

## **Analysis of Student Learning Experiences in Sign Language Learning through a Deep Learning Approach Based on the Case-Based Learning Model**

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**Abstract:** Students in special education programs often face challenges in mastering sign language due to limited access to interactive and contextual learning experiences. Therefore, this study aimed to explore the implementation of sign language learning by integrating the Deep Learning approach, which emphasizes mindful, meaningful, and joyful learning, with the Case-Based Learning (CBL) model to provide a more holistic learning experience. Using a descriptive research design with a qualitative approach supported by quantitative data, the study involved 51 students who had completed a sign language course and one instructor from the Special Education Study Program. Data were collected through observation, semi-structured interviews, and a student survey consisting of 30 Likert-scale items representing the three dimensions of Deep Learning. The results revealed that the integration of Deep Learning and CBL fostered active student participation, reflective awareness, and contextual understanding, with high mean scores across the three dimensions: mindful (4.43), meaningful (4.54), and joyful (4.51). Qualitative findings further showed that students not only developed technical sign language competence but also enhanced their empathy, reflective thinking, and appreciation of communication within inclusive contexts. These results indicate that the combination of Deep Learning and CBL effectively supports the development of both cognitive and affective aspects of learning. The study contributes to the design of inclusive education curricula by emphasizing reflective, experiential, and socially grounded learning strategies that can better prepare future special education teachers.

**Keywords:** Deep Learning Approach; Case-Based Learning Model; Sign Language Learning; Special Education; Students.

### **INTRODUCTION**

Learning is an interactive process that involves students, educators, and learning resources within a structured educational environment. Through this process, individuals acquire not only knowledge and skills but also develop values, attitudes, and a sense of meaning from their learning experiences (Archambault et al., 2022; Munna & Kalam, 2021; Nan Cenka et al., 2023). Therefore, learning should not be limited to academic achievement but should also foster reflective awareness and contextual understanding, enabling learners to engage in lifelong and meaningful learning (Harefa, 2023; Kryshtanovych et al., 2021). In the context of special education, sign language learning plays a vital role in supporting the communication, language, and cognitive development of students who are deaf or hard of hearing (Marlina et al., 2022; Oktaviani, 2022; Susetyo et al., 2025). Sign language functions not only as a linguistic system of visual symbols (Farooq et al., 2021; Zhou et al., 2021). but also as a representation of Deaf culture and identity. Therefore, pre-service special education teachers need to master sign language not merely as a technical skill but as an empathetic and reflective form of inclusive communication that respects the linguistic rights of deaf learners.

However, initial observations of the Sign Language course in the Special Education Study Program at Universitas Pendidikan Indonesia revealed several learning challenges. The learning process tended to emphasize memorization of sign forms rather than understanding their contextual meaning. Many students struggled to express ideas or engage in spontaneous conversations using sign language. Learning activities were mostly lecture-

based with limited opportunities for interaction, reflection, and contextual practice. According to interviews with the course instructor, limited instructional time and a dense curriculum led to a focus on technical aspects instead of reflective and meaningful learning experiences. This situation demonstrates a gap between the intended goals of sign language learning as a communicative and empathetic process and its current implementation, which remains largely technical and informative.

To address these challenges, a learning approach that promotes active participation, reflection, and meaningful engagement is necessary. The Deep Learning approach provides a relevant pedagogical framework by emphasizing three key principles: mindful learning, meaningful learning, and joyful learning (Mariana & Hula, 2024; Putri et al., 2024). Mindful learning encourages awareness of cognitive and emotional processes. Meaningful learning focuses on connecting new knowledge with prior experience to strengthen understanding and retention. Joyful learning fosters a positive and intrinsically motivated learning atmosphere. When applied to sign language instruction, these principles can help students not only master linguistic aspects but also develop empathy, social sensitivity, and authentic communication skills.

The Case-Based Learning (CBL) model can further support the implementation of Deep Learning by presenting real-life communication cases that encourage students to analyze, discuss, and reflect collaboratively (Hidayati & Wisudariani, 2023; Mariana & Hula, 2024; Muaffiani et al., 2022). This model connects theory and practice through problem-solving activities that develop students' critical and reflective thinking. The integration of Deep Learning and CBL provides opportunities to create a more interactive and experiential learning environment that aligns with the competencies required of future special education teachers.

