ELEMENTARY *Islamic Teacher Journal*
E-ISSN : 2503-0256 / ISSN : 2355-0155
Volume 13 Number 1 January - June 2025 (PP. 121-132)
http://dx.doi.org/10.21043/elementary.v13i1.31578
accessed at : http://journal.iainkudus.ac.id/index.php/elementary

Deep Learning Approach to Meaningful Learning at Primary Schools on IPAS Subjects

Fitria Martanti[1*], Maskur[2], Moch Fatkhurronji[3]
[1]Universitas Wahid Hasyim, Semarang, Indonesia, [2,3]Sekolah Tinggi Agama Islam Wali Sembilan, Semarang, Indonesia
**Corresponding author : fitriamartanti@unwahas.ac.id*

Abstract

Meaningful learning is one of the critical things in which teachers must realize in the learning process. Unfortunately, there are various challenges teachers face in realizing meaningful learning. One of the things teachers can do to develop meaningful learning is through deep learning approach. Studies on deep learning have been carried out a lot, but hose focusing on IPAS learning at elementary schools have not been carried out. This study aims to analyze the deep learning approach in developing meaningful learning on IPAS subjects and the implications of using deep learning in elementary school learning. This study used a qualitative approach with a case study design to see the implementation of deep learning on IPAS subjects. The informants comprised one classroom teacher, the school principal, and 24 students. Data were collected through interviews, observations, and documentation studies, with instruments in the form of interview guidelines, observation guides, and document recording formats. Data analysis was carried out through data reduction, display, and conclusion. The validity of the data was carried out through triangulation of sources, techniques and time. The study found three significant findings. First, the implementation of deep learning can develop the learning process to be more contextual. Second, contextual learning can be seen from the increasing ability of students to relating the learning into learning environment, solving problems in the real-world context, and building collaboration during the learning. Third, the implications of using deep learning on IPAS subject at elementary schools can increase students' activity and creativity.

Keywords: *Deep Learning, Meaningful Learning, Elementary School.*

INTRODUCTION

Meaningful learning is one of the learning processes that teachers must implement. However, teachers face various challenges when implementing meaningful learning (Tabuenca et al., 2021). The implementation of this meaningful learning can be done using a deep-learning approach (Swarnkar et al., 2023)(Abdel-Jaber et al., 2022). Teachers need to design deep learning to develop student involvement more optimally (Deshmukh et al., 2024)

Meaningful learning is one of the critical things that teachers must realise in the learning process. One of things teachers can do to develop meaningful learning is trough deep learning design. Studies on deep learning have been widely conducted, but they only focus on three study trends. First, deep learning is carried out by increasing active learning (Mystakidis et al., 2019). Second, the implications of deep learning in online learning for student engagement (Gupta, Kumar, and Tekchandani, 2023). Third, in-depth learning can impact various fields and influence academic achievement, research, and community relevance (Islam & Khan, 2024). However, studies have not examined the deep learning approach in developing IPAS learning at elementary schools.

Although various studies have addressed deep learning approaches in learning, most of them still focus on the context of higher education, online learning, or the increase in active learning and student engagement in general. These studies have not touched much in the realm of elementary schools, especially in the integration of deep learning approaches to support meaningful learning in science and science subjects (Natural and Social Sciences). In fact, strengthening meaningful learning at the elementary level is crucial to form the foundation of students' conceptual understanding from an early age. In addition, there has not been a study that specifically examines how teachers can design deep learning that is contextual and in accordance with the developmental characteristics of elementary school children. Therefore, there is still a need for research that examines the application of deep learning in depth in the development of meaningful learning-based science learning at the elementary school level, as an effort to bridge the current study gap.

This paper complements previous writings by implementing deep learning to improve meaningful learning on IPAS subject at elementary schools. In line with that, this study has the goal of (a) analysing deep learning approaches in developing meaningful learning in science subjects at elementary schools and (b) analysing the implications of using deep learning in elementary school learning. The benefits of this research are expected to provide a complete picture of deep learning approach in realising meaningful learning at elementary schools.

