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Empowering Schools to Integrate Climate Change Education into The Curriculum

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Abstract

The Education Quality Improvement Consortium in schools conducted mentoring in Malang Regency to enhance teachers' and students' awareness and understanding of integrating climate change content into the learning curriculum. The program aimed to strengthen participants' capacity not only to comprehend climate issues but also to take responsible environmental action. Mentoring was implemented through a training-based approach covering planning, implementation, simulation, and evaluation. Activities included developing training modules, conducting module simulations, and administering post-training assessments. Results showed that participants successfully produced training modules, carried out simulations effectively, and achieved strong post-test scores. Participants' understanding of climate change reached an average of 91%, indicating solid conceptual mastery. Additionally, participants demonstrated high skills in integrating climate-related content into their learning plans, with an average score of 96%. Overall, the mentoring program proved effective in enhancing both conceptual mastery and curriculum-integration skills related to climate change education.

Keywords: *climate change, education curriculum, learning integration, teacher training, workshop.*

Introduction

Climate change is one of the most pressing global challenges of this century, with far-reaching impacts on the environment, the economy, and human society. This phenomenon not only affects specific sectors but also threatens the sustainability of life on planet Earth (Intergovernmental Panel on Climate Change (IPCC), 2021). In response to the threat of climate change, awareness and understanding of this issue need to be instilled from an early age, especially among the younger generation. One strategic means to achieve this goal is through the integration of climate change topics into learning in schools and Islamic schools (UNESCO, 2017)

Integrating climate change education into the formal education curriculum can play a significant role in shaping more environmentally friendly attitudes and behaviors. Education is an effective tool for providing a deeper understanding of the causes, impacts, and mitigation efforts of climate change (Tilbury, 2011). Therefore, it is crucial to incorporate climate change awareness and understanding into relevant subjects so that the younger generation not only understands this issue theoretically but also takes more responsible actions towards the environment (Anderson, 2013)

Education plays a central role in shaping individuals' mindsets and behaviors regarding climate change. According to the Intergovernmental Panel on Climate Change (IPCC) report, climate change education should be a top priority in climate change adaptation and mitigation efforts (Intergovernmental Panel on Climate Change (IPCC), 2021). A sound understanding of climate change can encourage environmentally friendly behaviors, such as reducing the use of single-use plastics, wiser management of natural resources, and adopting a low-carbon lifestyle (UNESCO, 2017). Furthermore, increased understanding of climate change plays a crucial role in supporting more effective mitigation and adaptation policies at the local and global levels (Leiserowitz et al., 2006).

In Indonesia, climate change education has begun to receive government attention through various regulations. *Undang-Undang No. 32 Tahun 2009 Tentang Perlindungan Dan Pengelolaan Lingkungan Hidup* (2009) emphasizes the importance of environmental education to create a society aware of the importance of environmental sustainability. In this context, schools and Islamic schools are expected to be effective agents of change in instilling

awareness of the importance of environmental issues, including climate change (Syam et al., 2024).

At the international level, the 2030 Agenda for Sustainable Development, launched by the United Nations through the Sustainable Development Goals (SDGs), also emphasizes the importance of quality education in achieving inclusive and sustainable development. SDG 13, which specifically addresses climate action, recognizes that climate change education is one of the best ways to empower individuals and communities to better prepare for the challenges of climate change (Nations, 2015).

The integration of climate change education into school/Islamic school curricula faces several challenges. One of the main challenges is limited resources and teacher capacity to teach this topic effectively (UNESCO, 2017). Most teachers still require additional training on how to effectively integrate climate change issues into their lessons. Furthermore, the lack of relevant and up-to-date teaching materials also hinders the delivery of this topic in a way that is engaging and accessible to students (Anderson, 2013).

However, these challenges also present opportunities to improve the quality of education and teacher engagement in developing environmentally-based curricula. Several global initiatives, such as the Global Action Programme on Education for Sustainable Development, spearheaded by UNESCO, offer various resources and guidance to assist member countries in implementing climate change education (UNESCO, 2014). This presents a significant opportunity for Indonesia to strengthen the integration of climate change education in schools/Islamic schools by leveraging existing resources (Syam et al., 2024).

In the context of increasingly pressing climate change, education plays a crucial role in shaping the awareness and understanding of this issue among the younger generation. Integrating climate change awareness into school/Islamic school learning is not only crucial for providing basic knowledge about the causes and impacts of climate change, but also for fostering a more responsible attitude towards the environment. With appropriate policy support and adequate training for educators, climate change education can be a powerful tool in preparing young people to face future climate change challenges.