Previous studies have demonstrated the benefits of these approaches when applied independently. Deep Learning has been found to enhance conceptual understanding and student engagement (Jing & Swaran, 2024), while Case-Based Learning has proven effective in improving critical thinking and problem-solving skills (Krupat et al., 2016; Muaffiani et al., 2022). However, research integrating these two approaches specifically in sign language learning for pre-service special education teachers remains limited. Existing studies have largely focused on areas such as science, technology, and health education, while the pedagogical application of these approaches to enhance sign communication and teaching readiness in special education contexts has received little attention.

Based on this research gap, the present study aims to explore the implementation of sign language learning that integrates the Deep Learning approach and the CBL model in the Special Education Study Program at Universitas Pendidikan Indonesia. This study describes how sign language instruction is planned, implemented, and evaluated by the instructor and analyzes students' responses to the learning process based on the three principles of Deep Learning: mindful, meaningful, and joyful learning. Accordingly, the research question guiding this study is "How is sign language learning implemented through the integration of the Deep Learning approach and the CBL model, and how do students respond to this learning experience in the Special Education Study Program at Universitas Pendidikan Indonesia?".

## **METHOD**

This study employed a descriptive research method using a qualitative approach supported by quantitative data. The purpose of this research was to provide a comprehensive understanding of how sign language learning was implemented through the integration of the Deep Learning approach and the Case-Based Learning model, as well as to analyze students' responses to their learning experiences. The qualitative component focused on exploring the planning, implementation, and evaluation of the learning process conducted by the course instructor, while the quantitative component was used to support and strengthen the qualitative findings by identifying general patterns in students' perceptions of their learning experiences.

The participants in this study consisted of one instructor and 51 students from the Special Education Study Program at Universitas Pendidikan Indonesia who had completed the Sign Language course during one semester. Participants were selected using purposive sampling based on two criteria: students who attended at least 80 percent of class meetings and were actively involved in case-based learning activities. All students who met these criteria were included as a saturated sample due to the limited population size.

Data were collected through three techniques, namely observation, semi-structured interviews, and student surveys. Observations were conducted during the learning process to examine how the instructor implemented the principles of Deep Learning and the Case-Based Learning model, with particular attention to lesson planning, classroom interaction, and assessment strategies. Semi-structured interviews were conducted with the course instructor to obtain detailed information about the planning, implementation, and evaluation of sign language instruction that applied the Deep Learning approach and the Case-Based Learning model. The interview guide was structured around the three core principles of Deep Learning, namely mindful learning, meaningful learning, and joyful learning, to capture how these were reflected in classroom practices. Quantitative data were gathered through a Likert-scale questionnaire ranging from 1 to 5, consisting of 30 statements representing the three dimensions of Deep Learning. The survey was administered at the end of the semester to capture students' perceptions and experiences of the sign language learning process.

The qualitative data from observations and interviews were analyzed using thematic analysis, involving data reduction, coding, theme categorization, and interpretation to provide a holistic understanding of the instructional process. Quantitative data were analyzed using descriptive statistics to calculate the mean scores and percentage trends across the mindful, meaningful, and joyful learning dimensions. The two sets of data were integrated descriptively to construct a comprehensive representation of the learning implementation and student responses.

To ensure the validity and reliability of the data, this study employed source and method triangulation by comparing information obtained from observations, interviews, and surveys. The content validity of the questionnaire was reviewed through expert judgment by two lecturers specializing in inclusive education and instructional design. To minimize potential self-report bias, the survey was conducted anonymously, and participants were informed that their responses would be used solely for academic purposes. The integration of qualitative and quantitative evidence strengthened the credibility of the findings and provided a balanced interpretation of the results. Figure 1 presents the procedural flow of the study, which consists of four main stages: preparation, data collection, data analysis, and integration and reporting, as follows.

The research procedure consisted of the following stages:



**Figure 1. Research Flow**

The research procedure consisted of the following stages:

1. Preparation Stage. Identification of the research focus, development of interview and observation guidelines, and construction of the student survey instrument.
2. Data Collection Stage. Implementation of classroom observations, interviews with the instructor, and administration of the student survey.
3. Data Analysis Stage. Thematic analysis of qualitative data and descriptive statistical analysis of quantitative data.
4. Integration and Reporting Stage. Synthesis of both qualitative and quantitative results to provide a comprehensive description of the implementation of sign language learning and students' learning experiences.

