(Research/Review) Article

Improving Student Creativity and Collaboration in IPAS through Project-Based Learning in Class X SMKS Muhammadiyah Bungoro

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Abstract: This study aims to: (1) describe the level of creativity in Grade X students at SMKS Muhammadiyah Bungoro, (2) examine the implementation of the Project-Based Learning (PBL) model in the classroom, and (3) analyze the improvement in students' collaborative skills through PBL. The research employs a Classroom Action Research (CAR) method conducted in two cycles, each consisting of planning, action implementation, observation, and reflection. The study involved 25 Grade X students at SMKS Muhammadiyah Bungoro. Data collection techniques included observation, documentation, and interviews, with qualitative data analysis presented in percentage form. The findings indicate that: (1) students' creativity was initially low based on preliminary observations, (2) the implementation of PBL in the IPAS subject significantly enhanced students' creativity, showing improvement in all measured indicators, and (3) the PBL model also improved students' collaborative skills, increasing from 48% in the pre-cycle to 53.85% in Cycle I and 83.65% in Cycle II, surpassing the expected 80% threshold in the "collaborative" category. These findings highlight the effectiveness of PBL in fostering creativity and collaboration among students.

Keywords: Creativity, Collaboration, Project-Based Learning, Classroom Action Research, IPAS

1. Introduction

Education is one of the most fundamental pillars of national development, a driver of progress that shapes individuals and communities alike. In Indonesia, the educational landscape is evolving, driven by the urgency to equip students with 21st-century skills. According to Maki (2022), modern education should prepare students not only with theoretical knowledge but also with critical thinking, problem-solving, creativity, communication, and collaboration skills essential for competing in the era of Industry 4.0. However, despite ongoing reforms, the practical application of these competencies remains a challenge, particularly in vocational high schools, where students must master both theoretical and hands-on learning.

The Indonesian Ministry of Education and Culture Regulation No. 103 of 2014 states that students must actively seek, create, process, and apply knowledge. To internalize and apply learning effectively, students need opportunities to work collaboratively in problem-solving environments. Yet, in many classrooms, students struggle with creativity and collaboration. They tend to form groups with close friends rather than engaging in meaningful collaboration with diverse peers. Furthermore, distractions such as mobile phone usage hinder effective

communication, leading to disengagement from interactive learning. These issues are evident in Grade X students at SMKS Muhammadiyah Bungoro, where creativity and collaborative skills remain underdeveloped, particularly in Project IPAS classes. While students exhibit creative potential, many find it difficult to articulate and transform their ideas into tangible projects. The lack of motivation and structured guidance further exacerbates the issue, limiting the effectiveness of project-based learning approaches.

Several studies have provided empirical support for the effectiveness of PBL in fostering these skills. For instance, Kurniawati and Wardani (2023) examined the impact of PBL on students' collaboration skills in an IPAS class at SD Negeri Prembulan. Their findings revealed an 8.36% improvement in collaboration from the first to the second cycle of learning, surpassing the predetermined threshold of 7.5%. Similarly, Ruhmawati et al. (2024) demonstrated that PBL improved students' collaboration in Pancasila education, with a 42.1% increase in cycle one and a further 57.8% improvement in cycle two. These results underscore the potential of PBL in enhancing collaborative skills across different subjects.

Creativity, another crucial component of 21st-century learning, has also been explored in relation to PBL. A study by Agustin, Sutisnawati, and Maula (2023) assessed the effectiveness of PBL in enhancing students' creativity in science education. Their research showed a significant increase in creativity from an initial average score of 2.28 in the pre-cycle phase to 3.08 in the first cycle and 3.53 in the second cycle, demonstrating that PBL effectively nurtures creative thinking. Likewise, Widiastuti, Istihapsari, and Afriady (2020) found that implementing PBL led to a 6% increase in creativity indicators and an 8% improvement in student project outcomes, reinforcing the claim that PBL fosters both innovation and applied learning.

Despite the growing body of research supporting PBL, gaps remain in understanding its application in vocational high schools, particularly in subjects that integrate social and natural sciences, such as Project IPAS. Existing studies, while demonstrating positive outcomes in collaboration and creativity, often fail to address the unique challenges vocational students face, including practical skill application and real-world project implementation. Additionally, most studies focus on improving general classroom engagement rather than systematically measuring skill development through structured cycles of action research.

Moreover, while PBL has been shown to enhance collaboration, previous research does not fully explore the factors that hinder effective collaboration, such as communication barriers and social dynamics within groups. Rahayu et al. (2019) emphasize that collaboration requires not only teamwork but also compromise, responsibility, and flexibility—elements that are often overlooked in traditional PBL applications. In the case of SMKS Muhammadiyah Bungoro, students exhibit tendencies to work within their comfort zones, limiting exposure to diverse perspectives and reducing the effectiveness of group-based learning.

