. In the back of the brain receives including the occipital and temporal lobes of the brain as a recognition network (*network recognition*), then processed and conveyed for meaning in the middle of the brain, then regulated in the frontal lobe to act in response or act is called (*Strategic networks*). This brain network assignment in learning can assist teachers and students in designing learning experiences.

Universal Design for Learning (UDL) recognize 3 parts *representation* namely perception, language, symbols and understanding. *Actions and expressions* is about physical action, expression, communication and other functions. *Engagement* which consists of effort, involvement, interest, toughness and motivation / behavior in the learning process. Within the brain there is variability where the characteristics of the nervous system are different, no two brains are the same. Every brain is complex, interconnected and influenced by genetic heredity and environmental interactions. And the brain will develop based on environmental experiences and interactions. As children learn, some of the connections will get stronger and faster. Besides that, determine learning goals, formative feedback, and opportunities to support active learning can enhance brain development. In this case it is closely related to the implications of learning in various classes.

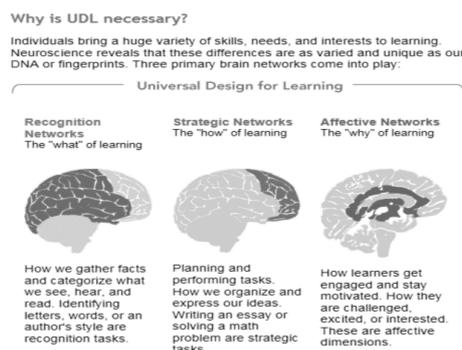


(CAST, 2023)

Indonesia has diversity characteristics of culture that characterize in nation, like other countries in the world, are certainly more diverse and complex. To be able to foster this diversity, it is necessary to create harmony and tolerance for all people. As educators, it is necessary to foster the implementation of equality and inclusion in a classroom. Students enter the class with different backgrounds including differences in religion or beliefs, customs, ethnicity, gender, race, socioeconomic, ethnicity, language and others. As a teacher, you must be able to help all obstacles in order to avoid disputes over these differences with how to support positive behavior among students. This is done in order to grow a sense of belonging for all students, and their families in order to foster an attitude of tolerance and respect for everyone (Resilient Education, 2023).

Equality is not only an idea but the treatment of justice in the learning process and outcomes. To get fairness in the learning process so, require treatment different. In this case as a teacher requires recognition and handling of different barriers or barriers to achieve equality. So, opportunities are needed for all children to be able to develop in the school environment. Diversity in schools including different backgrounds, strategy implications for handling diversity in the need for knowledge and understanding of child development, what if there is exclusion and bullying (McGill University, n.d.). Inclusion requires recognition that is created from exclusion or social isolation that can affect the school community. This diversity is faced by students and the school community, this triggers inclusion which is the idea of feeling, belonging, being accepted and valued as members of the school and community as well as citizenship. As a teacher can reduce *barriers* or obstacles caused by social interaction that can affect a school environment.

Teaching in inclusive classrooms is currently a challenge, where each person is a unique and different person. With the characteristics of each individual, the differences such as language, behavior, intellectual, customs or others (Gargiulo & Metcalf, n.d.). In this diversity, each child can have an attitude of mutual care, respect, and understand the differences between their classmates. Thus, teachers need to prepare learning strategies, paradigms and educational reforms. Class inclusion implications. According to IDEA regarding students with disabilities, there is a category of inclusive students (Columbus et al., 2017).



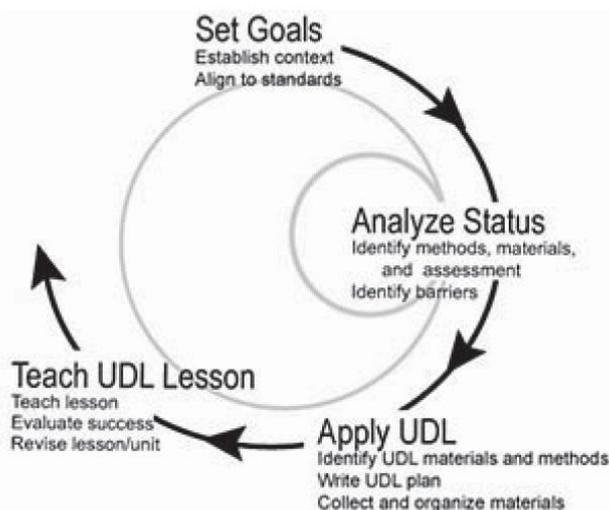
(CAST, 2023)

