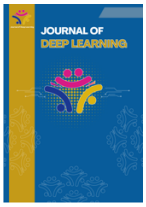

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Learning Innovation in Global Citizenship Education by Integrating Deep Learning Approach

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Abstract

Conventional learning methods in dealing with the complexity of dynamic and multidimensional global issues in learning global citizenship education are still ineffective, this can be seen from the low understanding and awareness of students in solving global issues that occur. This research aims to develop and test learning innovations by integrating *deep learning* approaches to improve students' understanding and participation in the context of global citizenship. The research method used was quantitative research with an experimental approach. The research subjects consisted of senior high school students in a sample school. The research instruments included questionnaires, comprehension tests, and observations used to measure the effectiveness of learning before and after the application of the deep learning approach. The collected data were analyzed using descriptive and inferential statistics to assess the improvement of learning outcomes. The results showed that the integration of deep learning approach in global citizenship education significantly improved students' concept understanding, critical thinking skills, and learning motivation. Students become more active and able to connect civic education materials with contemporary global issues more deeply. The implication of this research finding is that the application of deep learning technology can be an effective innovative strategy in developing global citizenship education that is adaptive and responsive to the challenges of the times. This encourages educators to utilize artificial intelligence technology in the learning process to create a more interactive and meaningful learning experience.

Keywords: adaptive learning, artificial intelligence, critical thinking, deep learning, global citizenship education, innovative learning methods, interactive learning

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1. Introduction

Conventional learning methods that have been used in global citizenship education are still ineffective in overcoming the complexity of dynamic and multidimensional global issues multidimensional (Sutrisno et al., 2021b). This condition causes low understanding and awareness of students in facing and solving various global problems that continue to develop rapidly (VanderDussen Toukan, 2018). On the other hand, traditional learning methods tend to be one-way and less able to accommodate the diversity of student learning styles, resulting in a lack of interest and active involvement in the global citizenship learning process (Pisani A, 2018). This has na impact on the lack of critical and analytical abilities of students in linking learning materials with the context of real global issues (Darma, 2020).

Learners are not optimized in understanding global issues that are complex

and require a more interactive and adaptive lerning approach (Cummings & Blatherwick, 2017). The lack of use of technology and innovation in learning methods are the main inhibiting factors in improving the quality of global citizenship learning (Sutrisno et al., 2023).

Several previous studies have shown that deep learning approaches, which are part of artificial intelligence technology, have great potential in the field of education (Yulianto & Iryani, 2024). This approach is able to process data deeply and provide a more personalized and interactive learning experience (Gunawardena & Chen, 2023.). In addition, studies related to global citizenship education emphasize the importance of using innovative and contextualized learning methods so that students can better understand and play an active role in global issues (Sutrisno et al., 2021a).

Although the potential of deep learning in education is increasingly recognized, its implementation in global citizenship education learning is still very limited and less studied in depth (Sunarto & Sutrisno, 2021). Most research focuses more on STEM or language learning, so there is still a void of specific research on the application of deep learning in the context of global citizenship education that can respond dynamically to global issues (Wittayakhom & Piriyasurawong, 2020). In addition, there is no research that comprehensively develops innovative learning models that integrate deep learning to increase students' understanding, participation, and global awareness effectively and systematically (Sutrisno et al., 2021a).

This research seeks to develop learning innovations by integrating deep learning approaches into global citizenship education, in order to answer the above problems. The research subjects consisted of senior high school students who were sampled to test the effectiveness of this innovative learning method in increasing students' understanding and participation in global issues.

It is hoped that the results of this research can make a real contribution in creating a learning model for global citizenship education that is more adaptive, interactive and responsive to the dynamics of global issues. In addition, this research also has the potential to become a foundation for the development of artificial intelligence technology-based learning methods that can be widely applied in today's education system.