Methods

The Education Quality Improvement Consortium (EQUIC)'s approach to integrating climate change issues into learning utilizes a training-based approach. This approach emphasizes developing participant capacity through a systematic process of planning, implementation, simulation, and evaluation. These stages are designed to build participants' competency in understanding climate change issues and their skills in integrating the material into daily learning.

During the planning stage, the EQUIC team designed a locally context-based training module using a participatory approach. This module involved teachers from Malang Regency to provide input and adapt the material to meet learning needs. This approach aligns with the Collaborative Professional Development model, which emphasizes the importance of collaboration between facilitators and participants in developing training materials (Desimone, 2009).

The training took the form of an intensive workshop comprising four main sessions: an introduction to climate change, learning indicators, integrating material into subjects, and developing climate change-based projects. Training programs that combine theory and hands-on practice have proven effective and should be considered in other professional development programs (Hanifah et al., 2024). This method adopts the principles of Experiential Learning developed by Kolb, where participants not only receive theoretical material but also practice it directly through simulations and learning projects (Kolb, 1984).

Simulations are used to test the effectiveness of the module and improve participants' skills in delivering the material. Simulations also serve as two-way feedback between facilitators and participants, which is essential in the Formative Assessment process (Black & Wiliam, 1998). Through this process, participants can reflect on their understanding and receive constructive feedback to improve their delivery.

Evaluation is conducted through a post-test designed to measure participants' understanding of climate change issues and their ability to integrate learning skills. Furthermore, ongoing support is provided through the provision of additional learning resources, such as digital modules and video tutorials. This aligns with Guskey's recommendation on the importance

of ongoing evaluation in teacher professional development to ensure long-term impacts on learning practices (Guskey, 2002).

Result

1. Mentoring Activities

Climate change is a global challenge that requires cross-sectoral attention, including the education sector. Education plays a strategic role in improving climate change literacy among teachers and students. In this context, EQUIC provides mentoring to teachers in schools/Islamic schools in Malang Regency to improve their understanding and ability to integrate climate change materials into their learning. The mentoring process includes the development of training modules, module simulations, and training evaluations.

The mentoring process begins with a thorough preparation phase. At this stage, the EQUIC team develops teaching materials in the form of training modules designed to meet the learning needs related to climate change. This module is titled "Integrating Climate Change in Learning in Schools/Islamic Schools." The module consists of four main sessions. First, "Introduction to Climate Change." The purpose of this session is to provide participants with an in-depth understanding of climate change, including its definition, causes, and impacts, both globally and locally. The approach used in this session involves interactive discussions and educational videos to facilitate understanding of basic concepts. Furthermore, participants are encouraged to share their personal experiences related to climate change, making the discussion more relevant to the local context.

Second, Climate Change Material and Indicators. The second session discussed specific material relevant to climate change and indicators that can be used to measure student understanding. In this session, participants were taught how to design climate change indicator-based assessments that are applicable and relevant to the curriculum. In-depth discussions were also conducted to adapt the indicators to the participants' local contexts, thus making learning more contextual.

Third, Integrating Climate Change into Subjects. In this session, teachers were trained to integrate climate change material into the subjects they teach. For example, in science, participants were directed to incorporate the concept of greenhouse gas emissions. In contrast, in social studies, participants were trained to link the impacts of climate change to social and economic aspects.

This session also included the development of climate change-based Lesson Plans (RPPs) or Teaching Modules, which were tested directly in classroom simulations.

Fourth, Integrating Climate Change into Project Activities. The final session focused on developing climate change-based project activities. Participants were trained to develop collaborative projects that actively involve students, such as school greening programs or campaigns aimed at reducing plastic waste. This session also taught participants how to monitor and evaluate the success of the projects.

After the module development was completed, the activity continued with a limited simulation of the training module for prospective trainers. This simulation aimed to test the effectiveness of the developed material and provide participants with the opportunity to provide feedback and make improvements. During the simulation, participants were encouraged to use an interactive and creative approach in delivering the material.

The activity concluded with a test of participants' understanding of the material covered during the training. The test consisted of 20 multiple-choice questions designed to measure participants' understanding of two key aspects of the material: their understanding of climate change issues and their skills in integrating climate change material into lesson plans.