Deep learning is a learning concept prioritising meaningful understanding and critical analysis, not just memorisation (Gan et al., 2019). The in-depth approach allows students to connect existing knowledge with new knowledge to create a more complete understanding (Duan, 2022). Through an in-depth learning approach, students can apply their knowledge to real-world situations, develop problem-solving skills, and prepare for future challenges (Ding & Li, 2024).

Deep learning will conceptually create an adaptive learning experience and increase student engagement (Li, 2022). Deep learning will also increase students' independence in learning and motivate them to develop their abilities. Its main principle is providing an active learning experience integrated with technology, and its primary goal is developing high-level thinking skills. Deep learning also aims to facilitate knowledge transfer and provide a comprehensive evaluation system (Wei 2023, Smirani and Yamani 2024).

Meaningful learning is a process that focuses on the process rather than the learning outcomes. It encourages students to be actively involved in the learning process (Obonyo, 2023). Meaningful learning also allows students to apply their knowledge and prepares them to face the challenges that will arise. To implement this meaningful learning, teachers optimise each learning process to provide valuable experiences for students. Teachers must design and facilitate learning experiences using the existing learning environment (Mollo-Flores & Deroncele-Acosta, 2021).

In principle, meaningful learning allows learning assessment not only to be limited to learning outcomes but also to see the application and integration of the knowledge they already have (Poonputta, 2023). Meaningful learning allows the learning process to be designed with various student challenges. It can be achieved by creating a learning experience that links the material taught with real-world experiences, (Zeivots, Tyrrell, and Wardak 2024 (Polman et al., 2021).

Meaningful learning can be designed using simulations and exercises to assess the relevance of the knowledge acquired (Urquidi-Martín et al., 2019). This meaningful learning is part of the principle of deep understanding, one of the indicators that must be carried out. Deep learning will create meaningful learning with teachers' efforts to develop a challenging learning process for students.

Elementary school as a formal education system for young children focuses on simple fact recognition and basic skills (Jang, 2025). The curriculum for elementary schools is designed to provide students with provisions that support their overall development (Pei, 2019). Basic education can be organised through various teaching methods. So, it can meet the developmental stage of children. The learning experience can be done through direct activities, interactive learning, and educational technology to improve the quality of education (Zuliana, Retnowati, and Widjajanti 2019, Khramova et al. 2019)

Implementing learning in elementary school is essential because it helps shape students' character. This character can indeed be formed through habits that are carried

out continuously. Student character can be built through several activities designed by the teacher. Learning in primary schools must pay attention to child-friendly learning, safety, health, and comfort to support effective learning (Pada, Sakina, and Bobby Saragih, 2021). Based on the previous research, it can be concluded that learning at elementary school must provide a learning experience that forms character through various activities, and teachers must carry out this by paying attention to the students' meaningful learning.

METHODS

This study used a qualitative approach with a case study design which aims to obtain an overview of deep learning implementation that emphasises the principles of meaningful learning on Social Science Learning at Al Hikmah Elementary School. The case study design was chosen because it allows researchers to explore comprehensively and contextually the social realities experienced by the research subjects, especially related to educational practices and dynamics.

This research was carried out during three months, from December 2024 to March 2025. The research began with determining the location and research subject. There were 26 informants, in details: 1 classroom teacher, 1 school principal, and 24 students. Data collection techniques can be obtained through interviews, observations, and document studies to obtain complete research data. This research was carried out for three months, from December 2024 to March 2025. This qualitative research is considered the most relevant in obtaining a complete picture of implementing the deep learning approach. Data triangulation in this study uses triangulation, sources, techniques and time triangulation. According to Miles and Huberman, this study uses qualitative data analysis involving data reduction, display, and conclusion. This data analysis aims to answer research questions more validly

RESULTS AND DISCUSSION

The deep learning approach is one of the practical approaches to developing meaningful learning on science learning at elementary schools. This can be seen from the implementation of more contextual learning. By implementing a deep learning approach, teachers can create a more contextual learning process. At Al Hikmah Elementary School, this is confirmed at the interviews where the classroom teacher stated that learning is always associated with the environment around students.

