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ORIGINAL

Universal design for learning to improve students' social interaction in elementary school teacher education

Diseño universal del aprendizaje para mejorar la interacción social de los estudiantes en la formación docente de la escuela primaria

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ABSTRACT

Introduction: the increasing diversity of learners in educational settings necessitates the adoption of inclusive teaching strategies. Universal Design for Learning (UDL) offers a framework to enhance student engagement and participation, particularly in higher education.
Objectives: this study aims to evaluate the effectiveness of UDL strategies in fostering social interaction and adaptation to learning among Elementary School Teacher Education students.
Method: a mixed-methods approach was employed, combining observational data and qualitative interviews. Observations were conducted in lectures to assess student engagement levels, while interviews provided insights into individual experiences with UDL implementation.
Results: the findings revealed that 70 % of students actively engaged in social interactions during lectures, with 60 % of participants reporting challenges in UDL implementation. Documentation rates indicated that 70 % of social interactions were recorded, highlighting a strong emphasis on capturing student engagement. However, 10 % of students faced barriers to participation, suggesting the need for tailored support.
Conclusion: the study underscores the effectiveness of UDL in promoting an interactive learning environment, while also identifying areas for improvement. Ongoing professional development and resource allocation are essential to address the challenges faced by both students and educators in implementing UDL principles. This research contributes to the growing body of literature advocating for inclusive educational practices that cater to diverse learner needs.

Keywords: Higher Education; Learning Strategy; Social Interaction; Universal Learning Design.

RESUMEN

Introducción: la creciente diversidad de estudiantes en los entornos educativos requiere la adopción de estrategias de enseñanza inclusivas. El Diseño Universal para el Aprendizaje (DUA) ofrece un marco para mejorar la participación y el compromiso de los estudiantes, en particular en la educación superior.
Objetivo: este estudio tiene como objetivo evaluar la eficacia de las estrategias del DUA para fomentar la interacción social y la adaptación al aprendizaje entre los estudiantes de Formación Docente de la Escuela Primaria.
Método: se empleó un enfoque de métodos mixtos, combinando datos de observación y entrevistas cualitativas. Se realizaron observaciones en las clases para evaluar los niveles de participación de los estudiantes, mientras que las entrevistas proporcionaron información sobre las experiencias individuales con la implementación del DUA.
Resultados: los hallazgos revelaron que el 70 % de los estudiantes participaron activamente en interacciones sociales durante las clases, y el 60 % de los participantes informaron desafíos en la implementación del DUA.

Las tasas de documentación indicaron que el 70 % de las interacciones sociales se registraron, lo que destaca un fuerte énfasis en capturar la participación de los estudiantes. Sin embargo, el 10 % de los estudiantes enfrentaron barreras para la participación, lo que sugiere la necesidad de un apoyo personalizado. **Conclusión**: el estudio subraya la eficacia del DUA para promover un entorno de aprendizaje interactivo, al tiempo que identifica áreas de mejora. El desarrollo profesional continuo y la asignación de recursos son esenciales para abordar los desafíos que enfrentan tanto los estudiantes como los educadores en la implementación de los principios del UDL. Esta investigación contribuye al creciente corpus de literatura que aboga por prácticas educativas inclusivas que atiendan las diversas necesidades de los estudiantes

Palabras clave: Educación Superior; Estrategia de Aprendizaje; Interacción Social; Diseño de Aprendizaje Universal.

INTRODUCTION

Universal Design for Learning (UDL) is an educational approach that prioritizes adaptability in instructional methods and is designed to accommodate a variety of needs,[1,2] learning styles, and student backgrounds. The authors of this article together present the use of UDL to readers consisting of therapists, teachers, lecturers, and educational practitioners, as well as publish knowledge in general.[3,4] Griful-Freixenet, Struyven, and Vantieghem (2021) suggest that the UDL Model operates on the premise that student diversity is a natural and anticipated aspect of learning(5). Consequently, educators take proactive steps to foster student engagement, and motivate students to access, participate in, and design learning projects.[6,7]