## **FINDING AND DISCUSSION**

### **Finding(s)**

This section presents the findings of the study based on data obtained through classroom observations, instructor interviews, and student surveys. The results are organized to illustrate two main focuses of the research: first, the implementation of sign language learning that integrates the Deep Learning approach and the CBL model; and second, students' responses to this learning experience viewed through the three dimensions of Deep Learning, namely mindful, meaningful, and joyful learning. The qualitative findings from observations and interviews provide a contextual understanding of how the teaching and learning process was carried out, while the quantitative data support these insights by highlighting students' overall learning experiences and perceptions.

### ***1. Implementation of Sign Language Learning with a Deep Learning Approach and Case-Based Learning Model***

Based on observations and interviews with lecturers, sign language learning in the Special Education Study Program at the Indonesia University of Education is designed by integrating the principles of Deep Learning and the Case-Based Learning (CBL) model. The learning process consists of three main stages, namely planning, implementation, and evaluation.

In the planning stage, lecturers develop a learning plan by considering the relationship between learning objectives, materials, and the context of sign language use in real communication. Lecturers design case studies in the form of authentic communication situations relevant to the lives of deaf children, such as interactions at school, social activities, and learning situations in the classroom. This approach aims to ensure that

students not only understand the form of sign language but are also able to place it in the context of meaning and communication objectives.

The implementation stage of learning shows the lecturer's efforts to create an active and reflective learning atmosphere. Students are encouraged to participate through case simulations, group discussions, and sign language practice activities that require analysis and reflection on the messages conveyed. Lecturers act as facilitators who guide students' critical and reflective thinking processes. Based on the results of observations, two-way interaction between lecturers and students increased significantly compared to conventional lecture methods. Students appeared to be more involved in understanding the meaning of each sign and showed a higher interest in mastering its contextual use.

At the evaluation stage, lecturers assess students through a combination of formative and summative assessments, covering mastery of sign language linguistic concepts, the ability to translate visual messages, and reflective skills in identifying the meaning and value of empathic communication. The interview results show that the evaluation is not only focused on the final results, but also on the learning process that demonstrates student awareness and active participation.

Although the application of the Deep Learning and CBL approaches showed a positive impact on student engagement, there were still several obstacles. Limited learning time meant that some students did not have sufficient opportunity for intensive practice. In addition, students' ability to interpret the social context of signs varied, especially among early-level students who were not yet accustomed to visual forms of communication.

## ***2. Students' Responses to Sign Language Learning through the Integration of the Deep Learning Approach and Case-Based Learning Model***

Student responses reflect how they interpret and perceive the experience of learning sign language integrated with the Deep Learning approach and the Case-Based Learning (CBL) model. The data were obtained from a survey administered to 51 students using a Likert scale (1 to 5), which aimed to capture the overall tendency of students' learning experiences rather than to measure effectiveness. The instrument consisted of 30 statements representing the three core dimensions of Deep Learning, namely mindful, meaningful, and joyful learning, with 10 indicators for each dimension. The data are presented in the form of mean scores and their corresponding interpretive categories, providing a descriptive overview of students' learning experiences throughout the course.

The mindful learning aspect describes the level of student awareness in following the learning process, including the ability to focus, reflect, and understand the flow of learning activities. The overall average score for this aspect was 4.43, which indicates a high tendency for reflective engagement among students. Table 1 contains a summary of the survey results on mindful aspects based on 10 question indicators. The summary results are shown in Table 1 below.