The learning framework supports DEI is the Universal for Design (UDL) framework. This learning principle is designed as a product design and classroom environment that can be used by everyone without requiring special adaptations or designs. Learning framework Universal Design for Learning (UDL) it is emphasized that accessibility must be build into the initial design made for a group of people according to disability simultaneously benefit all parties. This was also reviewed by organization named CAST developed Universal Design for Learning (UDL) where the curriculum is designed universally. In the classroom students have access to learning content regardless of all student limitations, inability learning, behavioral problems. The method used by CAST consists of 3 stages, namely; provide various means of representation (what is needed in learning, learning strategies (how is learning done?), engagement (why learn) or abbreviated *representations, expressions, and engagement* (Chodock & Dolinger, 2009). The learning model in the classroom required techniques, experience, the latest research and assessment evaluation.

Learning strategies Universal Design for Learning (UDL) in elementary school according to the principles learning. Among them are fair use that can be accessed by all children with diverse abilities, flexible which emphasizes the choice of methods used, effective communication, tolerance for every mistake, and a learning community (Rodesiler & Mcguire, 2015). On the practice as one example of implication

Universal Design for Learning (UDL) it is also about the pedagogy, or teaching practice, used for students with and without disabilities. The concept of Universal Design for Learning, which originated in the field of architecture continues to have great influence, especially reflected in building structures which are now required to incorporate features (e.g. ramps, door widths) that allow more people with different needs to access buildings without needing to fix details. structure. A key feature of universally designed buildings and products (whether business or home) is that they allow people with unique needs to be independent and immediately use them "as is". Some of these features are structural (door handles, not doorknobs); other (Margaret, 2009). Implications of the Universal Design for Learning model to support all individuals (Mesa, 2018). Implications for improving learning can be related to literacy, language, experience, creative drama, playing in activities (Fornauf1 & Dangora Erickson2, n.d.).

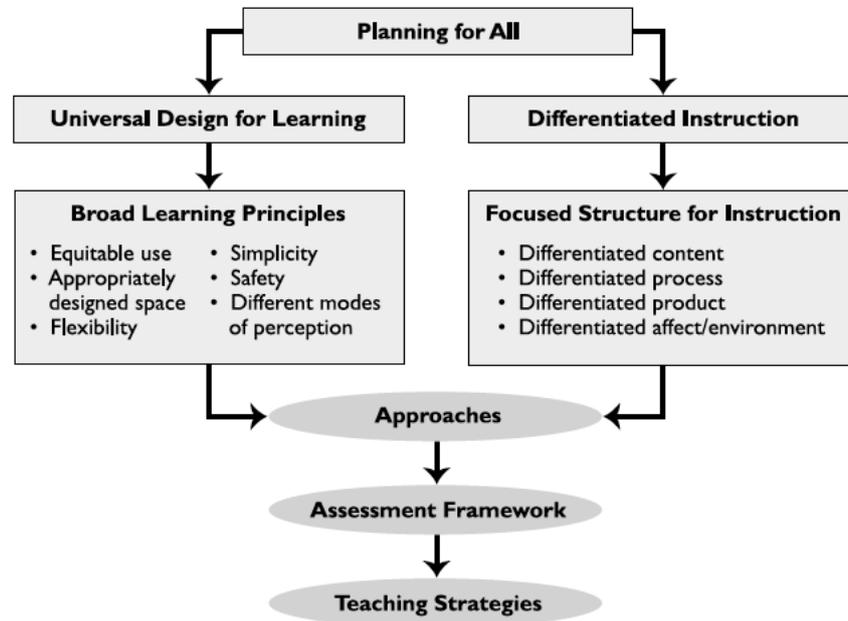
Curriculum planning and application of the UDL learning framework (Hall et al., n.d.)



