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Integrating PjBL, FGD, and LMS to Foster Creative Thinking in Geography Learning

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Abstract: Creative thinking and active participation are essential competencies in twenty-first-century geography education, particularly in addressing complex environmental and geosphere-related issues. However, geography learning in schools is often still dominated by conventional teacher-centered instruction that limits students' opportunities to collaborate, express ideas, and develop innovative environmental problem-solving abilities. This study aimed to analyze the effect of integrating Project-Based Learning (PjBL), Focus Group Discussion (FGD), and Learning Management System (LMS)-supported learning on students' learning activeness and creative thinking abilities in geography learning at SMAN 1 Wundulako, Indonesia. The study employed a quantitative quasi-experimental method using a One Group Pretest–Posttest Design involving 30 tenth-grade students. Data were collected through observation sheets measuring students' learning activeness and essay-based creative thinking tests developed based on Guilford's indicators, including fluency, flexibility, originality, and elaboration. Supporting data were also obtained through documentation of collaborative learning and LMS activities. Data were analyzed using descriptive statistics, N-Gain analysis, and paired sample t-tests. The findings revealed significant improvement in students' learning activeness, with average scores increasing from 63.6 to 87.0 after the intervention. Students' creative thinking abilities also improved substantially, with average scores increasing from 62.0 in the pretest to 86.2 in the posttest and an N-Gain score of 0.63 categorized as moderate improvement. The integration of PjBL, FGD, and LMS created collaborative and flexible learning environments that supported students' participation, digital interaction, and contextual environmental problem-solving. The study further indicates that technology-supported collaborative geography learning contributes positively to transformative education, ecological creativity, and sustainability-oriented learning practices in secondary education.

Keywords: Project-Based Learning; Focus Group Discussion; Learning Management System; Creative Thinking; Geography Learning; Digital Pedagogy.

INTRODUCTION

The rapid development of science, technology, and digital communication in the twenty-first century has significantly transformed educational paradigms and learning environments worldwide. Contemporary education is increasingly expected to develop students' higher-order thinking skills, creativity, collaboration, digital literacy, and problem-solving abilities to prepare them for complex global challenges and dynamic social realities (Haryaka & Razak, 2025; Kwangmuang et al., 2021; Vu, 2025). Among these competencies, creative thinking has become one of the most essential skills because it enables students to generate innovative ideas, analyze problems from multiple perspectives,

and construct adaptive solutions within rapidly changing environments (OECD, 2023). Consequently, educational practices should move beyond traditional teacher-centered instruction toward more collaborative, inquiry-based, and technology-supported learning approaches.

In geography education, creative thinking is particularly important because geographical phenomena involve complex interactions between humans and the environment that require analytical reasoning and contextual problem-solving (Bendl et al., 2025; Chen, 2021; Chumsukon, 2021). Geography learning is not merely concerned with memorizing concepts related to lithosphere, atmosphere, hydrosphere, biosphere, and anthroposphere, but also encourages students to critically examine environmental issues and formulate sustainable solutions to real-world problems such as floods, pollution, urbanization, and climate change (Fadjarajani et al., 2024; Handoyo et al., 2024; Silviariza et al., 2021). Therefore, geography learning should facilitate active student participation, collaborative inquiry, and contextual exploration to strengthen students' environmental awareness and creative problem-solving capacities.

However, previous studies indicate that geography learning in many schools remains dominated by conventional instructional methods emphasizing lecture-based explanation and textbook-oriented learning. Such approaches often limit students' opportunities to actively participate in classroom discussions, collaborate meaningfully, and express creative ideas during learning activities. As a result, students frequently become passive learners who rely heavily on teachers' explanations without engaging critically with environmental and geographical issues surrounding them (Djordjevic et al., 2026; Fadjarajani et al., 2024; Shepardson, 2019; Wijayanto et al., 2023). This condition is particularly problematic in contemporary educational contexts where students are expected to develop innovative thinking and collaborative competencies required in digital society.