The urgency of implementing UDL is greatly needed amidst global demands for more inclusive and adaptive education.[8,9] The widespread adoption of online education [10,11,12] presents unique challenges, particularly for individuals with disabilities, this emphasizes the importance of inclusivity. The aim is to incorporate digital-age learning while providing them with the knowledge and skills necessary to navigate the digital environment safely and efficiently.[13,14]

The role of UDL is critical to enhancing students' social interactions, a critical aspect of building academic competencies and life skills in the 21st century.[15,16] The results of the study indicate that from the student's perspective, the educational methods used in both teaching and learning environments differ in their potential to support social interactions in Elementary School Teacher Education Students. Social interactions resulting from gamification can influence their relationship with learning outcomes. Collaboration and competition are essential in this context. This paper emphasizes that collaborative learning enhances students' social interaction skills, which are essential for academic competence and life skills in the 21st century.

Implementing UDL creates an inclusive and adaptive educational environment where every student, without exception, can fully access and participate in the learning process. This study contributes to the growing literature that considers the potential impact of universal design on student experiences.[17,18] UDL promotes inclusivity by addressing the varied needs of diverse students, ensuring full access and participation in the educational process for all students, regardless of ability.[19,20] UDL aims to create inclusive learning environments using technology, with a focus on Representation in second-level education, with potential for further research on Engagement, Action, and expresion.[21,22]

This study aims to explore the effectiveness of UDL as an approach that can improve social interaction in the lecture process. UDL enhances social interactions for students with intellectual disabilities, as evidenced in the literature, promoting inclusive education and skill development.[23] Further research is needed to explore these barriers and optimize the potential of UDL in diverse classrooms.

The role of UDL in higher education, particularly for PGSD students, has not been explored in terms of its impact on enhancing social interactions. Integrating digital technologies, such as Virtual Learning Environments (VLE), can facilitate social interactions. However, findings suggest that reliance on social media can hinder the efficiency of achieving educational goals.[24]

METHOD

Type of Research

This study employs a qualitative research design, specifically utilizing a case study approach to gain in-depth insights into the implementation of Universal Design for Learning (UDL) in educational settings.[25]

Place and Date of Implementation

The research was conducted at Semarang State University, Indonesia, from January to March 2023.

Population and Sample

The target population comprised 60 students enrolled in the Elementary School Teacher Education program

(PGSD). Inclusion criteria included students actively participating in UDL-based courses, while exclusion criteria involved students who had not engaged with UDL methodologies. A stratified random sampling technique was employed to ensure representation across different demographics, including gender and age, resulting in a sample that accurately reflects the broader student population.[26]

Study Variables

The primary variables examined in this study included student engagement, social interaction, and the effectiveness of UDL strategies in enhancing collaborative learning.

Data Collection Methods and Instruments

Data were collected through three main methods: classroom observations, semi-structured individual interviews, and document analysis.[27,28] Observation sheets were utilized to record engagement levels, while interview guides facilitated in-depth discussions with participants.[29,30]

Statistical Techniques and Procedures

Thematic analysis was employed to analyze qualitative data, Statistical methods are not used directly in qualitative data analysis with thematic analysis methods. Thematic analysis focuses more on identifying, coding, and grouping themes that emerge in qualitative data, such as interviews or group discussions, based on contextual understanding. However, only using descriptive statistics to enrich qualitative data analysis.[31,32]

Ethical Parameters

Ethical approval was obtained from the university's research ethics committee. Informed consent was secured from all participants, ensuring confidentiality and the right to withdraw from the study at any time without repercussions.[33]

RESULTS

Social Interactions

Table 1. Social Interaction Engagement Indicators

Aspects	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4
Collaboration	Actively participate in group work	Occasional participation in groups	Prefer individual work, but pitch in when needed	Always engages in collaborative tasks
Social Activities	Engages in extracurricular activities	Attends seminars and social events occasionally	Rarely participates in social events	Frequently organizes study groups and events
Social Feedback	Provides feedback regularly in discussions	Occasionally gives feedback but Prefers written assignments	Prefers to give feedback privately	Regularly engages in peer feedback and discussions
Use of Technology	Utilizes online tools like Google Meet for group work	Uses social media platforms for academic discussions	Primarily relies on in-person meetings, but open to technology	Actively uses learning management systems and video conferencing

The qualitative insights from table 1 reveal varying levels of student engagement in collaborative activities. Notably, the responses indicate a spectrum of participation, with some students actively engaging in group work while others prefer individual tasks. This variability underscores the importance of tailoring collaborative opportunities to accommodate different learning preferences. The presence of students who frequently organize study groups suggests that peer-led initiatives can enhance social interaction, promoting a sense of community and shared learning experiences.