2. Mentoring Results

The results of the mentoring activities covered three main interrelated aspects: first, the development of a training module aimed at facilitating teaching about climate change; second, a simulation of the module's use by participants to test the feasibility and effectiveness of the developed material in a learning context; and third, a post-training evaluation conducted to measure participants' understanding of the material presented and the effectiveness of the overall training process in achieving the desired objectives.

First, Training Module Development. Participants successfully developed a comprehensive training module tailored to the local context in Malang Regency. This module is designed with a systematic approach, including a step-by-step guide that makes it easy for educators to integrate climate change issues into their daily learning. The module's development involved an in-depth analysis of local educational needs and the potential resources available

in the area, ensuring the material is easily understood and accepted by students.

Furthermore, this module also involves mapping the potential of natural and social resources in the local area, such as environmentally friendly agricultural practices, renewable energy utilization, and local wisdom in maintaining ecosystem balance. Therefore, the material in the module is not only theoretical but also contains contextual values that can be a real inspiration for students. Therefore, the module's development focuses not only on developing theoretical knowledge but also on practical applications adapted to local environmental and cultural conditions. This is expected to enhance the effectiveness of integrating climate change material into learning, enabling trainees to more easily understand and apply it in teaching and learning activities.

In addition to enjoying the learning experience, incorporating local elements into the module also fosters a sense of ownership and responsibility for the surrounding environment. This module is expected to become an adaptive and sustainable learning model, emphasizing not only knowledge but also attitudes and skills in addressing climate change issues. The use of local illustrations in the module serves as a medium to clarify concepts related to climate change, enabling participants to more easily understand and implement the material in contexts close to their daily lives. The integration of these local elements enriches the participants' learning experience and enhances the relevance of the issues being taught. Overall, the development of this training module provides a crucial foundation for integrating environmental education into schools in Malang Regency and serves as a strategic step in building ecological awareness among the younger generation through a humanistic and contextual educational approach.

Second, the Module Simulation. This module simulation demonstrated very positive results, reflected in the participants' ability to present the material clearly and demonstrate innovative learning methods. During the simulation, participants were not only able to communicate the content in an easily understood manner but also successfully implemented creative and relevant approaches to integrating climate change issues into the learning process.

The participants also demonstrated strong adaptability to feedback provided during the simulation. They were able to adjust their teaching methods and strategies based on the input received, demonstrating flexibility

and openness in developing pedagogical skills. This is crucial to ensure that the learning process can continuously evolve and adapt to the needs of students.

The simulation also had a significant impact on improving participants' pedagogical skills, particularly in the use of interactive learning media. Participants demonstrated a deeper understanding of the importance of using learning media that can increase student engagement and facilitate understanding of more complex concepts, such as climate change. This improved ability is expected to enrich the teaching and learning process and make the integration of climate change material more effective and engaging for students.

Third, Post-Test Evaluation. The post-test evaluation results showed a significant increase in participants' understanding and skills after participating in a series of training activities and simulations using climate change-based learning modules. The results indicate that most participants had adequately mastered the material.

Table 1. Data of Post test

Aspek Penilaian	Nilai Min	Nilai Maks	Total
Pemahaman Konsep	88	93	91,04%
Integrasi Pembelajaran	94	97	96,00%
Rata-Rata Keseluruhan	93.50%		

This improvement reflects the effectiveness of the training process, which emphasized not only cognitive aspects but also reinforced the application and contextual aspects of learning practices.

The post-test questions were divided into two main categories, covering two main areas of focus for the training material. First, participants' understanding of climate change issues achieved an average score of 91%. This achievement indicates that participants successfully absorbed and understood the concepts related to climate change. Second, participants' skills in integrating climate change issues into lesson plans achieved an average score of 96%. Achieving high scores in this second aspect indicates that participants not only understand climate change issues but can also effectively apply this knowledge in designing relevant and innovative lesson plans. The

post-test questions were divided into two main categories reflecting the focus of the training material: (1) understanding the concept of climate change, and (2) skills in integrating climate change issues into lesson planning. In the first category, the average score for participants reached 91%, indicating a strong understanding of the basic concepts and impacts of climate change, including causal factors, mitigation efforts, and adaptation at the local level. This high score also indicates that the method of delivering material through simulations, group discussions, and local case studies successfully increased participants' understanding of scientific issues previously considered complex.

Meanwhile, in the second category, participants achieved an average score of 96% in integrating skills for lesson planning. This achievement is a strong indicator that participants not only understand the theory but are also able to apply this knowledge concretely in the form of innovative and contextual lesson designs. Some examples of applications that emerged from the participants' simulation results include creating thematic lesson plans based on the environment, utilizing local media such as maps of flood-affected areas or water conservation posters, and student project activities related to recycling and school greening initiatives.