Preliminary observations conducted at SMAN 1 Wundulako revealed similar challenges in geography learning activities, particularly in the topic of geosphere phenomena. Classroom instruction was still largely teacher-centered, resulting in limited student interaction and low participation during learning activities. Students tended to experience difficulties when asked to formulate alternative solutions to local environmental problems such as flooding, waste management, and land degradation occurring within their surrounding communities (Alkair et al., 2023; Chen, 2021; Wei et al., 2020). Many students were hesitant to express opinions during classroom discussions and showed limited creativity in developing contextual environmental problem-solving ideas (Fredagsvik, 2023; Nilimaa, 2023). These conditions indicate the need for more innovative and collaborative learning strategies capable of stimulating students' active participation and creative thinking abilities.

One instructional approach considered effective for addressing these challenges is Project-Based Learning (PjBL). PjBL is a student-centered learning model that organizes learning activities around authentic projects and contextual problem-solving processes (A. P. Putri et al., 2023; M. A. N. Putri & Dwikoranto, 2022; Wijnia et al., 2024). Through project-based inquiry, students are encouraged to investigate real-world issues, collaborate in groups, develop creative solutions, and produce meaningful learning outputs (Johnson et al., 2019; Spires et al., 2019). Previous studies demonstrate that PjBL contributes positively to students' creativity, collaboration skills, critical thinking, and learning engagement because students actively construct knowledge through experiential and inquiry-oriented learning activities (Grobelski et al., 2023; Spires et al., 2019).

To strengthen collaborative interaction and deepen students' analytical discussions during project implementation, Project-Based Learning can be integrated with Focus Group Discussion (FGD). FGD provides structured opportunities for students to exchange ideas, evaluate different perspectives, negotiate meanings, and collaboratively formulate solutions to environmental and geographical problems (Abidin et al., 2025; Alam et al., 2025). Through collaborative dialogue and reflective interaction, students become more actively involved in the learning process and develop stronger communication and creative reasoning skills. The integration of PjBL and FGD therefore creates a more participatory and socially interactive learning environment that supports transformative and student-centered geography learning.

In addition to collaborative learning strategies, the integration of digital technology into education has become increasingly important in contemporary pedagogy. Learning Management Systems (LMS) provide flexible digital environments that facilitate communication, collaboration,

resource sharing, and blended learning beyond conventional classroom boundaries (Bradley, 2020; Uzorka & Obediyi, 2025). One digital platform frequently used in educational contexts is Edmodo, which allows students and teachers to interact through online discussions, project collaboration, assignment management, and digital content sharing (Ateş Çobanoğlu, 2018; Jayusman & Shavab, 2020). LMS-supported learning environments encourage continuous learning interaction and create more inclusive participation opportunities for students who may feel less confident participating in face-to-face classroom discussions.

The integration of PjBL, FGD, and LMS platforms such as Edmodo offers substantial potential for transforming geography learning into more collaborative, flexible, and creativity-oriented educational experiences. Through blended learning environments, students are able to continue project discussions, share ideas, and collaboratively construct solutions both inside and outside the classroom. Digital collaborative spaces also encourage broader student participation and provide opportunities for reflective interaction that support creative idea generation and environmental problem-solving. Furthermore, contextual projects focusing on local environmental issues may contribute to students' ecological awareness and sustainability-oriented thinking.

Despite growing interest in digital collaborative learning and project-based pedagogy, studies specifically examining the integration of PjBL, FGD, and LMS in geography education remain relatively limited, particularly within Indonesian secondary school contexts. Existing studies often investigate these approaches separately without comprehensively examining how their integration contributes to students' creative thinking and active participation in geography learning. Moreover, research connecting collaborative digital pedagogy with environmental problem-solving and sustainability-oriented geography learning is still underexplored.

Therefore, this study aims to analyze the effect of integrating Project-Based Learning, Focus Group Discussion, and Learning Management Systems on students' learning activeness and creative thinking abilities in geography learning at SMAN 1 Wundulako. The study specifically focuses on geography topics related to geosphere phenomena and contextual environmental issues. The findings are expected to contribute theoretically to collaborative digital pedagogy, transformative geography education, and creativity-oriented learning, while practically providing educators with innovative instructional strategies for developing meaningful, technology-supported, and sustainability-oriented geography learning in secondary education.