Table 2. Interview Results Related to Social Interaction

Aspects	Strongly Involved (%)	Moderately Involved (%)	SlightlyInvolved (%)	Not Involved (%)
Collaboration	40 %	35 %	15 %	10 %
Social Activities	30 %	25 %	25 %	20 %
Social Feedback	45 %	30 %	15 %	10 %
Use of Technology	50 %	30 %	15 %	5 %

Table 2 quantifies the levels of involvement in various social interaction aspects, including collaboration, social activities, social feedback, and the use of technology. The data indicates that 40 % of respondents are strongly involved in collaboration, which is a positive indicator of the effectiveness of UDL in promoting teamwork. However, the 10 % of students who reported not being involved in collaboration highlights a need for targeted interventions to engage these individuals. The high percentage (50 %) of students utilizing technology for group work further emphasizes the role of digital tools in facilitating social interactions, particularly in an increasingly online educational landscape.

Table 3. Student Interaction Observation Results

Aspects	High Involvement (%)	Moderate Involvement (%)	Low Involvement (%)	No Involvement (%)
Social Interaction in Lectures	50 %	30 %	15 %	5 %
Adaptation to Learning	45 %	35 %	15 %	5 %
Challenges in UDL Implementation	60 %	25 %	10 %	5 %

The observational data in table 3 corroborates the interview findings, revealing that 70 % of students are actively engaged in social interactions during lectures. This high level of engagement suggests that UDL strategies are effectively fostering an interactive learning environment. However, the 10 % of students who are not involved in social interactions during lectures indicate potential barriers that may need to be addressed, such as anxiety or lack of confidence in participating. The challenges identified in UDL implementation, with 60 % of students and lecturers facing obstacles, further highlight the necessity for ongoing professional development and resource allocation to enhance understanding and application of UDL principles.

Table 4. Documentation results

Aspects	Documented Evidence (%)	Supporting Documents (%)	Lack of Documentation (%)
Social Interactionin Lectures	70 %	20 %	10 %
Adaptation to Learning	65 %	25 %	10 %
Challenges in UDL Implementation	60 %	30 %	10 %

Table 4 highlights the extent of documented evidence regarding social interactions in lectures, adaptation to learning, and challenges in UDL implementation. The data indicates that 70 % of the observed social interactions during lectures were documented, suggesting a strong emphasis on capturing student engagement in real time. This high level of documentation is crucial for understanding the dynamics of classroom interactions and provides a foundation for assessing the effectiveness of UDL strategies. Additionally, the 65 % documentation rate for adaptation to learning indicates that a majority of students are successfully adjusting to the learning methods employed, which is a positive outcome of UDL implementation. However, the 10 % of students struggling to adapt point to the necessity for tailored support mechanisms to assist those who may require additional resources or guidance.

Table 5. Results of relationships between variables

Aspects	Results of Analysis
Social Interaction Engagement in Lectures	Based on the analysis, around 70 % of students are actively involved in social interactions during lectures. They participate in group discussions, teamwork, and communication in online forums. However, 10 % of students are not involved in social interactions, so additional efforts are needed from lecturers to increase participation.
Learning Adaptation	As many as 65 % of students can adapt to learning methods, especially online learning. They can use technology such as LMS to learn. However, 10 % of students struggle to adapt, requiring technology training or special assistance.
UDL Implementation Challenges	Around 60 % of students and lecturers face challenges in implementing UDL, such as limited resources and a lack of understanding of UDL concepts. These challenges indicate the need for curriculum adjustments and increased capacity of lecturers to implement UDL effectively.

Table 5 delves into the relationships between social interaction engagement in lectures, learning adaptation, and challenges in UDL implementation. The analysis reveals that approximately 70 % of students are actively involved in social interactions during lectures, which correlates positively with their ability to adapt to learning methods (65 %). This suggests that increased social engagement may enhance students' adaptability, creating a synergistic effect that benefits overall learning outcomes. However, the 60 % of students and lecturers facing challenges in UDL implementation indicates that despite high engagement levels, significant barriers still exist. These challenges may stem from limited resources, insufficient understanding of UDL principles, or a lack of training in inclusive teaching practices.