An important step in implementation study Universal Design for Learning (UDL) is curriculum planning and delivery. First, teachers must have a basic understanding of the UDL framework, a commitment to designing curricula and learning accessible to all students. In addition, pay attention to three principles Universal Design for Learning (UDL) based on

network recognitions, strategy and affective. The process includes 4 steps in the teaching activities framework Universal Design for Learning (UDL) including: setting goals, analyzing status with identify methods, materials, and assessments to reduce barriers or barriers, apply Universal Design for Learning (UDL) in this case collecting and organizing information and teaching stages. Universal Design for Learning (UDL) by teaching, evaluating learning achievement and revision (Hall et al., n.d.).

Figure 3. UDL and Differentiated Instruction



(Ministry of Education, n.d.)

From scratch learning framework Universal Design for Learning (UDL) planned based on difference instruction, offering a systematic method for identifying early students who are experiencing certain difficulties and monitoring learning progress. Provide the right support to improve results study because it focuses on personalized learning according to the needs, learning styles, and readiness of students.

Question study in a literature review study, namely:

1. How is the relationship between *neuroscience* with the Universal Design for Learning model?
2. What do the Universal Design for Learning learning principles involves in learning process?
3. Media technology and what strategies are used to support Universal learning for Design in class?

METHODS

Articles and book chapters are discussed in a literature review which is selected based on the stages. First, we do a search through the web page computer based on search via online databases and search engines or search engines. Databases and search engines: JSTOR, SAGE, Scholar, Scopus, ERIC, GALE power search, Google Scholars, and on line journal. Combination based on keywords: primary school education, Universal Design, teaching, inclusive, Diversity, Inclusive, Equality, pedagogy, neuroscience, disabilities, and

learning disabilities. Each article is based on search criteria to identify and evaluate readings. In addition, reading is done to summarize, compare and evaluate the reading. As other search results using Publish or Perish there are 50 articles, books, book chapters, and reports.

We further limit the search to important matters according to the research objectives. First, we review each article, book chapter, or report to verify that the work is based on actual research using quantitative, qualitative, or mixed methodologies. Literature and article reviews theoretical extracted, read for content, and checked for primary sources, but not included in the final analysis. Next, we reviewed the remaining research-based articles to ensure that each study was focused on students with learning disabilities. Analyze the similarities and differences in each article about the Universal for Design learning framework:

No.	Article Title	Year/Source	Core discussion of articles and updates
1.	Professional Development to Promote Universal Design for Instruction	2015/ JSTOR	UDL learning design for Professional Development/training activities (Rodesiler & Mcguire, 2015a)
2.	Inclusive Postsecondary Strategies for Teaching Students with Learning Disabilities: A Review of the Literature	2009/SAGE	Teachers apply inclusive learning to meet the needs of each child including in inclusion learning strategies, inclusive assessments, and building empathy(Orr & Hammig, n.d.)
3.	Universal Design for Learning: Technology and Pedagogy	2009/Learning Disabilities Quarterly	The discussion of learning principles in UDL includes flexibility, involving media and technology, etc. Learning Principles using technology and effective pedagogical approaches (Margaret, 2009)
4.	Using the Universal Design for Learning framework to support all learners	2018/Science and Children/National Science Teachers Association	Design and UDL framework to reduce learning barriers in learning with stages in science subjects to meet all children's learning needs. By combining the 5E inquiry-based learning model (Engage, Explore, Explain, Elaborate and Evaluate)(Mesa, 2018)
6.	Universal Design for Learning in Practice	2015/Journal of Special Education	The relationship between UDL and neuroscience in learning and its practice is to provide access to the learning process (Brand & Dalton, n.d.)
7.	Universal Design for Learning: Enhancing Achievement of Students with Disabilities	2012/Procedia Computer Science	This research article discusses Universal for Design for regarding the use of applications/hardware and software for media and technology that are universally designed to enhance learning. In this case it integrates UDL and technology to improve the learning outcomes of students, including those with special needs. This learning strategy creates