METHOD

Research Design

This study employed a quantitative approach using a quasi-experimental method with a One Group Pretest–Posttest Design. The design was selected to examine the effect of integrating Project-Based Learning (PjBL), Focus Group Discussion (FGD), and Learning Management System (LMS)-supported learning on students' learning activeness and creative thinking abilities in geography learning. Through this design, students' conditions before and after the learning intervention could be compared to identify changes resulting from the implementation of collaborative digital learning strategies.

The research design can be illustrated as follows:

$$O_1 \rightarrow X \rightarrow O_2$$

Where:

- O_1 = Pretest
- X = Learning intervention through PjBL, FGD, and LMS integration
- O_2 = Posttest

The intervention focused on geography learning related to geosphere phenomena and contextual environmental issues occurring in students' surrounding environments.

Research Site and Participants

The study was conducted at SMAN 1 Wundulako, Southeast Sulawesi, Indonesia, during the 2025 academic year. The school was purposively selected because preliminary observations indicated

relatively low levels of student participation and creative thinking during geography learning activities, particularly in topics concerning environmental and geosphere phenomena.

The participants consisted of 30 tenth-grade students from class X.E selected using purposive sampling techniques. The selected class represented heterogeneous academic abilities and demonstrated relatively low classroom participation based on recommendations from geography teachers and preliminary classroom observations.

Learning Intervention Procedure

The implementation of the learning intervention was conducted over four instructional meetings integrating Project-Based Learning, Focus Group Discussion, and Edmodo-based LMS activities. Before the intervention, students completed pretests designed to measure their initial creative thinking abilities related to environmental and geosphere issues. Classroom observations were also conducted to identify students' initial levels of learning activeness and participation during conventional geography learning activities.

During the intervention stage, students participated in collaborative geography learning activities organized around contextual environmental projects related to geosphere phenomena such as flooding, pollution, urbanization, and environmental degradation. Students were divided into several collaborative groups and assigned project tasks requiring investigation, discussion, and solution development regarding local environmental problems. Focus Group Discussion (FGD) strategies were integrated to encourage structured collaborative dialogue, critical reflection, and idea exchange among students. The learning process was supported through the Edmodo Learning Management System, which facilitated online discussions, project coordination, assignment submission, digital material sharing, and asynchronous collaborative interaction outside classroom hours. Teachers acted as facilitators by guiding discussions, monitoring project development, and providing feedback both during face-to-face and online learning sessions.

After completing the intervention, students completed posttests using assessment instruments equivalent to those administered during the pretest stage. Posttest assessments aimed to evaluate improvements in students' creative thinking abilities after participating in collaborative digital geography learning activities.

Research Instruments

Several instruments were utilized in this study to collect quantitative and supporting data related to students' learning activeness and creative thinking abilities. Observation sheets were used to measure students' learning activeness during classroom and online learning activities. The observation indicators included:

1. Visual participation
2. Oral participation
3. Listening engagement
4. Writing participation
5. Emotional engagement and enthusiasm

Observations were conducted collaboratively by the researcher and supporting observers during both face-to-face and LMS-supported activities.

Students' creative thinking abilities were measured using essay-based tests developed based on Guilford's creative thinking indicators, including:

1. Fluency
2. Flexibility
3. Originality
4. Elaboration

The test items focused on contextual environmental and geographical problems requiring students to generate innovative and applicable solutions.

Documentation techniques were used to collect supporting data related to learning activities, including photographs, screenshots of Edmodo discussions, project outputs, digital assignments, and classroom interaction records.

Validity and Reliability of Instruments

The research instruments were validated through expert judgment involving geography education lecturers and educational evaluation experts. The validation process focused on content relevance, clarity of instructions, contextual appropriateness, and alignment with creative thinking indicators. Instrument reliability was tested prior to implementation to ensure consistency and accuracy in measuring students' learning activeness and creative thinking abilities.

Data Collection Techniques

Data collection was conducted through observations, pretest-posttest assessments, and documentation studies.

- Observation techniques were used to monitor students' learning activeness throughout the intervention process.
- Pretest and posttest assessments measured students' creative thinking abilities before and after the intervention.
- Documentation techniques provided supporting evidence regarding collaborative learning processes and LMS-based interaction activities.