**Table 1. Summary of Survey Results on Student Learning Experiences in Sign Language Courses Based on The Mindful Aspects**

No	Statement Indicator	Average Score
1	Comfortable learning from real-life cases	4.57
2	Focus on imitating movements from videos	4.55
3	Understand the context of sign language communication	4.45
4	Understanding the learning stages in the learning strategy applied	4.43
5	Sorting important information from sign language videos	4.39
6	Following the systematic steps of CBL	4.37
7	Re-explaining simple experiences using sign language	4.41
8	Conducting self-reflection	4.37
9	Connecting learning experiences	4.45
10	Confident in sign language after learning through the applied learning strategies	4.29
<b>Average of all mindful aspect</b>		<b>4.43</b>

Most students showed full awareness of the learning process, especially when learning began with real cases relevant to their daily experiences. The indicator with the highest score, namely "comfort in learning from real cases" ( $\bar{x} = 4.57$ ), showed that an authentic learning context encouraged students to focus more and understand the meaning of each sign they learned. Students are also able to sort important information from video media and relate it to their previous learning experiences.

However, the analysis results show that there is still room for improvement in the aspect of self-reflection. Indicators such as "reflecting on oneself after practicing sign language" and "understanding the learning stages with the CBL strategy" scored slightly below the overall average ( $\bar{x} = 4.37$  and  $\bar{x} = 4.43$ , respectively). This shows that some students are not yet fully accustomed to reflecting deeply on their learning experiences or understanding the learning structure systematically.

The meaningful learning aspect emphasizes students' ability to relate new knowledge to personal and professional experiences and values. This aspect received the highest average score, namely 4.54, indicating a very positive trend towards meaningful understanding. Table 2 contains a summary of the survey results on the meaningful aspect based on 10 question indicators. The summary results are shown in Table 2 below.

**Table 2. Summary of Survey Results on Student Learning Experiences in Sign Language Courses Based on The Meaningful Aspect**

No	Statement Indicator	Average Score
1	Sign language proficiency is important for teaching deaf children	4.5
2	CBL is relevant for understanding sign language communication in daily life	4.51
3	The material is relevant to the role of prospective teachers.	4.57
4	Improves readiness to deal with real-life situations when interacting with deaf children	4.49
5	Gaining new insights into sign language	4.57
6	Sign language can be applied in real-world practice	4.41
7	Learning is beneficial in the long term.	4.61
8	Recognizing the social value of sign language proficiency	4.53
9	More sensitive to the needs of deaf children	4.55
10	Understanding the need to communicate with deaf children through real-life cases.	4.53
<b>Average of all the meaningful aspect</b>		<b>4.54</b>

Students acknowledge that sign language learning not only improves linguistic knowledge but is also relevant to their role as prospective special education teachers. Indicators such as "material relevant to the role as a prospective teacher" ( $\bar{x} = 4.57$ ) and "improving readiness to deal with real cases" ( $\bar{x} = 4.49$ ) show that case-based learning helps students understand the real application of sign language in a professional context.

Students also showed awareness of the social and empathetic value of learning. High scores on the indicators "aware of the social value of sign language proficiency" ( $\bar{x} = 4.53$ ) and "more sensitive to the needs of deaf children" ( $\bar{x} = 4.55$ ) indicate that this learning experience is not only cognitive but also develops social sensitivity.

However, there are still areas for development in students' ability to apply their learning outside the classroom. The indicator "application of sign language in real practice" received a slightly lower score ( $\bar{x} = 4.41$ ), indicating that students still need more opportunities to practice sign language skills in authentic situations. This emphasizes the need to integrate project-based learning or field practice- s so that the meaning gained does not stop at conceptual understanding but can also be realized in an applicable manner.

The joyful learning aspect describes the affective dimension of students in learning, including feelings of pleasure, motivation, and comfort during the learning process. The average score for this aspect reached 4.51, indicating a high tendency toward a positive learning atmosphere. Table 3 contains a summary of the survey results on the joyful aspect based on 10 question indicators. The summary results are shown in Table 3 below.

**Table 3. Summary of Survey Results on Student Learning Experiences in Sign Language Courses Based on The Joyful Aspect**

No	Statement Indicator	Average Score
1	Enjoyed learning with the strategies applied	4.47
2	Enjoyed activities in group work	4.35
3	Enthusiasm for learning sign language through the learning strategies applied	4.45
4	Appreciated in sign language practice	4.55
5	Proud to have completed the assignments in this course	4.51
6	Challenged to practice sign language more extensively	4.55
7	Enthusiastic about practicing sign language based on real-life cases	4.53
8	The classroom atmosphere supports the spirit of learning.	4.51
9	Happy to see personal progress in sign language.	4.63
10	Motivated to be more actively involved in the education of deaf children	4.57
<b>Average of all joyful aspect</b>		<b>4.51</b>

Students reported that they felt enthusiastic and comfortable in participating in the learning process. The indicator with the highest score was "happy to see personal development in sign language" ( $\bar{x} = 4.63$ ), which indicates a sense of pride and personal satisfaction with the achievements made. This indicates that Deep Learning approach and CBL model successfully fostered students' intrinsic motivation and self-confidence.