No.	Article Title	Year/Source	Core discussion of articles and updates
8.	Ideas in Practice: Professional Development to Promote Universal Design for Instruction	2015/Journal of Development Education	<p>a more flexible and student-centered learning environment, one of which is the learning model with the STEAM approach (Izzo, 2012).</p> <p>This research article discusses efforts to design inclusive learning. Developmental education programs consist of dynamic environments that promote learning. Grant-funded initiatives for professional development that use the Universal Design (UDL) learning framework include activities in reading, writing, and developmental mathematics courses. The elements of the training are explained; examples of strategies used by these instructors based on UDI principles are included; and insight into the value of designing teaching to incorporate UDL principles (Rodesiler & Mcguire, 2015b)</p>
9.	Universal Safety Design (USD) and Sustainability: Comparison of Guidelines between Universal Design (UD) and USD	MDPI Journal/2021	<p>This research article discusses about Application of UD or USD learning. Results show USD guidance has extensibility in fairness, flexibility, and a sustainability perspective. USD guidelines are expected to contribute to creating comfortable and safe environment for students with special needs, parents, foreigners (Baek & Jeong, 2021)</p>
10.	Differentiated Instruction and implications for UDL implementation	AEM Center Journal / 2004	<p>This research article discusses about UDL practices and principles, by means of learning begins with the identification of student class profiles and the support of the learning environment and resources (Hall et al., n.d.)</p>
11.	Universal Design for Learning: The More, the Better?	MDPI Journal/2021	<p>This research article deals with inquiry and learning practice and the Universal principles. Design for Learning (UDL).</p> <p>The results emphasize how important it is to properly adopt and introduce UDL principles to be able to learn and care about test accessibility when conducting quantitative research in inclusive setting (Roski et al., 2021)</p>

No.	Article Title	Year/Source	Core discussion of articles and updates
12.	Universal Design for Learning as a Bridge to Inclusion: A Qualitative Report of Student Voices	International Journal of Whole Schooling/2016	Research articles discuss about experiences and results of students understanding the philosophy of inclusive education. Experiences and results of various diverse students including ethnically and linguistically diverse students, students from indigenous backgrounds, and students with and without special needs. This model is aimed at fulfilling diverse needs of students. Specifically research models of various conceptions of student learning, learning processes, interdependence in learning, academic self-concept, and school engagement and reports through students' opinions about the benefits and challenges of this pedagogy (Katz & Sokal, 2016).
13.	Toward an Inclusive Pedagogy Through Universal Design for Learning in Primary Education: A Review of the Literature	Journal of Post Secondary Education and Disability	This research article discusses Universal for Design (UDL) learning at the age level of 3-12 years. Research on UDL is somewhat limited, hampered by competing definitions, objectives, and constructs. This review expands on previous research by focusing solely on UDL, such as that developed by researchers at the Center for the Application of Special Technologies (CAST) and includes research that is both empirical and descriptive in nature. Our findings suggest that ambiguity still exists for the application of UDL as an intervention, or framework; this has implications for its use in advancing inclusive pedagogy (Fornauf1 'Dangora Erickson2, nd)
14.	Executive functions in universal design for learning: moving towards inclusive education	International Journal of Inclusive Education/2020	This research article discusses understanding how students analyze the principles, guidelines, and introduction of Universal Design for Learning (UDL). In this way, teachers can introduce students to how to anticipate, organize, and decide on their learning actions, and how students can rebuild their

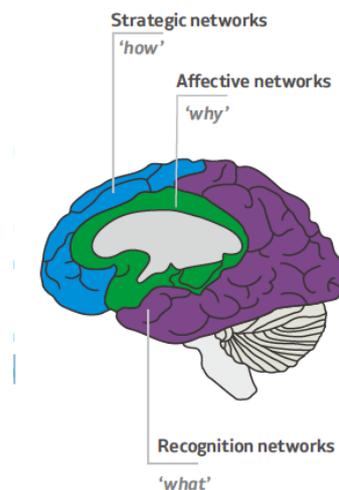
No.	Article Title	Year/Source	Core discussion of articles and updates
15.	Developing Teachers' Competences for Designing Inclusive Learning Experiences	Journal of Educational Technology & Society/ 2016	<p>experiences and learning, through a process of reflection, revision and improvement. It was concluded that UDL is not only a framework that enhances the improvement of barriers to student learning and participation, but also provides a guide for classroom practice that can enhance students' executive abilities as long as there is encouragement to develop the affective dimension.(García-Campos et al., 2020)</p> <p>This research article discusses inclusive education, namely the process of providing all students with equal educational opportunities challenge for many education systems around the world. To solve this problem, many frameworks have been used developed, namely Universal Design for Learning (UDL), which aims to provide a particular education design guidelines to ensure the accessibility of all types of learners to the learning environment. Additionally it presents the design, implementation and evaluation of teachers to implement UDL principles through PDP. The results of teacher PDP evaluations indicate added value for the development of teachers' competencies to design inclusive learning experiences for students(Baldiris Navarro et al., 2016; García-Campos et al., 2020)</p>
16.	Making It Happen: Using Differentiated Instruction, Retrofit Framework, and Universal Design for Learning	Teaching Exceptional Children Plus/ 2009	<p>This research article discusses about teach inclusive students? How do they teach students with different backgrounds? Differentiated Instruction (DI) learning is focused on content, processes, and products. Meanwhile, the Universal Design Learning Design Framework (UDL) determines which pathways can lead to a more positive learning environment for learners.</p>
17.	The Effectiveness of Universal Design for	Macrothink/ 2018	<p>This study discusses students who have various characteristics and</p>