Data Collection Techniques

The collected data were analyzed quantitatively using descriptive and inferential statistical techniques. Descriptive statistics were used to calculate:

- mean scores,
- percentage scores,
- gain scores,
- and categories of learning activeness and creative thinking improvement.

The effectiveness of the intervention in improving students' creative thinking abilities was analyzed using the normalized gain (N-Gain) formula:

$$N - Gain = \frac{Postest - Pretest}{Maximum\ Score - Pretest} \quad (1)$$

The interpretation of N-Gain values followed the following criteria:

Table 1. N-Gain Interpretation Criteria

N-Gain Score	Category
$g \geq 0.70$	High
$0.30 \leq g < 0.70$	Moderate
$g < 0.30$	Low

To determine whether there were statistically significant differences between pretest and posttest results, paired sample t-tests were conducted using statistical software. The significance level used in this study was 0.05.

Ethical Considerations

Prior to conducting the study, permission was obtained from the school administration and classroom teachers. All participants voluntarily participated in the learning activities and assessments after receiving explanations regarding the research objectives and procedures. Students' identities and personal information were kept confidential, and all collected data were used exclusively for academic research purposes.

RESULTS AND DISCUSSION

RESULTS

Students' Learning Activeness Before and After the Intervention

The implementation of Project-Based Learning (PjBL) integrated with Focus Group Discussion (FGD) and Learning Management System (LMS)-supported learning demonstrated substantial improvement in students' learning activeness during geography instruction. Classroom observations conducted before the intervention indicated that geography learning activities were still predominantly teacher-centered, resulting in relatively passive student participation during discussions and classroom interactions.

Prior to the intervention, students tended to rely heavily on teachers' explanations and showed limited confidence in expressing opinions, asking questions, or contributing ideas during classroom discussions. Students also demonstrated low engagement in collaborative problem-solving activities related to geosphere and environmental issues.

After the implementation of collaborative digital learning activities, students' participation increased significantly across various indicators of learning activeness, including visual participation, oral participation, listening engagement, writing activities, and emotional involvement during learning sessions.

Table 2. Comparison of Students' Learning Activeness Scores

Assessment	Average Score	Category
Pre-Intervention	63.6	Moderate
Post-Intervention	87.0	Very High
Improvement	+23.4	-

The findings indicate that integrating PjBL, FGD, and LMS-supported learning created more interactive and inclusive learning environments that encouraged students to actively participate both during face-to-face and online learning activities. Students who were initially passive in classroom discussions became more engaged through digital interaction spaces provided by the Edmodo platform. Observational data further revealed that students demonstrated stronger enthusiasm and collaboration during project discussions related to environmental issues occurring in their local surroundings. Students actively shared ideas, responded to peers' opinions, and collaboratively discussed possible environmental solutions through both classroom discussions and online collaborative forums.

The results of pretest and posttest assessments demonstrated significant improvement in students' creative thinking abilities after participating in collaborative digital geography learning activities. The creative thinking assessments focused on students' abilities to generate innovative, flexible, original, and elaborative solutions related to geosphere phenomena and environmental problems. Before the intervention, many students experienced difficulties in producing alternative solutions and contextual ideas regarding environmental challenges. Students' responses were generally descriptive and limited to conventional textbook-based explanations. However, after participating in project-based inquiry and collaborative discussions, students demonstrated more diverse and innovative approaches to environmental problem-solving.

Table 3. Comparison of Pretest and Posttest Scores on Creative Thinking Skills

Assessment	Average Score	Category
Pretest	62.0	Moderate
Posttest	86.2	Very High
N-Gain	0.63	Moderate

The average posttest score exceeded the minimum learning achievement criteria, indicating substantial improvement in students' creative thinking abilities after the intervention. The N-Gain score of 0.63 categorized the effectiveness of the learning intervention within the moderate improvement category. The findings suggest that integrating project-based inquiry, collaborative discussion, and

digital learning platforms effectively stimulated students' creativity in generating environmental problem-solving ideas. Students became more capable of proposing contextual and innovative solutions related to issues such as flooding, waste management, deforestation, and pollution within their surrounding communities.