In addition, indicators such as "feeling appreciated in sign language practice" ( $\bar{x} = 4.55$ ) and "motivated to be more active in the education of deaf children" ( $\bar{x} = 4.57$ ) show that an inclusive and supportive classroom atmosphere also plays a role in creating an enjoyable learning experience.

However, the indicator "enjoying group work in solving cases" received a relatively lower score ( $\bar{x} = 4.35$ ). This indicates challenges in group dynamics, such as an imbalance in role distribution or differences in participation levels among members. Therefore, group facilitation strategies need to be strengthened through constructive feedback, fair role distribution, and the creation of activities that are both challenging and enjoyable.

Overall, the three dimensions of Deep Learning showed consistently positive results with an overall average above 4.4. Although most students showed a good learning experience, the variation in scores between indicators indicates that self-reflection and involvement in real-world practice still need to be improved. These findings provide a strong basis for further discussion on how the Deep Learning approach and CBL model can be optimized in the context of sign language learning in special education.

### **Discussion(s)**

The results of this study indicate that the application of a Deep Learning approach integrated with a CBL model in sign language learning in the Special Education Study Program at the Indonesia University of Education has succeeded in creating a reflective, meaningful, and enjoyable learning process. Based on the results of interviews with lecturers and classroom observations, the learning process was systematically designed to foster students' reflective awareness of their learning process. The learning began with the presentation of real cases taken from the context of deaf children's communication in the school environment, followed by group discussions to identify problems and formulate solutions using sign language. Lecturers acted as facilitators who provided guidance, motivated active participation, and directed students to reflect on their learning experiences.

From the observation results, it can be seen that case-based learning is able to increase students' awareness of the importance of inclusive and empathetic communication. Students not only learn sign language as a technical skill, but also understand its meaning as a tool for building social relationships with deaf students. This shows that the principle of mindful learning is realized through the full involvement of students in the learning process, which requires awareness of each stage of the activity. These findings are in line with the principle of mindfulness in the Deep Learning approach, which emphasizes full awareness of the learning process, where students not only passively receive information but also realize what they are learning, observe their own thought processes, and engage reflectively (Azila-Gbettor et al., 2022; Edwards-Smith, 2022; Feriyanto & Anjariyah, 2024; Fitriani & Santiani, 2025; Lewittes & Morris, 2021; Moghadam et al., 2022; Putri et al., 2024). In this context, students demonstrated the ability to identify the difficulties they experienced during sign language practice and consciously attempted to improve them in the next session.

In addition, qualitative findings show that CBL-based learning also strengthens the dimension of meaningful learning. Students feel that the cases provided by lecturers are very relevant to the working world of prospective special education teachers. They understand that the ability to communicate through sign language is not only academically important but also a form of professional empathy. These findings are in line with the concept of meaningful learning, which emphasizes the importance of connecting new knowledge with the real experiences of learners (Bryce & Blown, 2024; Vargas-Hernández & Vargas-González, 2022). Furthermore, in line with Transformative Learning theory, learning experiences that are emotionally and socially relevant can change an individual's way of thinking and broaden their perspective on inclusive education (Javed, 2023). In this context, sign language learning not only develops communication skills but also changes students' perspectives on the diversity of children's abilities.

The results of the student survey support these qualitative findings. The average scores for mindful learning (4.43), meaningful learning (4.54), and joyful learning (4.51) indicate that students responded positively to their overall learning experience. Further analysis reveals interesting variations between indicators. 's high scores on indicators related to pride in personal development and enthusiasm for learning show that this learning method has succeeded in fostering intrinsic motivation. Meanwhile, relatively lower scores on indicators of self-reflection after practice and application of learning outcomes in real contexts indicate that students' reflective processes still need to be strengthened. This shows a difference in the level of depth of involvement between the affective and cognitive aspects, which shows that even though students had positive experiences, not all of them achieved deep reflection on their learning processes.