Based on classroom observation, it also can be seen that teachers also provide

parental involvement by reinforcing the material taught. The deep learning is implemented on various topics including some environmental problems caused by human actions. The material discussed in the classroom is relevant to the student learning environment and can be implemented directly in students' lives. It means deep learning can be used to apply the knowledge and skills to solve environmental problems caused by human actions. In other words, the results of the study confirmed that deep learning that is carried out can improve contextual learning, as shown in the following table of profound learning results.

Table 2. Development of Contextual learning

No	Student learning experience	Description
1	Students associate learning with their learning environment	Students' learning experiences can be seen from students identifying several environmental problems due to human actions and finding solutions related to students' understanding of the material taught by the teacher
2	Students solve problems in the real world	The implementation of deep learning can provide an overview of the problems faced in daily life and identify the causes of the problem, so that it can provide solutions according to students' abilities.
3	Learning is carried out in collaboration	Solving several problems that occurred involved collaborating as a team. Students exchanged opinions on the issues identified.

Based on the contextual learning development table above, it can be seen that contextual learning experiences cover in three main ways: students relate learning to the learning environment, students can solve problems in the real world, and learning can be done collaboratively among students. First, students relate learning to the learning environment means students identify several environmental issues caused by human activities, including floods, landslides, air pollution, clean water crisis, and waste problems. Students identify some of these problems with the help of teachers as facilitators during the learning process.

Second, students solve problems in the real world means solutions regarding the environmental problems are also determined based on the previously identified problems. For example, the flood problems experienced by students were identified as caused by the absence of water infiltration and clogged garbage. The solution that students can provide according to their abilities is to dispose the waste in its place and

clean the drains around their home environment. The problem of landslides is caused by the large number of plants cut down for residential areas. The solution that can be proposed by the students is to plant trees around the home environment. The third problem is air pollution caused by motor vehicle smoke and garbage burning in the environment. The solution that students can implement is to recycle household waste which can be used as handicrafts or made into compost. The next problem is the clean water crisis caused by the overexploitation of water resources, household, and also factory waste pollution. The solution that can be provided is to increase water use and treat household wastewater using natural materials. Another problem identified is the problem of accumulating waste in the environment around students; this is because the public concern regarding waste management is still lacking, and the solution provided by the students is to recycle waste by processing waste into handicraft material and processing waste into compost.

Moreover, the results of interviews with MN teachers at Al-Hikmah Elementary School reinforced the researcher's observations. Applying the deep learning approach can make the learning becomes more contextual, and associate the material taught with the environment. As a result, students have more concrete in identifying problems in their environment and providing solutions according to their abilities.

Third, contextual learning development is carried out in collaboration means the deep learning approach optimises cooperation between students and teachers. High collaboration occurred is one of the indicators of successful deep learning implementation. Collaboration can be carried out by dividing students into several teams or group discussion. Students exchange opinions regarding the issues that have been identified. Two tendencies suggest that meaningful learning can increase students' activity, and deep learning can increase students' creativity. Based on the result, the findings show that students' activity has increased. It can be seen by some students are active in asking questions, expressing their opinions, and looking for reference sources to solve environmental problems. Some of the solutions provided by students are maintaining the cleanliness of the environment by cleaning the home and residential environment, providing garbage cans in several places so that people can dispose garbage to its place, recycling waste into several handicrafts and making compost that can be used as a plant fertiliser. Additionally, students' activity can also be seen in their willingness to plant trees around their houses.

The deep learning approach is one of the right approaches to increase student

creativity, as students generating new ideas, and producing diverse works. Based on the study's results, students' creativity in learning about various environmental problems caused by human actions can be seen in three tendencies. Students' creativity can be seen by their actions to solve environmental issues, such as producing creative ideas to make works from waste, and create posters to enhance public awareness and preserve the environment. This is also strengthened by the interview section with MN teachers who stated some students' creativity can be identified by students producing crafts such as bags, pencil holders, flower holders, plant pots, wall decorations, posters, and compost. This strengthens the idea that profound learning decentralisation can increase students' creativity. Thus, deep learning effectively realises meaningful learning at elementary school.