The implementation of the Edmodo Learning Management System played an important role in facilitating continuous collaboration and interaction beyond classroom boundaries. Students utilized Edmodo to access learning materials, participate in asynchronous discussions, upload assignments, exchange feedback, and coordinate project activities. The digital learning environment provided more flexible participation opportunities, particularly for students who initially felt hesitant to participate actively in face-to-face classroom discussions. Through online forums and written interaction spaces, students demonstrated increased confidence in expressing opinions and sharing creative ideas.

Several students actively utilized Edmodo discussion features to continue collaborative inquiry outside school hours. Teachers also provided digital scaffolding by uploading environmental case studies, instructional videos, and guiding questions to support project development and reflective discussion.

Table 4. Students' Participation in LMS-Supported Learning Activities

LMS Activity	Student Participation
Accessing Learning Materials	Very Active
Online Group Discussions	Active
Assignment Submission	Very Active
Feedback Exchange	Active
Collaborative Project Coordination	Active

The findings indicate that LMS-supported learning environments contributed positively to students' engagement, learning flexibility, and collaborative interaction during project implementation.

Another important finding of this study was the emergence of ecological creativity among students during project-based learning activities. Students developed various contextual environmental solutions and creative project outputs related to local geographical and environmental issues. For example, one student group proposed a simple school drainage filtration system to address flooding and waste accumulation problems around the school environment. Another group developed digital environmental campaigns using QR-code-based posters to raise awareness regarding deforestation and pollution issues within the local community. These findings demonstrate that collaborative geography projects encouraged students not only to understand environmental problems theoretically but also to creatively design practical and socially relevant solutions for sustainability-related challenges.

DISCUSSION

The findings of this study demonstrate that integrating Project-Based Learning (PjBL), Focus Group Discussion (FGD), and Learning Management Systems (LMS) contributes positively to students' learning activeness and creative thinking abilities in geography learning. The combination of collaborative inquiry, project-based activities, and digital interaction transformed geography learning into a more participatory, contextual, and creativity-oriented educational process.

One significant finding concerns the substantial increase in students' learning activeness after the intervention. Prior to the implementation of collaborative digital learning, students tended to demonstrate passive classroom behavior due to the dominance of teacher-centered instructional approaches. However, the integration of PjBL and FGD encouraged students to actively participate in discussions, collaborative inquiry, and project development activities. This finding supports constructivist learning theory, which emphasizes that students develop deeper understanding when actively engaged in knowledge construction through social interaction and experiential learning processes (Vygotsky & Luria, 1978).

The implementation of Focus Group Discussion further strengthened collaborative interaction and reflective dialogue among students. Through structured group discussions, students exchanged ideas, evaluated alternative perspectives, and collaboratively formulated solutions to environmental problems related to geosphere phenomena. Sorensen (2021) explain that dialogic interaction in

collaborative learning environments contributes significantly to the development of reasoning, communication, and higher-order thinking skills. In this study, FGD functioned as an important mechanism for stimulating students' confidence and participation during learning activities.

Another important finding concerns the improvement of students' creative thinking abilities. The project-based learning process required students to investigate environmental problems, generate alternative solutions, and produce meaningful project outputs relevant to their local contexts. Such learning experiences stimulated fluency, flexibility, originality, and elaboration aspects of creative thinking. Previous studies similarly found that project-based inquiry supports creativity development because students are challenged to solve authentic problems through innovative and contextual approaches (Johnson et al., 2019; Spires et al., 2019).

The integration of LMS-supported learning environments also played a substantial role in creating more inclusive and flexible collaborative learning spaces. Through Edmodo, students were able to continue discussions, access learning resources, exchange feedback, and coordinate projects outside classroom hours. Digital learning platforms therefore extended collaborative interaction beyond physical classroom limitations and encouraged broader student participation. This finding aligns with digital pedagogy perspectives emphasizing that technology-supported learning environments enhance student engagement, communication, and collaborative knowledge construction in contemporary education (Shaikh, 2026; Väätäjä & Ruokamo, 2021).