From an affective perspective, Deep Learning and CBL-based learning are also capable of creating a fun and collaborative learning atmosphere. Students enjoy interacting in simulation activities, role-playing, and group discussions. The results of observations show that the classroom atmosphere has become more interactive and communicative compared to conventional learning. This is in line with the view that positive emotions can expand students' thinking capacity and build psychological resources such as perseverance, flexibility of thinking, and the ability to collaborate (Golestanibakht et al., 2022; Hailikari et al., 2022; Suldo et al., 2021). However, the dynamics of interaction within groups still show variation. Some students tend to be more active in discussions, while others are more passive, so collaborative facilitation strategies need to be continuously developed to ensure that each individual obtains an equal learning experience.

Overall, this discussion shows that the integration of Deep Learning and CBL is not only effective in building reflective awareness and meaning of learning but also strengthens students' emotional dimensions towards the sign language learning process. The collaboration of these two approaches allows students to learn holistically: to think deeply, empathize with the social context of learning, and enjoy an interactive learning process. Thus, the results of this study contribute to the development of a learning model that is not only oriented towards cognitive outcomes but also emphasizes a balance between reflective awareness, social relevance, and meaningful affective experiences for prospective special education teachers.

## **CONCLUSION**

This study provides an empirical overview of the implementation of sign language learning that integrates the Deep Learning approach with the Case-Based Learning (CBL) model in the Special Education Study Program. The findings indicate that the combination of these two approaches fosters a participatory, reflective, and contextual learning experience for students. Through this integration, students not only acquire technical skills in sign language but also develop empathy, reflective awareness, and a deeper understanding of the communication context of deaf children.

Overall, the survey results show that the three dimensions of Deep Learning, namely mindful, meaningful, and joyful learning, received high average scores of 4.43, 4.54, and 4.51 respectively. These findings suggest that students hold a positive perception of case-based sign language learning, which allows for active engagement, reflective awareness, and enjoyable learning experiences. This indicates that the integration of Deep Learning and CBL has the potential to strengthen students' critical thinking, social sensitivity, and intrinsic motivation as prospective special education teachers.

However, this study has several limitations. The quantitative data relied on students' self-reports, which may introduce perceptual bias. In addition, this research did not include inferential analyses or group comparisons, as the primary focus was descriptive and exploratory. Therefore, the findings emphasize an empirical portrayal of the learning process and students' learning experiences rather than a causal test of effectiveness.

For future practice, it is recommended that reflective activities such as learning journals, group discussions, and self-observation be further reinforced in the learning process. Moreover, providing more opportunities for practical experience is essential to help students apply their sign language skills in real-life contexts. Future research is encouraged to involve a larger and more diverse group of participants as well as additional data sources, such as instructor or peer observations, to obtain a more comprehensive and accurate understanding of the learning process.