No.	Article Title	Year/Source	Core discussion of articles and updates
Learning			abilities, and teachers have the responsibility to teach all students in their class according to different student profiles. Teachers need a practical teaching approach to address this diversity. UDL is a designing approaches in appropriate and effective learning activities for all students(Pokey et al., 2009).
18.	Universal Design of Learning and Inclusion in Basic Education	Alteridad/ 2019	<p>Using three basic principles. This study aims to conduct a meta-analysis related to the application of UDL is useful, in improving the quality of twelve-based student learning previous research published in journals. The results of the meta-analysis show that the application of UDL principles can improve the quality of the learning process of students(Dewi et al., 2018)</p> <p>This research article discusses inclusive education embodied in classes, taking into account the diversity of students, which is a necessary step to ensure equal opportunities in accessing the educational process. The purpose of this research is to find out Universal Design for Learning (UDL). The main outcome of the study is knowledge of UDL and its principles, highlighted that in public schools and where there is a higher percentage of students with special needs, only 29% of teachers know roughly what UDL is method. On the other hand, there are actions that affect formative processes and equality of opportunity (Espada Chavarria et al., 2019)</p>

Based on the studyThe literature review of the research questions above can be explained based on theoretical studies and analysis so that it can support and strengthen the studyliteratureused.

1. How is the relationship between *neuroscience* with the Universal Design for Learning learning model?

The brain network responds to the "why" we have to study this, the network *recognition* help us get about "what we will learn, as well as networking *strategic* process the "how" the way we learn it. Three networks need a strategy developed by the teacher in learning activities. Where the stages of the brain network are integrated and connected to each other (CAST, 2020). The things studied in this obstacle are helping educators as education practitioners in developing, designing, and evaluating curricula, finding obstacles, and providing support to students. The fundamentals of what is developed in UDL are based on research in neurology, psychology, development, the diversity of ways of learning mentioned by (Rose, 2010). This study states that the UDL concept involves three brain networks namely network *affective*, *recognition*, and *strategic*.



Designing an inclusive learning environment using technology creates optimal conditions to accommodate changing needs designed using UDL principles and supported by technology that is universally designed to give students the choice to access a variety of different content while using a variety of technology applications. With the growth of the Internet and technological innovation, many learning environments include computers and other devices that help students learn more efficiently. Based on the journal (Izzo, 2012b) some examples of different types of technology include: iPad/iPodTouch, Tablet PCs, Digital Pen with audio recording

What do the Universal Design for Learning learning principles have to do with the learning process in the classroom?

Thus, research states that to design good planning in learning it is necessary to plan effective learning for various students, so teachers need to develop the effectiveness of various learning for students in the integration of these principles into the learning and assessment process. In the learning process it is necessary to create learning that is meaningful, flexible, and involves student involvement



(Independent Module Ministry of Education and Culture Research and Technology, nd)

UDL goals and principles

- Accommodate during the learning process to the level of students according to ability, provide equal opportunity to students in order to achieve learning outcomes.
- Creating a meaningful and flexible learning environment
- Develop various teaching methods to be able to respond to learning barriers.
- Help students become proficient individuals.
- Accommodate all student backgrounds, interests and talents

According to (Tomlinson, 1995) explained that to apply the UDL learning approach requires educators to think about three aspects in curriculum planning including content, process, and product. Content concerns what students want to know or learn, do and what the teacher will teach. The process relates to how students understand what they learn. The product concerns how students demonstrate what is learned. Thus the teacher can ensure that the UDL learning design is in accordance with the brain network coordination described earlier.