Teachers also learn deeply by identifying the subject material and its relationship with the student learning environment. Learning becomes more contextual because students can relate the material to their lives. Previous research has explained that contextual learning will provide authentic experiences for students (Currin et al., 2023). Teachers always connect their teaching material to students' real lives so students can relate the material to their lives. Contextual learning will help students relate their previous experiences to the material taught by the teacher. The learning experience is undoubtedly becoming increasingly developed according to students' learning needs (Reddy & Revathy, 2024).

The implication of using the deep learning approach is the increased student activity and creativity. The approach provides an opportunity to explore learning resources and make the learning environment more engaging (Gazawy et al., 2023). Meanwhile, other research results suggest that the deep learning approach will increase learning activity and effectiveness. (Lu, 2025).

Hands-on deep learning will increase students' activity in responding to the teacher's information (Zeegers & Elliott, 2019). The implementation of deep learning approach is determined by the interactive learning design carried out by teachers (Sølvik and Glenna, 2022). Contextual learning requires teachers to respond to students' needs and desires in learning (Korsager, Reitan, and Dahl,2023). Deep learning has effectively made learning more meaningful, allowing students to gain a more contextual learning experience (Saputra et al, 2024). Thus, students will be more motivated in the learning process.

The deep learning approach has been proven to increase student activity. An in-depth approach will develop more varied learning activities and increase students' active participation (HaitaoHao, Sbeih, and Shibly 2021). An in-depth learning approach that is successfully carried out will increase student innovation.(Liu et al., 2022). Deep learning approaches can also increase students' creativity. Learning will provide an experience that foster students' creativity, enhance their creative ideas, and improve their awareness of innovation (Cai et al., 2023)

CONCLUSION

The findings in this study show that the deep learning approach is one of the most effective approaches implemented at elementary schools. This study has three main conclusions. First, implementing deep learning can develop learning to be more contextual. Second, contextual learning can be seen from the increasing ability of students to relate the learning material to their environment; students can solve problems in the real world and increase collaboration in learning. Third, the implications of using deep learning on science subject at elementary schools can improve student activity and creativity.

This research provides scientific contributions by providing a concrete picture of the deep learning implementation at elementary schools, although teachers' understanding of deep learning is still limited. Thus, by all evidences elaborated here, this research highly recommends teachers to implement deep learning at elementary school level. This research has several limitations since this study only involved one private elementary school, and one classroom teacher. This limitation arises because based on preliminary studies, the number of teachers who have applied the deep learning approach in elementary schools is still very limited. Therefore, further research that includes public schools is needed to obtain a more comprehensive picture of the implementation of deep learning. Recommendations for further research include the development of studies at various levels of education taking into account different levels of teacher readiness. In addition, quantitative approaches as well as research and development (R&D) can also be used to produce a deeper and more systematic understanding of the application of deep learning in the learning process in elementary schools.

REFERENCES

Abdel-Jaber, H., Devassy, D., Al Salam, A., Hidaytallah, L., & EL-Amir, M. (2022). A Review of Deep Learning Algorithms and Their Applications in Healthcare. Algorithms,

15(2), 71. https://doi.org/10.3390/a15020071

Cai, Q., Zhang, X., & Xie, W. (2023). Art Teaching Innovation Based on Computer-Aided Design and Deep Learning Model. Computer-Aided Design and Applications, 124–139. https://doi.org/10.14733/cadaps.2024.S14.124-139

Chen, L. (2024). Integrating Deep Learning-Based Educational Technologies in Biotechnology Training: An Effectiveness Evaluation from a Hybrid Education Perspective. Journal of Commercial Biotechnology, Volume 29(3), Pages 416-426.

Currin, F. H., Diederich, K., Pantoja, L. S., Cargo, H., Franzone, N., Geiger-Lee, J., & Hourcade, J. P. (2023). Designing Stories to Inspire Preschoolers' Creative, Collaborative Roleplay. ACM International Conference Proceeding Series, 40–47. https://doi.org/10.1145/3582515.3609516

Deshmukh, N. K., Darak, M. S., Patil, S. S., Veerbhadra, S. S., Kashibarao, N. S., Sharadkumar, R. S., Kurhe, A. B., & Salve, V. P. (2024). Unveiling the Canvas: A Comprehensive Literature Review on Deep Learning Approaches for Assessing Student Engagement Through Observable Actions and Emotions in Classroom Settings (pp. 289–298). https://doi.org/10.1007/978-981-97-6678-9_26