## REFERENCES

- Alam, A. (2022). Mapping a sustainable future through conceptualization of transformative learning framework, education for sustainable development, critical reflection, and responsible citizenship: an exploration of pedagogies for twenty-first century learning. *ECS Transactions*, 107(1), 9827. <https://iopscience.iop.org/article/10.1149/10701.9827ecst/meta>
- Archambault, L., Leary, H., & Rice, K. (2022). Pillars of online pedagogy: A framework for teaching in online learning environments. *Educational Psychologist*, 57(3), 178–191. <https://doi.org/10.1080/00461520.2022.2051513>
- Azila-Gbettor, E. M., Mensah, C., Atatsi, E. A., & Abiemo, M. K. (2022). Predicting students' engagement from hope and mindfulness. *Journal of Applied Research in Higher Education*, 14(4), 1355–1370. <https://doi.org/10.1108/JARHE-02-2021-0068>
- Bryce, T. G. K., & Blown, E. J. (2024). Ausubel's meaningful learning revisited. *Current Psychology*, 43(5), 4579–4598. <https://doi.org/10.1007/s12144-023-04440-4>
- Cranton, P. (2023). Understanding and promoting transformative learning: A guide to theory and practice. *Routledge*. <https://doi.org/10.4324/9781003448433>
- Edwards-Smith, A. (2022). Embracing mindfulness to facilitate active learning. *100 Ideas for Active Learning*. <https://openpress.sussex.ac.uk/ideasforactivelearning/chapter/embracing-mindfulness-to-facilitate-active-learning/>
- Farooq, U., Rahim, M. S. M., Sabir, N., Hussain, A., & Abid, A. (2021). Advances in machine translation for sign language: approaches, limitations, and challenges. *Neural Computing and Applications*, 33(21), 14357–14399. <https://doi.org/10.1007/s00521-021-06079-3>
- Feriyanto, F., & Anjariyah, D. (2024). Deep learning approach through meaningful, mindful, and joyful learning: a library research. *Electronic Journal of Education, Social Economics and Technology*, 5(2), 208–212. <https://doi.org/10.33122/ejeset.v5i2.321>
- Golestanibakht, T., Babaie, E., & Mostaed Hesari, S. (2022). The effects of positive psychology training on wisdom, resilience, and cognitive flexibility of students. *Positive Psychology Research*, 8(2), 83–100. <https://doi.org/10.22108/ppls.2022.131504.2225>
- Hailikari, T., Nieminen, J., & Asikainen, H. (2022). The ability of psychological flexibility to predict study success and its relations to cognitive attributional strategies and academic emotions. *Educational Psychology*, 42(5), 626–643. <https://doi.org/10.1080/01443410.2022.2059652>
- Harefa, D. (2023). The relationship between students' interest in learning and mathematics learning outcomes. *Afore: Journal of Mathematics Education*, 2(2), 1–11. <https://doi.org/10.57094/afore.v2i2.1054>
- Hidayati, F. H., & Wisudariani, E. W. E. (2023). The effect of case-based learning in increasing students' creativity and thinking ability in vector control and rodent courses. *BIODIK*, 9(2), 180–190. [https://doi.org/10.2991/978-2-38476-110-4\\_102](https://doi.org/10.2991/978-2-38476-110-4_102)