DISCUSSION

Social Interaction Indicators

Collaboration skills emphasize the process of knowledge sharing and knowledge integration, as well as the quality of knowledge sharing and integration using reflective practice analysis and interpretive analysis.[34] Thirty of respondents are highly engaged in social activities, but 25 % are only moderately engaged, and 25 % are slightly engaged, indicating that social activities are not as intensive as collaboration. 20 % of respondents are not engaged, indicating that some groups do not participate in social activities. Engagement in academic activities plays a crucial role in determining the overall success of students in higher education institutions.[35]

Giving and receiving social feedback is very popular, with 45 % of respondents highly engaged and 30 % moderately engaged. 15 % are somewhat engaged, while 10 % are not engaged, indicating a need for stronger social communication. Individuals do not simply evaluate the range of viewpoints accessible to them based on the social responses they receive when expressing an opinion in a given social situation. Instead, they internalize the anticipated and therefore valued opinion to the point where it becomes their personal opinion.[36,37] Fifty of respondents were highly engaged in technology, indicating that technology plays an important role. 30 % were moderately engaged, while 15 % were slightly engaged. Only 5 % of respondents were not engaged in technology use, indicating that most participants were active. Teachers need to be aware of the potential of digital technology in everyday practice and guidelines for developing their skills when using technology for teaching and learning.[38,39]

Documentation Results

Fifty percent of students were highly engaged in social interaction during lectures, indicating that half of the students actively participated in discussions or collaboration with classmates. 30 % were moderately engaged, indicating good engagement but not as active as the first group. 15 % were only slightly engaged, perhaps because they felt uncomfortable or limited in social interaction. 5 % were not engaged at all, indicating that a handful of students did not participate in social interaction during lectures. It is important to note that students are happier and more motivated when learning from a happy instructor than a bored instructor.[40]

Forty five percent of students were highly engaged in adapting to learning, reflecting their ability to adapt to the methods and materials provided. 35 % were moderately engaged, meaning that most students were able to adapt, although perhaps with some challenges. 15 % were only slightly engaged, indicating that some students had difficulty adjusting to changes or learning demands. 5 % were disengaged, indicating that a small group of students were not adapting well. Dynamic Distribution Adaptation (DDA) is a new concept that may address the problem of transfer learning.[41,42]

Sixty percent of respondents indicated high engagement in addressing challenges in implementing Universal Design for Learning (UDL), reflecting that the majority felt there were significant barriers to implementing this approach. 25 % were moderately engaged in addressing these challenges, indicating that they faced barriers but not as severe as those with high engagement. 10 % experienced only slight challenges, indicating that they were able to navigate the implementation of UDL easily. 5 % did not face any barriers, indicating that a small portion felt that implementing UDL did not pose significant problems. Several interrelated challenges hinder UDL, the instructional design investigated in the extant literature, overlap among some checkpoints and guidelines, and lack of theoretical guidance regarding the design and implementation process.[43]

These data show that most students are actively involved in social interactions and learning adaptation. However, the majority of students feel some challenges in implementing UDL. Some groups of students still need more support in learning adaptation. The implementation of UDL can significantly improve social interaction skills in Elementary School Teacher Education (PGSD) students. UDL is an educational approach designed to provide equal access to learning for all students, considering their varied needs, interests, and capabilities. In the context of higher education, especially for PGSD students, the implementation of UDL allows them to interact more actively, both with fellow students and lecturers.

UDL creates an inclusive learning environment where each student can participate in the learning process in a way that best suits their learning style. This can increase social interaction, as students are encouraged to collaborate, discuss, and share understanding through various media and adapted methods.[44] In addition, UDL

encourages the use of various resources and strategies to facilitate learning, which can strengthen students' social interactions. By using various ways to access, process, and present information, PGSD students can develop deeper literacy skills in reading, writing, and critical thinking. Although the UDL concept has been widely applied in elementary and secondary schools, its application in higher education, especially in PGSD programs, has rarely been studied in depth.