Ding, Y., & Li, Y. (2024). A study of preschool integration of deep learning to optimise the content of personalised education for young children. Applied Mathematics and Nonlinear Sciences, 9(1). https://doi.org/10.2478/amns-2024-2432

Duan, Y. (2022). Mathematics Deep Learning Teaching Based on Analytic Hierarchy Process. Mathematical Problems in Engineering, 2022, 1–10. https://doi.org/-10.1155/2022/3070791

Gan, B., Deng, F., Zhang, C., & Li, J. (2019). Construction and Application of Information-Based Teaching Resources Sharing Platform Based on Deep Learning. 2019 4th International Conference on Mechanical, Control and Computer Engineering (ICMCCE), 634–6343. https://doi.org/10.1109/ICMCCE48743.2019.00147

Gazawy, Q., Buyrukoglu, S., & Akbas, A. (2023). Deep Learning for Enhanced Education Quality: Assessing Student Engagement and Emotional States. 2023 Innovations in Intelligent Systems and Applications Conference (ASYU), 1–8. https://doi.org/10.1109/ASYU58738.2023.10296748

Gupta, S., Kumar, P., & Tekchandani, R. K. (2023). Facial emotion recognition based real-time learner engagement detection system in online learning context using deep learning models. Multimedia Tools and Applications, 82(8), 11365–11394. https://doi.org/10.1007/s11042-022-13558-9

HaitaoHAO, Sbeih, A., & Shibly, F. H. A. (2021). WITHDRAWN: Physical education and its role in improving the health of college students by active participation and optimization by deep learning. Aggression and Violent Behavior, 101628. https://doi.org/10.1016/j.avb.2021.101628

Islam, Q., & Khan, S. M. F. A. (2024). Understanding deep learning across academic domains: A structural equation modeling approach with a partial least squares approach. International Journal of Innovative Research and Scientific Studies, 7(4), 1389–1407. https://doi.org/10.53894/ijirss.v7i4.3408

Jang, W. (2025). Children's Perceptions of Elementary School in South Korea Before and After Entering School. Early Childhood Education Journal, 53(3), 689–701. https://doi.org/10.1007/s10643-023-01625-1

Khramova, M. V., Bukina, T. V., Aleksandrova, N. A., & Kurkin, S. A. (2019). Research on

Developing Elementary School Students' Attention in Computer Science Lessons. 2019 International Conference "Quality Management, Transport and Information Security, Information Technologies" (IT&QM&IS), 515–518. https://doi.org/-10.1109/ITQMIS.2019.8928344

Li, Z. (2022). Network Intelligent Education System Based on the Deep Learning Algorithm. Security and Communication Networks, 2022, 1–7. https://doi.org/-10.1155/2022/5677089

Liu, Y., Chen, L., & Yao, Z. (2022). The application of artificial intelligence assistant to deep learning in teachers' teaching and students' learning processes. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.929175

Lu, J. (2025). Research on Interactive Teaching of College English Based on Deep Learning and Virtual Reality. International Journal of High-Speed Electronics and Systems. https://doi.org/10.1142/S0129156425402402

Mollo-Flores, M., & Deroncele-Acosta, A. (2021). Meaningful Learning: towards a Meta-regulated Learning model in Hybrid Education. 2021 XVI Latin American Conference on Learning Technologies (LACLO), 52–59. https://doi.org/-10.1109/LACLO54177.2021.00066

Mystakidis, S., Berki, E., & Valtanen, J. (2019). The Patras Blended Strategy Model for Deep and Meaningful Learning in Quality Life-Long Distance Education. Electronic Journal of E-Learning, 17(2). https://doi.org/10.34190/JEL.17.2.01

Obonyo, C. N. (2023). Digital Tools for Meaningful Learning of Preservice Teachers (pp. 36–54). https://doi.org/10.4018/978-1-6684-6339-0.ch003

Pada, D., Sakina, B., & Bobby Saragih, J. (2021). Implementation of Child-Friendly School Concept in Elementary School as Early Education Environment. IOP Conference Series: Earth and Environmental Science, 794(1), 012209. https://doi.org/-10.1088/1755-1315/794/1/012209