2. What media and strategies are used to support Universal for Design in class? In learning methods can integrate especially the STEAM model so that it can facilitate student can use a variety of media as well as strategy in study that can accommodate student needs.

Adapted from High Incidence Accessible Technology, (nd) and Enome, inc (2019)

Mode	UDL Strategy	Rationale	Tools to Support	Link the UDL strategy
Presentation of Information	Graphic organizers with differentiated levels to support content understanding	ESL students Learning disabilities, cognitive impairments	Word, Inspiration, Kidspiration.	https://goalbookapp.com/toolkit/v/strategy/open-mind-diagram
Response/Expression of Knowledge	Digital graphic organizers for planning	Support students with organizational deficits, poor handwriting (don't have to rewrite work—copy and paste or export to word processor	Word, Inspiration, Kidspiration.	https://goalbookapp.com/toolkit/v/strategy/graphic-organizers
Engagement	Multimedia	Tap into a variety of learning modes, maintain attention	Clicker 5, Discovery Streaming, Online Encyclopaedia Britannica, PebbleGo, PhotoStory, Windows Movie Maker, Animoto, VoiceThread.	https://goalbookapp.com/toolkit/v/strategy/thinking-routine

RESULTS AND DISCUSSION

From the results of the Literature Study (*Literature Review*) can be concluded that comparison and analysis of sources of information about the UDL framework in relation to neuroscience in the DEI program (Diversity, Equity, and Inclusion). It focuses on the

importance of model Universal Design for Learning (UDL) in 3 stages: Engagement (*Engagement/Why*) namely by knowing the learning objectives, the reasons for learning that affect the affective network (affective network) which is in the mid brain it can generate a sense of interest, motivation, effort, toughness and desire/feelings. Where as the second stage representation (*Representation/What*) which is related to the recognition brain network in the occipital/temporal lobes or in the part of the brain that functions to receive information on what is seen and heard (*network recognition*) namely about perception, language, symbols and understanding. The third stage is action and expression (*Actions and expressions/How*), this stage is related to the frontal lobes of the brain such as physical behavior, expression, communication and executive function. Knowing the learning model can help design a child's learning experience.

Thus, from the results of the literature review there are several research results that discuss the three stages above and how to or strategies in supporting the learning framework Universal Design for Learning (UDL). One of them *purposeful* namely determining learning goals, providing choices that can motivate and provide *feedback*, a strategy for using modes or technological media that are *resourceful/knowledge*, and a directed goal strategy. Universal Design for Learning (UDL) it really accommodates diversity, equality, and inclusion of students in the class to meet the learning needs of each individual.

CONCLUSION

Databases and search engines: JSTOR, SAGE, Scholar, Scopus, ERIC, GALE power search, GoogleScholars, Journal on line. Combination based on keywords: primary school, elementary school education, Universal Design, teaching, inclusive, Diversity, Inclusive, Equality, pedagogy, neuroscience, disabilities, and learning disabilities. From the database obtained information related to the learning model Universal Design for Learning (UDL), psychology neuroscience, and DEI. Make important notes by analyzing, compare differences and similarities as well as renewal of research.

RECOMMENDATIONS

Further elaboration is needed about the stages or study plans of the UDL learning framework which are systematic, flexible and meaningful so that they can be use in all ideas, strategies, media/technology learning resources and knowledge of learning materials can be mapped to meet the needs of each individual student. In addition, it can be seen formative and summative forms of students who stimulate creativity and critical students, skills, and understanding of competence in order to grow motivation, feelings and actions that are sustainable. Application of learning principles Universal Design for Learning (UDL) can be further elaborated according to the principles of Universal Design for Learning (UDL) namely fair, flexible, simple and intuitive, clear information, fault tolerance, low physical effort, size and space for approach and use, learning community and instructional climate (*equitable, flexibility, simple and intuitive, perceptible information, tolerance of error, low physical effort, size and space for approach and use, community of learners and instructional climate*) (Heelan et al., n.d.).

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form uses literature review to analyze the similarities, differences and updates to the UDL learning framework in relation to *neuroscience* as the implementation of the DEI program.

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