2. Method

This study employed a quantitative research design with an experimental approach to examine the effectiveness of learning innovations that integrate a deep learning framework within the context of Global Citizenship Education (GCE). The experimental approach was deliberately chosen to allow for objective measurement of causal relationships between the applied intervention and students' learning outcomes. By systematically comparing pre-test and post-test results, the researchers were able to determine the extent to which the implementation of the deep learning-based instructional model influenced students' comprehension, engagement, and motivation in GCE. This design also minimizes subjective interpretation by relying on numerical data and statistical evidence to evaluate the observed changes.

The experimental approach is particularly suitable for this study because it provides a structured way to test hypotheses about the effectiveness of educational interventions. In this context, the "treatment" refers to the implementation of deep learning principles—such as critical thinking,

conceptual integration, and reflective analysis—into the teaching of global citizenship themes. By using an experimental setup, the research ensures that the differences observed between pre-intervention and post-intervention results can be attributed with greater confidence to the innovative learning strategy rather than to extraneous variables. Thus, the design not only supports empirical verification but also contributes to the development of evidence-based practices in modern education.

The research subjects consisted of upper secondary school students from a school selected purposively as the research site. The choice of participants was based on several considerations: (1) the school's curriculum relevance to Global Citizenship Education, (2) the accessibility and willingness of both students and teachers to participate, and (3) the students' cognitive readiness to engage with a deep learning-based instructional approach. These participants were deemed representative of the population targeted by GCE, which emphasizes awareness of global interdependence, sustainability, human rights, and social responsibility. By focusing on this group, the study aims to capture the potential of deep learning methodologies in shaping adolescents' cognitive and affective understanding of global issues.

To ensure the validity and comprehensiveness of data, the research employed multiple instruments: questionnaires, comprehension tests, and structured observations. Each instrument was designed to capture a specific dimension of the learning process.

The questionnaire measured students' learning motivation, attitudes toward global citizenship, and perceptions of the teaching process. It included both closed and open-ended items to collect quantitative as well as qualitative insights.

The comprehension tests were constructed to assess students' conceptual mastery of GCE topics before and after the implementation of the deep learning intervention. These tests included objective questions (such as multiple-choice and short-answer items) and analytical prompts requiring students to apply their knowledge to real-world contexts.

Observation sheets were used to record students' interactions, participation levels, and collaboration during classroom activities. The observation focused on indicators of active learning, such as questioning, peer discussion, and problem-solving behavior.

The use of triangulated instruments—questionnaire, test, and observation—enhanced the robustness of the findings. It enabled the researchers to cross-validate the data and capture the multifaceted effects of the instructional innovation, including both cognitive and behavioral changes among students.

The data analysis phase was conducted through both descriptive and inferential statistical techniques. Descriptive statistics were applied to summarize the general characteristics of the data, including mean scores, percentages, and frequency distributions of students' responses. This step provided an overview of students' initial understanding and post-intervention performance. Meanwhile, inferential statistics were employed to test hypotheses and determine the significance of differences between pre-test and post-test results. Tests such as the t-test for paired samples or ANOVA were used to examine whether the observed improvements were statistically significant and not due to chance. Through these analyses, the researchers were able to draw valid and generalizable conclusions about the impact of the deep learning model

on students' understanding and engagement in GCE.

Furthermore, to ensure research reliability, all instruments underwent pilot testing before the main data collection phase. This step aimed to verify item clarity, consistency, and construct validity. Ethical considerations were also maintained throughout the research process. Informed consent was obtained from participants and school authorities, confidentiality of responses was guaranteed, and the study followed all institutional research ethics protocols.

In conclusion, this research methodology provides a systematic framework for evaluating the effectiveness of integrating deep learning principles into Global Citizenship Education. By employing an experimental design supported by quantitative analysis, the study not only measures improvement in student outcomes but also contributes to the development of pedagogical innovations that promote critical and reflective global awareness among learners. The complete research flow is presented in Figure 1.

