

IMPLEMENTATION OF UNIVERSAL DESIGN FOR LEARNING (UDL) CONCEPTS ON LEARNING IN HIGHER EDUCATION

Imam Yuwono¹, Mirnawati Mirnawati², Dewi Ekasari Kusumastuti³,
Tenty Jahrina Ramli⁴

^{1,2,3,4}Lambung Mangkurat University, Indonesia

Abstract. *This research aims to describe the application of the three UDL principles in higher education, the obstacles experienced and the solutions. The type of research used in this research is library research. The data in this research is in the form of previous research reports published in journals. This research uses national or international journal articles with publication years in the last 5 years (2017-2023). Overall, there were 14 journal articles studied that were relevant to the research topic. Among the 14 journal articles obtained, there were 10 journal articles indexed by Scopus. The results of the research show that (1) the application of Universal Design for Learning (UDL) in higher education is by applying the 3 principles of UDL, namely: (a) application of the principle of representation through face-to-face learning, online learning, teaching using lecture methods, discussions, sheets work, delivering material using graphics, video, text, or images, as well as using e-books, (b) applying the principles of action and expression by giving students the freedom to choose how to express their understanding, either verbally, written, hardcopy, or softcopy, (c) application of the principle of involvement by creating a comfortable learning environment, frequently interacting with students, carrying out group discussions, and using assistive applications (mind tap, clicker, moodle), (2) the obstacle faced by universities in implementing UDL is the large number of students in classes, lack of knowledge and awareness about UDL among teachers and school officials, and lack of time for teachers to apply UDL in learning, lack of interest and motivation in learning. Applying and studying UDL, (3) the solution to overcome the obstacles faced by universities in implementing UDL is to hold training on UDL for teachers and school officials, this training can be in the form of an orientation program or workshop, another solution to overcome the problem of lack of motivation for teachers To adopt and learn UDL is to provide motivation in the form of rewards to teachers who are interested in learning more about UDL.*

Keywords: *learning, higher education, Universal Design for Learning*

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Introduction

Higher education is a significant factor in obtaining employment which ultimately leads to a better quality of life. However, participation of persons with disabilities in higher education in Indonesia is still low and very limited. Data shows that only around 2.8% of people with disabilities graduated from higher education while 9.48% were non-disabled. The attitude of the academic community towards people with disabilities, a discriminatory academic culture, and the low pedagogical competence of lecturers in accommodating Students with Special Needs (MBK) are the main obstacles in the successful implementation of inclusive education in higher education.

Higher education is one of the most important institutions in educational development in Indonesia. Its birth and development cannot be separated from the needs and ideals of national development. Higher education is organized as a systematic unit with an open and multifaceted system. It builds the process of fostering and empowering higher education constituents creatively and effectively and respecting the existence of pluralism in society. One of them is the existence of students with special needs in higher education (Nursanjaya, 2019).

In 2017, UNESCO declared that quality higher education must strive to promote a culture of inclusion. To be able to do this, it is important to appreciate and respect the diversity of needs, learning experiences, and needs of each student as an individual in order to hopefully create an inclusive learning environment (Riswari et al., 2022). The reality is that there are still many people who have difficulty participating in learning activities and this is in accordance with the research results of Mujiono et al (2018). University of Malang as a higher education institution currently offers learning opportunities for students with special needs. Since the opening of the Special Education Department, every new academic year Malang State University accepts students with special needs. Several problems arise when teachers in inclusive classes have students with special needs. Teachers do not feel prepared to develop lessons that meet their specific needs. Accessibility is difficult to define and achieve because it is a subjective variable for students with special needs. This requires an environment and learning materials that suit the characteristics of students with special needs.

Apart from that, research conducted by Ningtyas et. al (2021) at the Muhammadiyah University of Jember also revealed that college semester learning plans tend to be too general without referring to the conditions of students with special skills. Specific needs and appropriate updating of learning resources are still inadequate (Ningtyas et al., 2021). This is also in line with research by Azimi et al. (2020) who also explained that at Lambung Mangkurat University (ULM), students with special needs always experience difficulties in planning and studying. These problems arise in the form of semester learning plans that have not been revised and the inadequate availability of learning materials (Azimi et al., 2020).