The evaluation results reinforce the conclusion that the training approach successfully improved participants' capacity in two key areas: understanding climate change issues and skills in integrating the material into their learning. Furthermore, participants provided positive feedback regarding the relevance of the material to their needs in the field, indicating that the training was aligned with the challenges educators face in their local educational contexts. This feedback also indicates that the training was not only effective in terms of test results but also invaluable in improving the quality of learning for teachers and students in the field.

Discussion

Analysis of the mentoring results shows that the training and simulation-based approach had a significant impact on improving teacher capacity. The systematic development of modules enabled participants to understand and implement the material in a more structured manner. The success of the module simulations demonstrated that participants not only understood the material but were also able to transfer this knowledge to students using creative methods.

The effectiveness of this approach aligns with Kolb's experiential learning theory, which emphasizes the importance of direct experience in the learning process. Kolb emphasized that the learning process is not simply the transmission of knowledge from facilitator to participants, but rather an active cycle in which individuals construct their understanding through direct experience. In Kolb's model, learning is viewed as a dynamic process consisting of four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). These four stages complement each other and serve as a foundation for participants to deeply internalize knowledge while honing their critical thinking and application skills.

In the context of climate change integration training in Malang Regency, participants experienced these four stages in real-life situations. The concrete experience stage was reflected when participants were directly involved in the process of developing and testing learning modules based on local contexts. Through this experience, they interacted with materials, case studies, and examples of environmental education practices relevant to their local conditions. The next stage, reflective observation, was conducted through group discussions and joint reflection sessions, where participants analyzed the effectiveness of the developed modules and reviewed their suitability for student needs. This reflection fostered a new awareness of the importance of a participatory and contextual learning approach.

The process progresses to abstract conceptualization, where participants begin to connect their reflections to learning theories and scientific concepts of climate change. At this stage, participants develop a conceptual understanding of how climate change issues can be integrated into the curriculum through creative strategies, such as project-based learning, local case studies, or environmental literacy activities. The final stage, active experimentation, is seen when participants apply these new concepts and ideas to concrete learning designs, such as lesson plans, teaching media, and classroom simulations. Through these experiments, participants not only test the effectiveness of their developed approaches but also strengthen their pedagogical competencies in delivering action-oriented learning on environmental issues.

This also aligns with Dewey's perspective, which emphasized that experiential learning provides individuals with the opportunity to better

understand and internalize concepts (Dewey, 1938). Participants not only listen and take notes, but also experience and create, making the learning process more contextual and meaningful. The systematic arrangement of modules allows participants to understand and implement the material in a more structured manner. Successful module simulations demonstrate that participants not only understand the material but are also able to transfer that knowledge to their students using creative methods.

The module simulations conducted during the mentoring reflected the application of problem-based learning (PBL) theory. PBL, as proven by numerous recent studies, is an effective approach for improving critical thinking and problem-solving skills (Hmelo-Silver, 2004). In this simulation, participants are not only provided with theoretical knowledge but also directly involved in applying the material in situations that approximate real-world conditions. This simulation allows them to develop pedagogical skills and facilitate a deeper understanding of how to integrate climate change issues into lesson planning. PBL also supports the development of interactive skills, as evidenced by the increased use of innovative learning media, a crucial component in increasing student engagement in the learning process.

Post-test evaluations showing significant improvements in participants' understanding indicate behavioral changes, which can be explained by behavior change theory, specifically through the outcomes-based learning model. This model focuses on achieving competencies measured through performance assessments. Post-test results, which showed an average score of 91% for understanding climate change issues and 96% for integration skills in lesson planning, demonstrate that this training significantly transformed participants' knowledge and skills. This aligns with behavior change theory, which states that in-depth and relevant learning experiences can encourage participants to transform their understanding and improve their competencies, ultimately reflected in high evaluation results (Schunk, 2014).

Furthermore, participant feedback regarding the relevance of the training material to their needs in the field points to the theory of participant engagement. This theory suggests that high participant engagement in the learning process will improve the quality and effectiveness of the learning itself. When participants perceive the material presented as relevant to the challenges they face, they are more motivated to implement the knowledge in their practice. In this case, the relevance of the training material to field needs

not only increases participant motivation but also strengthens the long-term impact of the training (Fredricks et al., 2004).