An important aspect emerging from this study is the development of ecological creativity and sustainability-oriented thinking among students. Geography projects focusing on local environmental issues encouraged students to connect geographical concepts with real-world sustainability challenges occurring within their communities. Students not only analyzed environmental problems but also designed practical and innovative solutions related to waste management, flooding mitigation, and environmental awareness campaigns. This finding indicates that geography learning can contribute significantly to sustainability education by fostering environmentally responsible and creatively engaged learners.

The findings also demonstrate that contextual and blended learning environments support transformative educational experiences. Students became more emotionally and intellectually involved in learning because project activities were directly connected to their surrounding environmental realities. Transformative learning theory suggests that meaningful learning occurs when students critically reflect upon experiences and reconstruct understanding through contextual engagement and social interaction (Mezirow, 2023). In this study, collaborative digital geography learning enabled students to reinterpret environmental issues from more reflective and solution-oriented perspectives.

Despite these positive findings, several challenges were identified during the implementation process. Technical limitations related to internet connectivity, students' digital readiness, and time management occasionally affected the continuity of online collaborative activities. Teachers also required additional preparation time to design integrated project activities and manage both face-to-face and digital learning interactions simultaneously. These challenges indicate that successful implementation of LMS-supported collaborative learning requires adequate technological infrastructure and pedagogical readiness.

Overall, this study confirms that integrating PjBL, FGD, and LMS provides effective strategies for fostering students' activeness and creative thinking in geography learning. The integration of collaborative inquiry, project-based learning, and digital pedagogy creates meaningful educational experiences that support twenty-first-century competencies, sustainability awareness, and transformative geography education. Such learning approaches are essential for preparing students to become creative, collaborative, and environmentally responsible individuals capable of addressing complex social and environmental challenges in contemporary society.

CONCLUSION AND SUGGESTION

The findings of this study demonstrate that the integration of Project-Based Learning (PjBL), Focus Group Discussion (FGD), and Learning Management System (LMS)-supported learning

effectively improved students' learning activeness and creative thinking abilities in geography learning at SMAN 1 Wundulako. The implementation of collaborative digital learning transformed geography instruction from passive and teacher-centered activities into more interactive, participatory, and contextual learning experiences. Students became more actively involved in classroom discussions, collaborative inquiry, project development, and digital interaction activities both inside and outside the classroom.

The study further revealed significant improvement in students' creative thinking abilities after participating in project-based geography learning activities related to environmental and geosphere issues. Through collaborative discussions and contextual projects, students demonstrated stronger abilities in generating innovative, flexible, original, and elaborative solutions to local environmental challenges. The integration of LMS platforms such as Edmodo also contributed positively to students' participation and collaborative engagement by providing more flexible and inclusive digital learning environments.

Another important finding is that geography learning integrated with contextual environmental projects encouraged the development of ecological creativity and sustainability-oriented thinking among students. Students were able to connect geographical concepts with real-world environmental problems and produce meaningful project outputs reflecting environmental awareness and social responsibility. These findings indicate that collaborative digital geography learning can support transformative education by fostering creativity, environmental problem-solving skills, and twenty-first-century competencies.

This study implies that geography education should move beyond conventional textbook-oriented instruction toward more collaborative, technology-supported, and inquiry-based learning approaches. The integration of PjBL, FGD, and LMS may therefore serve as an effective pedagogical strategy for developing meaningful, flexible, and sustainability-oriented geography learning in contemporary educational contexts.However, this study was limited by the use of a one-group quasi-experimental design without a comparison group and a relatively small number of participants. Future studies are recommended to involve larger participant populations, apply experimental or mixed-method approaches, and examine additional variables such as digital literacy, environmental awareness, collaborative problem-solving, and ecological intelligence. Further research may also explore the effectiveness of other digital learning platforms and investigate long-term impacts of collaborative digital learning on students' creativity and sustainability competencies in geography education.

DECLARATION OF GENERATIVE AI SOURCES

During the preparation of this manuscript, the author(s) used several generative artificial intelligence (AI) tools, including Claude AI by Anthropic, Gemini by Google, and Grammarly AI, for language enhancement, grammar correction, paraphrasing assistance, and manuscript organization. All AI-assisted outputs were critically reviewed, revised, and validated by the author(s). The author(s) take full responsibility for the accuracy, originality, and final content of this manuscript.

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