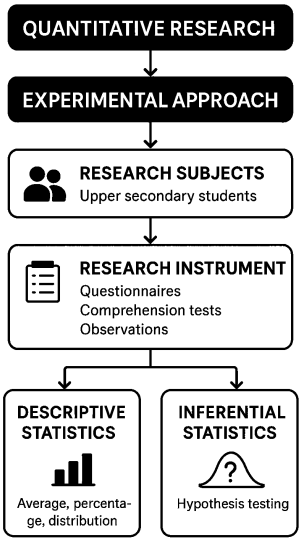

Figure 1. The research flow

3. Result and Discussion

Based on the results of field findings related to learning innovation by integrating the deep learning approach, it can be explained as in the following Table 1 (Sutrisno, 2025).

Table 1. Learning Outcomes

class	Number of Students	Pre-Test	Post-Test	Results
Class 1	20	60	82	36,7
Class 2	20	58	80	37,9

Based on the table above, it can be concluded that the level of understanding of students from the results of the pre-test and post-test scores shows how far students understand the concepts of global citizenship education before and after learning with the deep learning method. There is an average increase of about 36-38%.

For learner participation, it can be measured through a questionnaire designed to reflect the level of student activeness and involvement in the learning process. The increase in participation ranged from 38-40%.

While learning motivation can be measured by questionnaires to see changes in student learning motivation before and after innovative learning methods are applied. The increase was found to be around 40-41%.

It can be interpreted that before the use of innovative methods, the average student participation was at level 3, indicating moderate participation. After the application of the deep learning method, the score increased significantly to 4.25 which is in the high category, indicating increased student engagement and activeness.

Learning motivation also showed a corresponding increase, from an average score of 2.95 (quite low) to 4.15, indicating that students became more motivated to learn.

Meanwhile, based on the results of students' understanding of global citizenship education and its implementation at school, it is visualized in the form of the following bar chart (Sutrisno, 2025). Students' understanding of global citizenship education

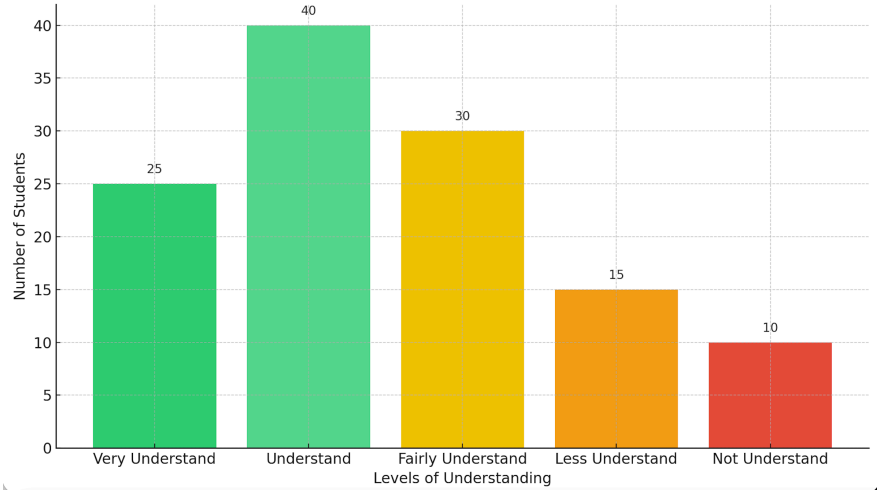

Figure 2. The Distribution of Students' Level of Understanding

Figure 2 illustrates the distribution of students' levels of understanding regarding the learning material. The data are categorized into six levels: Very Understanding (15 students), Understanding (40 students), Fairly Understanding (30 students), Less Understanding (15 students), and Not Understanding (10 students). This classification provides a comprehensive overview of the varying degrees of cognitive comprehension among the participants, reflecting how well the instructional methods and materials were internalized by the students.

From the figure 2, it can be observed that the majority of students fall into the Understanding category (40 students), indicating that the learning process was generally effective in facilitating conceptual grasp. This finding suggests that the instructional approach used in the study successfully enabled most students to comprehend the core content and apply it in a meaningful way. The second largest group is those categorized as Fairly Understanding (30 students), representing learners who have acquired partial comprehension but may still require further reinforcement or clarification of specific concepts. These students possibly understood the general framework of the material but encountered challenges in connecting theoretical knowledge with practical applications.