One solution to overcome the problem of diversity in student characteristics in an inclusive classroom is to apply the principles of Universal Design for Learning. This UDL approach gives teachers the freedom to adjust the curriculum, adjust the way of learning and delivering the material, also assess students in any way possible. UDL was initially developed in architecture and product design. It was then expanded to education (Alqarni, 2022). One of the principles that animates UDL is that the curriculum must be created to include certain alternatives so that the curriculum is accessible and suitable for students with different backgrounds, various learning styles, abilities, and those with special needs (Rosmi & Jauhari, 2023). UDL takes advantage of technological developments to accommodate learner differences. According to Edyburn in Basham, Gardner & Smith (2020), UDL has three principles, namely, *multiple means of engagement*, namely providing various ways of involvement to support learning, *multiple means of representation*, namely providing various representative means, *multiple means of action and expression*, namely providing various ways of showing understanding.

The research conducted by Dalton, McKenzie, & Kahonde (2012) entitled Inclusion, Universal Design and Universal Design for Learning in Higher Education: South Africa and the United States discusses the implementation of UDL-based interventions in higher education in South Africa and America. Therefore, researchers will conduct a literature study regarding UDL for students with special needs so that teachers can know and design appropriate learning methods in the learning process. This research focuses on the three principles of UDL in Higher Education as well as the obstacles and solutions. Data obtained from several journal articles spanning the years 2018-2023. Based on the background that has been described, researchers are interested in conducting a literature study regarding the application of UDL in higher education.

Methodology

The type of research used in this research is Literary Study research or Library Research. According to Zed in Melfianora & Si (2019), in library research, library research is

not only the first step in preparing a research framework (research design), but also utilizes several library sources. These library sources were used to obtain research data. The data in this research is in the form of previous research reports published in journals. This research uses national or international journal articles with publication years in the last 5 years (2017-2023). Overall, there were 14 journal articles studied that were relevant to the research topic. Among the 14 journal articles obtained, there were 10 journal articles indexed by Scopus. The data collection process was carried out by filtering based on inclusive criteria determined by the author. Inclusive criteria are general characteristics of the literature to be used. Some of the inclusion criteria used in this study include:

- a. International or national journal with publication year in the last 5 years;
- b. Journals are preferred to be indexed by Scopus;
- c. Journals contain the same keywords as the research topic;
- d. Journals are full papers and are not limited to certain research methods;
- e. Journals contain information or data that is appropriate to the research focus.

Results and Discussion

Table 1 Data Analysis Results

No	Author's name	Publication Year	Research Title	Research result
1	Beny Hari Firmansyah	2017	The Influence of Universal Design for Learning (UDL) based on Social Learning Networks (SLN) on STKIP PGRI Situbondo Student Learning Outcomes	Universal Design for Learning (UDL) learning based on Social Learning Networks (SLN) influences student learning outcomes in curriculum review courses by looking at the comparison results between the experimental group and the control group. The UDL principles contained in this research are the principles of various means of action and expression, the use of various methods. The principle of various means of involvement, various methods of learning involvement such as group discussions. The principle of multiple means of representation provides for a wide variety of teaching methods. The obstacles experienced by universities are a lack of awareness, resources, time and technological tools so that this becomes inefficient and affects student learning outcomes. The solution to these problems is by being determined/committed, asking for support, engaging in professional development such as training,
2	Rachmita Maun Harahap, Iman Santosa, Widjaja Martokusumo	2019	The Influence of Universal Design and Usability on Public Facilities in Higher Education for Persons with Disabilities	Every public space is obliged to provide a universal design for all users, including people with disabilities, because everyone has the same rights, including the principle of means of representation, namely the use of public facilities to gain physical access as needed. Obstacles: wheelchair users and the deaf found that Universitas Muhammadiyah Banjarmasin was not yet accessible and usable because several facilities and buildings were inaccessible or difficult to access. Solution: Providing a universal design for all users including people with disabilities
3	Yoga Dwi Windy, Kusuma Ningtyas, Fitri Amilia, Nur Kamilah	2020	Universal Design Model Innovation for Special Needs Learning in Higher Education	The UDL-based learning provided to students is by applying the Universal Design-based Elearning (DUE) learning model. This learning model gives students the freedom to create a comfortable learning environment. In addition, the principles of the UDL approach will be combined with cooperative learning models.
4	Fina Riswari, Neny Yuniarti, Ediyanto and Asep Sunandar	2022	The Implementation of an Inclusive Learning Environment as a Form of Inclusive Education in Higher Education	Implementation of an inclusive learning environment as a form of inclusive education in higher education can be achieved by creating a comfortable learning environment by providing a learning environment that is acceptable to all groups, both students with disabilities and those without disabilities by applying the concept of universal