The implementation of UDL in higher education, especially in the Elementary School Teacher Education Study Program (PGSD), is still not optimal. Several factors that cause this include:

Although UDL emphasizes the importance of using a variety of teaching methods that are adapted to the diversity of student learning styles, its implementation in higher education is still limited. Many teachers still tend to use traditional methods that are less flexible, such as one-way lectures, without considering the differences in visual, auditory, and kinesthetic learning styles that students have. This makes it difficult for students with different learning styles to understand the material optimally.

Students with special needs, such as sensory or cognitive disabilities, often do not have adequate access to inclusive learning resources. For example, learning materials are not always provided in formats that are accessible to all students, such as alternative text for images, audio transcriptions, or videos with subtitles. These limitations prevent students with special needs from fully participating in the learning process and can create gaps in academic achievement. One of the principles of UDL is to foster an inclusive learning environment that enables all students, regardless of their abilities or backgrounds, to engage and interact effectively. However, social interaction among students is not optimal in many colleges. Differences in social background, culture, or ability often create barriers to student communication and collaboration. In addition, classrooms or learning settings are not always designed to encourage more intense student collaboration and interaction.

Many university teachers do not fully understand the concept of UDL and how to implement it effectively in lecture activities. This limited understanding causes the implementation of UDL in PGSD to be uneven and tends to be sporadic. As a result, not all students benefit from this approach, especially those with special learning needs. Thus, to optimize the implementation of UDL in higher education, especially in PGSD, there needs to be an effort to expand teachers' understanding of more inclusive teaching methods, provide more accessible learning resources, and create an environment that supports social interaction between students. This will ensure that all students, including those with special needs, can learn effectively and have equal access to education.

UDL encourages active participation and collaboration between students. Students are more likely to engage in discussions, share ideas, and work together by providing a variety of ways of action and expression. This collaborative environment enhances social interaction skills, such as communication, empathy, and teamwork. Based on the research results, there are several significant findings related to student engagement in various aspects of learning and the challenges faced in implementing UDL. In general, most students showed high engagement in social interactions during lectures, learning adaptation, and literacy skill development.[21]

However, challenges in implementing UDL are still significant issues, especially related to accessibility, variety of teaching methods, and inclusive learning environments. The researcher will then take the following steps:

The researcher will design and implement more varied and adaptive teaching methods to address the needs of students with diverse learning styles. This will involve the use of educational technology and the integration of learning media that support inclusivity. The researcher will work with institutions to provide more learning resources that are accessible to all students, including students with special needs. This includes providing materials in various formats (text, audio, video, etc.) that are in accordance with UDL principles. The researcher will focus on increasing more effective social interactions in the lecture environment, especially by encouraging collaboration and cooperation between students from various backgrounds. This will involve designing classrooms that support active communication and participation. Ongoing Evaluation of UDL Implementation: Researchers will also continue to evaluate the effectiveness of UDL implementation through further research. This step aims to identify new challenges that may arise and adopt a more inclusive and sustainable approach to education.

CONCLUSIONS

This study has explored the implementation of Universal Design for Learning (UDL) and its impact on enhancing social interaction among learners in university. The findings indicate that UDL strategies significantly contribute to increased student engagement in collaborative activities, social interactions, and the efficient utilization of technology. The data reveal that a substantial majority of learners actively participate in social interactions during lectures and adapt well to diverse learning methods, highlighting the positive outcomes of UDL in fostering an inclusive educational environment. However, the research also identifies notable challenges in the implementation of UDL, including barriers related to accessibility, resource limitations, and varying

levels of understanding among educators. These challenges underscore the necessity for ongoing professional development and support for faculty to ensure that UDL principles are effectively integrated into teaching practices.In conclusion, while the study demonstrates the potential of UDL to enhance social interaction and engagement among students, it also emphasizes the need for targeted interventions to address the barriers faced by some learners. Future research should focus on developing comprehensive strategies to optimize UDL implementation, ensuring that all students, regardless of their backgrounds or capabilities, can fully contribute to and benefit from the educational process. By fostering an inclusive learning environment, we can promote not only academic success but also the development of essential social skills that are vital for students' future endeavors.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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