Pei, W. (2019). Curriculum Reform of Science in Elementary Schools in China. Beijing International Review of Education, 1(2–3), 573–578. https://doi.org/-10.1163/25902539-00102007

Polman, J., Hornstra, L., & Volman, M. (2021). The meaning of meaningful learning in mathematics in upper-primary education. Learning Environments Research, 24(3), 469–486. https://doi.org/10.1007/s10984-020-09337-8

Poonputta, A. (2023). The Impact of Project-Based and Experiential Learning Integration on Pre-Service Teacher Achievement in Evaluation and Assessment. International Journal of Learning, Teaching and Educational Research, 22(7), 356–370. https://doi.org/10.26803/ijlter.22.7.19

Reddy, P. J. K., & Revathy, K. (2024). Contextual Learning. In Digital Skill Development for Industry 4.0 (pp. 83–104). Auerbach Publications. https://doi.org/10.1201-/9781003504894-8

Saputra, Nisa Aulia, Hamidah, Ida, Setiawan, Agus, Riza, Lala Septem, Nandiyanto, Asep Bayu Dani, Rachman, Indriyani, Matsumoto, T. (2024). Deep Learning Applied In Education: Scoping Review. Journal of Engineering Science and Technology, Volume 19, Pages 93-106.

Smirani, L. K., & Yamani, H. A. (2024). Enhancing personalized learning with deep learning in Saudi Arabian universities. International Journal of ADVANCED AND APPLIED SCIENCES, 11(7), 166–175. https://doi.org/10.21833/ijaas.2024-

.07.018

Swarnkar, S. K., Bhushan, B., & Tran, T. A. (2023). Deep Learning Algorithms in Healthcare. Nova Science Publishers, Inc. https://www.scopus.com/record-/display.uri?eid=2-s2.0-85151207123&origin=scopusAI#metrics

Tabuenca, B., Serrano-Iglesias, S., Martin, A. C., Villa-Torrano, C., Dimitriadis, Y., I. Asensio-Perez, J., Alario-Hoyos, C., Gomez-Sanchez, E., L. Bote-Lorenzo, M., Martinez-Mones, A., & Kloos, C. D. (2021). Affordances and Core Functions of Smart Learning Environments: A Systematic Literature Review. IEEE Transactions on Learning Technologies, 14(2), 129–145. https://doi.org/10.-1109/TLT.2021.3067946

Urquidi-Martín, A., Tamarit-Aznar, C., & Sánchez-García, J. (2019). Determinants of the Effectiveness of Using Renewable Resource Management-Based Simulations in Developing Critical Thinking: An Application of the Experiential Learning Theory. Sustainability, 11(19), 5469. https://doi.org/10.3390/su11195469

Wang, C., Li, T., Wang, X., Liu, M., Kim, M., & Chen, R. (2024). Research on Integrating Deep Learning and Psychology in Intelligent Digital Education Technology. Proceedings of the 2024 Guangdong-Hong Kong-Macao Greater Bay Area International Conference on Education Digitalization and Computer Science, 177–180. https://doi.org/10.1145/3686424.3686455

Wei, L. (2023). Deep Learning in the Context of Big Data: The Theoretical Basis of Undergraduate Education Reform (pp. 376–384). https://doi.org/10.1007/978-3-031-23950-2_40

Zeegers, Y., & Elliott, K. (2019). Who's asking the questions in classrooms? Exploring teacher practice and student engagement in generating engaging and intellectually challenging questions. Pedagogies: An International Journal, 14(1), 17–32. https://doi.org/10.1080/1554480X.2018.1537186

Zeivots, S., Tyrrell, J., & Wardak, D. (2024). Exploring what makes learning meaningful for postgraduate business students in higher education. The Australian Educational Researcher, 51(5), 1927–1944. https://doi.org/10.1007/s13384-023-00672-2

Zuliana, E., Retnowati, E., & Widjajanti, D. B. (2019). How should elementary school students construct their knowledge in mathematics based on Bruner's theory? Journal of Physics: Conference Series, 1318(1), 012019. https://doi.org/10.10-88/1742-6596/1318/1/012019.