5	Jennifer Renée Kilpatrick, Suzanne Ehrlich, & Michelle Bartlett	2021	Learning from COVID-19: Universal Design for Learning Implementation Prior to and During a Pandemic	design. The application of learning is based on 3 UDL principles, namely, the principle of various means of action and expression, the use of various methods. The principle of various means of involvement, various methods of learning involvement such as group discussions. The principle of various means of representation, providing a wide variety of teaching methods. The obstacles experienced by universities are lack of awareness, resources, time and technological tools. The solution to these problems is by being determined/committed, asking for support, engaging in professional development such as training.
6	Lynne Murphy, Heather Panczykowski, Lindsey Fleury & Brooke Sudano	2020	Implementation of Universal Design for Learning in Occupational Therapy Education	Applying learning based on 3 UDL principles, namely, the principle of various means of action and expression, students are offered several method choices. The principle of multiple means of engagement provides feedback to students. The principle of multiple means of representation, providing a wide variety of teaching methods such as lectures, lab experiences, picture showing, etc., emphasizes the need for more comprehensive preparation for teaching and continuous professional development in the implementation of UDL. The obstacle experienced by universities is a lack of understanding of UDL. The proposed solution is the development of resources regarding UDL to address awareness and instructional use
7	Beth Oyarzun, Bryndle L. Bottoms, & Carl Westine	2021	Adopting and Applying the Universal Design for Learning Principles in Online Courses	The learning application is based on 3 UDL principles, namely the principle of various means of action and expression which allows students to present as many ideas as possible. Diverse interaction principles, using group chat to interact. Diverse interaction principles, using group chat to interact. Multimedia principles of expression and assessment of students' ability levels to determine the most appropriate learning method. The obstacles faced by universities are a lack of education and pedagogical training for professors, as well as a lack of time or motivation to explore resources. The solution to these obstacles lies in the actions of universities to encourage teachers to motivate the implementation of UDL.
8	Jennifer Renée Kilpatrick, Suzanne Ehrlich, & Michelle Bartlett	2021	Learning from COVID-19: Universal Design for Learning Implementation Prior to and During a Pandemic	The application of learning is based on 3 UDL principles, namely, the principle of various means of action and expression, the use of various methods. The principle of various means of involvement, various methods of learning involvement such as group discussions. The principle of various means of representation, providing a wide variety of teaching methods. The obstacles experienced by universities are lack of awareness, resources, time and technological tools. The solution to these problems is by being determined/committed, asking for support, engaging in professional development such as training
9	A. Sholanke, A. Adeboye, O. Alagbe, U. Ugah	2018	Universal Design for Learning: Assessment of Teaching Methods in Covenant University, Ota, Ogun State, Nigeria	The implementation of learning is based on 3 UDL principles, namely the principle of various means of action and expression, the use of seminars and assignments to assess student knowledge, the use of question and answer techniques during the teaching of a subject. The principle of various means of involvement by applying three methods, namely lectures, seminars and assignments. Principles of various means of representation, namely the use of electronic boards, uploading lecture material to the module platform. University lecturers generally must be sufficiently trained to understand and appreciate the principles of UDL and how to apply them to benefit all students at all levels. Finally, lecturers should also be encouraged to use