In contrast, only a small proportion of students were classified as Very Understanding (15 students). This group represents the high achievers who not only mastered the material but were also able to integrate their understanding into broader contexts or problem-solving scenarios. The relatively limited number of students in this category might indicate that while the learning strategy was effective at a general level, it was less capable of fostering deep conceptual mastery among all learners. This could be due to differences in learning styles, prior knowledge, or motivation levels among students.

Meanwhile, 15 students were placed in the Less Understanding category, and 10 students in the Not Understanding category. Together, these groups make up a significant

minority that struggled to grasp the lesson content. Their difficulties may be attributed to various factors, such as inadequate prior knowledge, ineffective engagement during the learning process, or external distractions that hindered their cognitive focus. Additionally, these findings suggest that a differentiated instructional approach may be necessary to accommodate the learning needs of students who require more support, such as remedial sessions, peer tutoring, or the integration of more interactive and visual learning media.

This distribution provides a comprehensive picture of the perception and level of mastery of global citizenship education materials among students, which can form the basis for further analysis and decision-making for the development of learning methods.

The low understanding and participation of students in conventional Global Citizenship Education learning due to less. interactive learning approaches and unable to accommodate the development of educational technology causes limitations in triggering active involvement and in-depth understanding of the concept of citizenship in the era of globalization.

Therefore, this research is directed at developing and testing learning innovations that integrate deep learning approaches as a more effective strategy to solve these problems (Castek & Dwyer, 2018)

The results showed significant positive achievements in material mastery and the level of student participation during the learning process. Quantitative data collected showed significant improvements in pre-test and post-test scores, as well as student participation and motivation scores.

This finding indicates that learning innovations based on the deep learning approach can facilitate a more active, in-depth learning process and stimulate students' emotional and cognitive engagement, thus effectively addressing the problem of low learning outcomes and participation in civiceducation (VanderDussen Toukan, 2018).

Theoretically, the success of this approach receives support from cognitive theory and learning constructivism, which emphasize the importance of active engagement and comprehensive understanding by students as a process of knowledge formation (Martini, 2017)

The deep learning approach integrates these principles with methods that encourage exploration, critical reflection and collaboration among students, in line with the demands of global literacy in forming citizens who are able to think critically and act participatively in a dynamic global context dinamis (VanderDussen Toukan, 2018).

The research findings recommend thneed for widespread adoption of innovative learning methods that utilize technology and deep learning-based approaches at various levels of education. Professional mentoring and training of educators is also crucial to ensure successful implementation and management of learning that is adaptive to student needs and the latest developments in educational technology. Thus, civic learning can take place effectively and be relevant to the character building goals of global citizens (Smith et al., 2017). The implications of this research open up an important space for further studies that canexplore more specific and contextual deep learning models according to the characteristics of learners and the learning environment.Future research is also recommended to

Examine additional variables such as the use of digital technology tools, variations in student learning styles, and the long-term impact of these methods on global citizenship

attitudes and behaviors (Mayo et al., 2009). Discussions on the technical and non technical constraints of implementing this innovation in the field should also be a focus so that the resulting learning solutions are truly optimal and comprehensive.

4. Conclusion

Low understanding and participation of students in learning Global Citizenship Education that has been taking place conventionally. The less interactive approach and the lack of utilization of technology cause students to be less actively involved and have difficulty in understanding material that is contextual to current global challenges. This raises an urgent need to develop learning innovations that are able to answer these limitations so as to increase the effectiveness of the learning process and the results achieved.

The results of the study prove that learning innovation with the integration of deep learning approach has succeeded in overcoming these problems significantly. Increased understanding of the material and active participation of students in learning activities show that this method is able to create a more innovative, interactive and motivating learning atmosphere. The use of instruments such as questionnaires, tests, and observations provide a comprehensive picture of the effectiveness of this innovation, while strengthening the basis of cognitive theory and constructivism that support its application. Thus, the deep learning approach not only improves academic achievement, but also shapes students' critical and participatory attitudes as global citizens.

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