The issue of creativity also presents a critical gap. While many students have latent creative potential, they struggle with translating ideas into concrete outputs due to a lack of structured guidance and motivational frameworks. The studies by Agustin et al. (2023) and Widiastuti et al. (2020) highlight creativity improvements in general education settings, but their findings do not address how vocational students, who require both theoretical and practical competencies, can be systematically guided to enhance creativity in project-based learning environments.

To address these gaps, this study aims to explore the impact of Project-Based Learning on creativity and collaboration among Grade X students at SMKS Muhammadiyah Bungoro in the Project IPAS class. Specifically, this research seeks to: (1) analyze the current state of creativity among students in the given context, (2) examine the implementation of PBL in Project IPAS and its influence on student engagement, and (3) assess the extent to which PBL improves students' collaborative skills. By structuring the study around a Classroom Action Research (CAR) framework, this research will provide empirical evidence on how PBL can be effectively adapted to vocational high school settings, ensuring both creativity and collaboration are fostered in a meaningful way. The novelty of this research lies in its dual focus on creativity and collaboration within a vocational high school setting, particularly in an interdisciplinary subject like Project IPAS. Ultimately, this research aims to bridge the gap between theoretical knowledge and practical application, ensuring that students are not only prepared for academic success but also equipped with the essential skills needed for real-world problem-solving and innovation.

2. Preliminaries or Related Work or Literature Review

Creativity

Creativity is the ability to generate new and original ideas, which plays a crucial role in the teaching and learning process (Ningrum, 2016). While often perceived as an innate talent, creativity can be cultivated through structured learning processes that enhance productivity, problem-solving, imagination, and the ability to generate valuable outcomes (Taula & Angreni, 2018). The term "creativity" originates from the English word to create, signifying the act of producing something new (Hamalik, 2016). Creativity involves openness to new experiences, curiosity, resilience in solving complex tasks, and active participation in learning (Slameto, 2017). Creative individuals tend to be independent, confident, and willing to take risks while remaining responsible (Oktiani, 2017). Indicators of creativity include fluency in generating ideas, flexibility in problem-solving, originality in responses, and the ability to elaborate on thoughts (Munandar, 2012). Additionally, creative behavior is characterized by curiosity, critical questioning, spontaneous expression, imagination, and an ability to develop

unique perspectives (Uno & Mohamad, 2011). Creativity emerges from a dynamic interaction between individuals and their environment, requiring both internal motivation and external stimuli to flourish (Sudjana, 2017). It is a multifaceted process involving problem identification, hypothesis formulation, evaluation, and refinement of ideas, ultimately leading to novel and meaningful outcomes (Azis, 2019). While intelligence and creativity are often linked, they function differently, as analytical thinking does not always equate to creative thinking, underscoring the need for targeted educational approaches to nurture creativity in students (Azis, 2019).

Collaboration

Collaboration is a social process that involves collective activities aimed at achieving shared objectives through mutual assistance and understanding of each participant's role (Abdulsyani, 2007). As defined by Roucek and Warren, collaboration is the act of working together to attain a common goal, making it one of the most fundamental social processes. Typically, collaboration entails a division of labor, where each participant is responsible for specific tasks to ensure overall success. Various scholars have further expanded on this concept; Jonathan (2004) describes collaboration as an ongoing interaction between individuals, while the American Heritage Dictionary (2000) defines it as the cooperative effort of multiple individuals working toward a unified purpose. Gray (1989) emphasizes collaboration as a process where parties recognize and navigate differences in perspectives to arrive at a mutually beneficial solution, while Lindeke and Sieckert (2005) view collaboration as a deliberate and knowledge-sharing endeavor that requires accountability from all involved parties. These perspectives collectively highlight collaboration as a structured and goal-driven interaction involving individuals, institutions, or stakeholders who share mutual benefits and consequences. Djumara (2008) outlines seven core values essential to effective collaboration, including respect, integrity, a sense of ownership, consensus-building, accountability, trust-based relationships, and recognition. Carpenter (2009) identifies key characteristics of collaboration, such as non-hierarchical participation, shared responsibility, problem definition, peer education, option evaluation, and collective implementation of solutions. Collaboration can manifest in different forms: primary collaboration, where individuals integrate fully into a cohesive group (Narwoko, 2004); secondary collaboration, which is more specialized and formalized, often seen in modern organizations (Ahmadi, 2004); and tertiary collaboration, which arises from latent conflicts and opportunistic alliances, often characterized by loose organizational structures (Ahmadi, 2004). The benefits of collaboration include enhanced professional expertise, optimized resource utilization, improved job satisfaction, stronger team cohesion, and clear role distribution (Meilinawati, 2018). Furthermore, collaboration serves as an innovation strategy among institutions and individuals to address challenges, create new solutions, and overcome obstacles efficiently (Lai, 2011).