10	Peter Fenrich, Tim Carson & Mark Overgaard	2018	Comparing Traditional Learning Materials with Those Created with Instructional Design and Universal Design for Learning Attributes: The Students' Perspective	different techniques to teach the same course. Providing teaching materials based on UDL is more effective. An example is PowerPoint teaching materials which are designed to make things easier for all parties, both in terms of font size and background color. Additionally, it also provides more detailed learning videos.
11	Yuwono, Imam., Kusumastuti, Dewi E., Suherman, Yuyus., Zainudin., Dhafiya, Farah., Rahmatika, Puteri.	2023	Development of learning applications for students with special needs using Universal Design for Learning	UDL-based applications help the learning process of students with special needs at the tertiary level. In this research, they used the ADDIE development model which consists of 5 stages, namely, analysis, design, development, implementation and evaluation. This research has used several principles from UDL itself, namely the principle of representation and the principle of involvement. As a result, the application created allows students with special needs to explore learning content that has been adapted for students with special needs and helps them understand the learning content.
12	Dalton, Elizabeth M., et all	2019	Inclusion, universal design and universal design for learning in higher education: South Africa and the United States	There are challenges and responsibilities that must be met in implementing inclusion, universal design or UDL itself for students with special needs at the tertiary level. The role of UD and UDL to strengthen the successful inclusion of people with different needs in higher education programs is presented from the literature, including national and international policies and resources. Examples are from higher education in South Africa and the United States of online discussions regarding accessibility, environmental issues, professional development, barriers to inclusion and recommendations for future development in international contexts that provide a vision for developing inclusive learning environments in higher education. Thus, the research that has been carried out has used the principles of UDL itself, namely representation, action & expression and involvement.
13	Fovet, Frederic	2020	Universal Design for Learning as a Tool for Inclusion in the College Classroom: Implementation tips for the Next Decade	This research aims to analyze UDL as a tool that can create conditions of inclusion in learning in higher education classes and analyze what principles must be fulfilled to implement UDL in the learning process. There are three principles in UDL itself, namely the principles of representation, action & expression and engagement. Therefore, this study has also explained that the principles that must be fulfilled in UDL to be effective are divided into three, namely the principle of representation, the principle of action & expression and the principle of involvement.

Implementation of Universal Design for Learning (UDL)

The application of Universal Design for Learning (UDL) in international universities is based on 3 principles, namely, the principle of representation, the principle of action and expression, and the principle of involvement.

Principle of Representation

Based on the 14 journal articles that have been analyzed, 12 journal articles show that there is an application of the principle of representation in learning in higher education. The Representation Principle recommends providing information in a variety of formats. For example, school textbooks should mostly consist of pictures. However, providing text, audio, video, and live learning aims to give all students the opportunity to access the material in a way that best suits their learning style. According to Mayer et al in Dalimunthe, Dewi &

Faadhil (2020). The principle of meaningful representation provides various means of delivering material to students to obtain, process, and integrate information and knowledge. The use of media in delivering material can encourage students to further explore content in various formats, such as delivery using graphics, video, audio, text, and images, photos and e-books which can overcome the problem of differences in the delivery of material. The learning styles of each student and teacher also provide various types and methods of learning to make it easier for students to understand learning, such as face-to-face learning, online learning, teaching through lecture methods, discussions, exercises, physical activities, and the use of articles. This is also adjusted, whether it is suitable for each student's learning style (visual, auditory or kinesthetic). This allows teachers to create documents in a variety of electronic formats (HTML, RTF, PDF, etc.) so that course material is accessible to a variety of learning needs and styles.

The most important thing that needs to be explained is that performance is a process that cannot be separated from learning. Teachers apply this principle of expression through the transmission of sound, writing, images, and body movements. For example, from the explanation of the article discussed previously, the teacher provides learning materials such as PPT software, WEB CT, and Moodle. This is one of the advantages of educational accessibility.

Principles of Action and Expression

Based on the 14 journal articles that have been analyzed, 12 journal articles show the application of the principles of various actions and expressions in learning in higher education. The principle of action and expression supports students' freedom of expression and work in carrying out academic assignments and final assessments. Freedom of expression to convey knowledge or opinions according to students' learning styles. According to Guan (2021), the difference in ways of acting and expressing refers to how to evaluate student learning outcomes. This principle is related to the ability to express the knowledge obtained by students. This is consistent with this view which requires teachers to give students the freedom to choose the expression of the skills and knowledge they acquire. Students can use various means to demonstrate their knowledge, through physical, software, oral, and written activities, developing their own final assignment by adapting individual learning styles, creating or revising their own rubrics, as well as by presenting their work on paper or electronically.

Thus, the principles of action and expression are options for expressing one's understanding using various methods that suit each learning style, whether visual, auditory, or kinesthetic. In Novianti's (2021) view, various ways of acting and demonstrating to support strategic learning can be done by providing opportunities for students to demonstrate their understanding in various ways, for example through tests and art, multimedia presentations, and digital recordings. UDL encourages lecturers to provide students with a variety of options to demonstrate understanding and engage in activities that match their strengths and abilities. UDL ensures that students can effectively demonstrate their knowledge and skills in a meaningful and relevant way to them.