- Huang, J. (2024). Exploring the Strategies of Civic Education in Higher Vocational Collages and Universities Based on Deep Learning. *Applied Mathematics & Nonlinear Sciences*, 9(1), 1–15. <https://doi.org/10.2478/amns-2024-1357>
- Javed, F. (2023). Transformative learning strategies for successful teaching and learning in the transforming higher education. In *Active and transformative learning in STEAM disciplines*. Emerald Publishing Limited, 125-152. <https://doi.org/10.1108/978-1-83753-618-420231007>
- Jing, C., & Swaran, K. (2024). Enhancing academic achievement in computer science students: An experimental study on the efficacy of deep learning teaching methods in higher vocational education. *International Journal of Education and Humanities*, 15(2), 121–130. <http://dx.doi.org/10.54097/17sxfz44>
- Krupat, E., Richards, J. B., Sullivan, A. M., Fleenor, T. J., & Schwartzstein, R. M. (2016). Assessing the effectiveness of case-based collaborative learning via randomized controlled trial. *Academic Medicine*, 91(5), 723–729. <https://doi.org/10.1097/ACM.0000000000001004>
- Kryshchanovych, S., Chubinska, N., Gavrysh, I., Khlitobina, O., & Shevchenko, Z. (2021). Philosophical and psychological approach to self-development of scientific and pedagogical workers. *Wisdom*, 4 (20), 139–147. <http://dx.doi.org/10.24234/wisdom.v20i4.560>
- Lewittes, H., & Morris, L. (2021). Intentional learning, mindfulness, and mindset. *The International Journal of Pedagogy and Curriculum*, 28(1), 37. <https://doi.org/10.18848/2327-7963/CGP/v28i01/37-55>
- Mariana, A., & Hula, I. R. N. (2024). Application of deep learning in foreign language learning for boarding students: meaningful, mindful, and joyful analysis. *Proceedings of Law, Education, and Socio-Economic Studies*, 1(1). <https://ejournal.iaingorontalo.ac.id/index.php/please/article/view/2607>
- Marlina, M., Ningsih, Y. T., Fikry, Z., & Fransiska, D. R. (2022). Helping girls with deafness victims of sexual harassment: REBT with Bisindo as a mental health education service in schools. *Journal of ICSAR*, 6(1), 30–36. <http://dx.doi.org/10.17977/um005v6i12022p030>
- Moghadam, H., Ghanizadeh, A., & Ghonsooly, B. (2022). The effect of mindfulness-cultivation intervention on EFL learners' reflective thinking, positive orientation, and language achievement. *Teaching English as a Second Language Quarterly. Formerly Journal of Teaching Language Skills*, 41(1), 69–101. <http://dx.doi.org/10.22099/TESL.2021.39016.2911>
- Muaffiani, A., Artayasa, I. P., & Merta, I. W. (2022). The effect of case-based learning on additive and addictive substances on students' critical thinking skills. *Journal of Classroom Action Research*, 4(3), 120–126.
- Munna, A. S., & Kalam, M. A. (2021). Teaching and learning process to enhance teaching effectiveness: a literature review. *International Journal of Humanities and Innovation (IJHI)*, 4(1), 1–4. <https://doi.org/10.33750/ijhi.v4i1.102>
- Nan Censka, B. A., Santoso, H. B., & Junus, K. (2023). Personal learning environment toward lifelong learning: an ontology-driven conceptual model. *Interactive Learning Environments*, 31(10), 6445–6461. <https://doi.org/10.1080/10494820.2022.2039947>
- Oktaviani, J. N. (2022). The use maru video tutorials to improve skills make dowry from paper money for children with hearing impairment. *Journal of ICSAR*, 6(2), 158–161. <http://dx.doi.org/10.17977/um005v6i22022p158>
- Putri, R., Syahnam, S., Kurnia, H., Indah, M., & Fierna, M. (2024). Penerapan Deep Learning dalam Pendidikan di Indonesia [The Application of Deep Learning in Education in Indonesia]. *Prosiding Seminar Nasional Pendidikan Pancasila Dan Kewarganegaraan*, 2(2022), 97–102. <https://openjournal.unpam.ac.id/index.php/gnp/article/view/46868>
- Santiani, S. (2025). Literature analysis: deep learning approach in education. *Jurnal Ilmiah Nusantara*, 2(3), 50–57. <https://www.ejurnal.kampusakademik.co.id/index.php/jinu/article/view/4357>
- Schnepp, J., Wolfe, R., Brionez, G., Baowidan, S., Johnson, R., & McDonald, J. (2020). Human-centered design for a sign language learning application. *ACM International Conference Proceeding Series*, 435–439. <https://doi.org/10.1145/3389189.3398007>

- Simbolon, D. H. (2022). The Effect of the Case-Based Learning (CBL) Model on Student Learning Outcomes. *BULLET: Multidisciplinary Science Journal*, 1(3), 181–184.
- Suldo, S. M., Mariano, J. M., & Gilfix, H. (2021). Promoting students' positive emotions, character, and purpose. *Fostering the Emotional Well-Being of Our Youth: A School-Based Approach*, 282–312. <https://psycnet.apa.org/record/2021-20304-014>
- Susetyo, B., Tarsidi, I., Siswaningsih, W., Rahmawati, A. A., Rahayu, N. S., & Hernawati, T. (2025). Implementation of pictorial test instruments to improve deaf students' sexual behavior knowledge through direct learning. *Journal of ICSAR*, 9(1), 52–66. <https://doi.org/10.17977/um005v9i12025p52-66>
- Vargas-Hernández, J. G., & Vargas-González, O. C. (2022). Strategies for meaningful learning. *JISTECH: Journal of Information Science and Technology*, 2(1), 47–64. <https://jurnal.unipa.ac.id/index.php/jri/article/view/41>
- Yolanda, Y., & Fauziah, A. (2024). Keterampilan pemecahan masalah, sharing task dan jumping task mahasiswa menggunakan case method dengan pendekatan deep learning [Problem-solving skills, task sharing, and task jumping of students using the case method with a deep learning approach]. *Silampari. Journal of Physics Education*, 6(2), 303–317. <https://doi.org/10.31540/sjpif.v6i2.3268>
- Zhou, H., Zhou, W., Zhou, Y., & Li, H. (2021). Spatial-temporal multi-cue network for sign language recognition and translation. *IEEE Transactions on Multimedia*, 24, 768–779. <https://ieeexplore.ieee.org/document/9354538/>