However, several challenges were identified during the mentoring process. One major challenge was the varying levels of participants' initial understanding. Some participants required additional time to grasp basic concepts of climate change, while others demonstrated more advanced abilities. Furthermore, the limited training time hindered optimal understanding of each module session. To address these challenges, continued mentoring focused on strengthening the understanding and application of the material is necessary. Ongoing mentoring is also crucial to ensure that teachers are truly able to consistently integrate climate change into their lessons. Furthermore, providing additional learning resources, such as digital modules and video tutorials, can be a solution to overcome time constraints in training.

Overall, the results of the mentoring process in Malang Regency indicate that a training approach based on constructivist theory, problem-based learning, and the theory of change, Behavioral training has successfully enhanced participants' capacity. This approach not only enhanced their understanding of climate change issues but also strengthened their pedagogical skills in integrating these issues into lesson planning. Thus, this training not only provided theoretical knowledge but also enhanced participants' practical competency in addressing challenges in the field.

Conclusion and Suggestion

The mentoring activities carried out by EQUIC in Malang Regency have had a positive impact on increasing teachers' capacity to integrate climate change materials into their learning. The structured mentoring process, from module development to post-training evaluation, demonstrated the effectiveness of the approach used. However, ongoing efforts are needed to overcome challenges encountered, such as limited training time and varying levels of participant understanding. With continued support, this program is expected to have a broader impact and contribute to improving climate change literacy among teachers and students. Furthermore, this program can serve as a model for other regions to adopt, increasing awareness and collective action on climate change issues.

References

Anderson, A. (2013). Climate Change Education for Mitigation and Adaptation. *Journal of Education for Sustainable Development*, *6*(2), 191–206. https://doi.org/10.1177/0973408212475199

Black, P., & Wiliam, D. (1998). Assessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74. https://doi.org/10.1080/0969595980050102

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Dewey, J. (1938). *Experience and Education*. Macmillan Company.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Guskey, T. R. (2002). Does It Make a Difference? Evaluating Professional Development. In *Leading Professional Learning: Building Capacity Through Teacher Leaders* (Vol. 59, Issue 6, pp. 45–51). Educational Leadership. https://uknowledge.uky.edu/edp_facpub/7

Hanifah, D. P., Jumini, S., Parmin, Triyani, A., Ariyani, M., Jannata, T., & Haryanto, S. (2024). Training and Assistance in Article Writing for Sinta Accredited Journals for Wonosobo Science MGMP. *Dimas : Jurnal Pemikiran Agama Untuk Pemberdayaan*, *24*(2), 117–132. https://doi.org/10.21580/dms.v24i2.23209

Hmelo-Silver, C. E. (2004). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, *16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Intergovernmental Panel on Climate Change (IPCC). (2021). *Climate Change 2021: The Physical Science Basis*. Cambridge University Press. New York

Kolb, D. A. (1984). *Experiential Learning: Experience as The Source of Learning and Development* (Issue 1984). Prentice Hall, Inc. https://doi.org/10.1016/B978-0-7506-7223-8.50017-4

Leiserowitz, A. A., Kates, R. W., & Parris, T. M. (2006). Sustainability values, attitudes, and behaviors: A review of multinational and global trends. *Annual Review of Environment and Resources*, *31*(March), 413–444. https://doi.org/10.1146/annurev.energy.31.102505.133552

Nations, U. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. https://sdgs.un.org/2030agenda

Schunk, D. H. (2014). *Learning Theories: An Educational Perspective* (6th ed). Pearson Education Limited.

Syam, R., Ras, A., & Rahim, H. (2024). Peningkatan Pengetahuan Siswa tentang Kesadaran Ekologis untuk Lingkungan Berkelanjutan di SMA Negeri 1 Pinrang. *PaKMas: Jurnal Pengabdian Kepada Masyarakat*, *4*(2), 451–459. https://doi.org/10.54259/pakmas.v4i2.3196

Tilbury, D. (2011). *Education for Sustainable Development: An Expert Review of Processes and Learning*. UNESCO. Available in Spanish, French, and English.ED-2010/WS/46

Undang-Undang No. 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup. (2009). Kementerian Lingkungan Hidup.

UNESCO. (2014). *Global Action Programme on Education for Sustainable Development as Follow-Up to the United Nations Decade of Education for Sustainable Development after 2014*. https://esdcenter.jp/wp-content/uploads/2016/04/GAP.pdf

UNESCO. (2017). Education for Sustainable Development Goals: learning objectives. In *Education for Sustainable Development Goals: learning objectives*. UNESCO.