Principles of Engagement

Based on the 14 journal articles that have been analyzed, 14 journal articles show the application of the principles of multiple involvement in learning in higher education. This principle emphasizes a positive learning environment in the classroom which must be created by the teacher by involving all students in learning. This means that the most important aspect of this principle is active participation between teachers and students and their engagement with each other so that communication takes place and learning also takes place smoothly. All

students are directly involved in the learning process so that this atmosphere creates enthusiasm and motivation for learning. This direct participation can involve students in group work activities and individual work, not just individual work. However, providing choices does not mean changing expectations of how students will be active and it really helps train them (Rosmi & Jauhari, 2023). All students are directly involved in the learning process, thereby creating enthusiasm and motivation in learning. This direct participation can take the form of group discussions that can involve students visually, aurally, and kinesthetically. In addition, to encourage student involvement, teachers and universities can provide learning aids or learning materials that use digital technology, such as clickers and Mind taps. With this application, teachers and students can interact remotely. The university also pays attention to creating a comfortable learning environment as well as providing feedback from teachers through blog posts, emails, and after-class discussions, including the application of learning principles and participation rules.

Thus, this principle of involvement can be applied using digital-based learning materials. For example, in higher education information systems that can be accessed online through this technology, students can interact with teachers remotely. Apart from that, students can also access learning materials, and practice in various formats provided by the teacher. Through the use of this technology, students' levels of motivation and learning engagement can be increased. According to Dariyadi (2018), the use of learning media in the classroom helps teachers foster students' interest in learning because using learning media easily stimulates reflection so that students become better. In addition, learning media has the ability to provide students with a clearer picture of the material being studied.

Barriers to Implementing Universal Design for Learning (UDL) Principles in Higher Education and Solutions

Based on the overall analysis results, the obstacle faced by universities in implementing UDL is that the number of students in one class is too large so that this situation makes it difficult for teachers to implement UDL innovations. Teachers will return to traditional teaching options such as written assignments or tests due to the large number of students participating in assessments. Apart from large-scale classroom learning, another obstacle is the lack of teacher knowledge, education, and teaching training regarding the implementation of UDL principles. One other inhibiting factor in implementing UDL principles is the lack of preparation from universities to equip teachers with procedural knowledge regarding the application of UDL principles. Lecturers' knowledge, attitudes, and readiness also can be obstacles to implementing UDL. Professional development will be a key component for teachers to implement UDL.

There are several solutions to overcome obstacles to implementing UDL principles. The universities can promote new ideas or important reminders via email or seminars, can offer incentives to faculty interested in learning and applying UDL principles, such as waiving courses or paying extra to increase motivation, conducting training for teachers to use design methods universal in teaching, creating mentoring programs and workshops, collaborating with other faculties to share knowledge about UDL applications, collaborating with colleagues, and collaborating with learning designers, as well as participating in communication groups.

Social media and professional organizations are solutions to increase awareness and the knowledge of professors in providing services to students with disabilities through UDL-based learning. Thus, UDL training can increase knowledge and teaching effectiveness. Additionally, UDL training is beneficial for employment. This training can be applied to teaching and learning activities at the university level. This can help teachers work better. This is in line with the views of Malinen, Savolainen, and Xu (Dalimunthe et al., 2020) who

say that training is an action that can increase teacher knowledge, skills, and effectiveness. Christopher (2020) also argues that any level of professional development or training can have a positive impact on teachers' teaching practices to increase their understanding of the UDL framework and enhance their abilities so that instructors will use UDL in course design. This is proven by research by Hsiao et al (2019) that teachers who have received training through professional development or other specific programs in sensitive areas, disabilities, special education law, and especially universal learning design (UDL) show increased understanding, open-mindedness, and flexibility in teaching.

Conclusion

Based on the results of the article analysis, the application of UDL in higher education is carried out through the application of three UDL principles, namely: the principle of involvement, the principle of action and expression, and the principle of representation. However, there are obstacles/obstacles in implementing UDL in higher education in terms of interest, motivation, lack of awareness and knowledge, facilities, and infrastructure. The recommended solution is to train lecturers to use universal design methods in teaching; create mentoring and workshop programs, collaborate with other universities to share information about UDL applications, collaborate with colleagues, collaborate with learning designers, and participate in social groups.

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