Project-Based Learning

Project-Based Learning (PBL) is an instructional model that centers on project-based activities as the core of the learning process, effectively enhancing students' creativity and engagement. According to Sukmanasa (2016), PBL fosters analytical thinking, active participation, teamwork, and creative learning. Defined as a learning approach that integrates projects to develop knowledge, skills, and attitudes, PBL enables teachers to structure classroom activities around collaborative projects, where students engage in problem-solving, decision-making, and independent exploration (Jeliza, 2021). Teachers function as facilitators, guiding students to discover answers through various learning methods while encouraging teamwork and collaboration (Smantish, 2014). The defining characteristics of PBL include student-driven decision-making, collaborative problem-solving, critical thinking, and diverse final project formats, such as presentations or performances (Hosnan, 2014). The advantages of PBL include its ability to create real-world learning experiences, foster active and creative engagement, promote collaboration, and enhance communication skills (Pradita, 2016). However, it also presents challenges, such as requiring skilled teachers, extensive time allocation, and adequate resources to support project completion (Sunita & Mahendra, 2019). The primary objectives of PBL are to cultivate students' active and creative problem-solving abilities, develop resource management skills, and facilitate real-world application of knowledge while fostering teamwork and empathy among learners. The structured implementation of PBL follows a six-step process: project selection, planning, scheduling, project execution with teacher monitoring, finalizing and presenting the project, and evaluation (Eko, 2015).

3. Proposed Method

This study employs a Classroom Action Research (CAR) methodology based on the Kemmis and McTaggart model, conducted at SMKS Muhammadiyah Bungoro in the even semester of the 2024/2025 academic year. The research involves Grade X LAS students and follows a qualitative field research approach to examine the effectiveness of Project-Based Learning (PjBL) in enhancing creativity and collaboration skills. The study consists of multiple cycles, each comprising planning, action implementation, observation, and reflection, with adjustments made for continuous improvement. Data collection methods include observation, documentation, and interviews, while data analysis follows a qualitative approach, presenting findings in percentage form. The study measures creativity through the percentage of active students and evaluates collaboration skills based on established criteria (Karomah in Satria, Nurmalina, & Kusuma, 2021). The research aims to achieve increased student creativity and collaboration in Project IPAS classes, with success indicated by an improvement in students' engagement and teamwork within the learning process.

4. Results and Discussion

Research result

Table 1. Student creativity observation sheet with the Project Based Learning Cycle I learning model.

No.	Indicator	Cycle I								Average (%)
		Frequency				Percentage (%)				
		I	II	III	IV	I	II	III	IV	
1.	Have a great curiosity	17	19	19	21	68	76	76	84	76
2.	Often ask meaningful questions	14	15	18	20	56	60	72	80	67
3.	Providing many ideas and suggestions in a problem	7	7	8	10	28	28	32	40	32
4.	Able to express opinions spontaneously and without hesitation	13	15	15	16	52	60	60	64	59
5.	Have and appreciate a sense of beauty	4	5	6	6	16	20	24	24	21
6.	Have your own opinion and can express it, without being influenced	5	7	8	8	20	28	32	32	28
7.	Have a strong imagination	2	1	2	3	8	4	8	12	8
8.	Able to put forward thoughts, problem solving ideas that are different from others (original)	12	14	14	15	48	56	56	60	55
9.	Enjoy trying new things	3	4	5	7	12	16	20	28	19
10	Able to develop or detail an idea (elaboration ability)	2	2	3	4	8	8	12	16	11

The observation data from Cycle I of the Project-Based Learning model indicate varying levels of student creativity across different indicators. The highest average percentage (76%) was observed in students' curiosity, showing that most students were eager to explore new ideas. Similarly, their ability to ask meaningful questions (67%) and express spontaneous opinions (59%) demonstrated moderate engagement in critical thinking and participation. However, creativity in providing original solutions (55%) and the ability to detail ideas (11%) remained relatively low, suggesting a need for further encouragement and structured guidance. The weakest aspects were strong imagination (8%) and appreciation of beauty (21%), indicating that students might require more exposure to activities that foster creative exploration and aesthetic appreciation. Overall, while some indicators showed promising improvement throughout the cycle, further interventions are needed to enhance students' ability to generate ideas, articulate unique thoughts, and engage in deeper creative problem-solving.

Table 2. Observation sheet of students' collaboration skills with the Project Based Learning Cycle I learning model

No.	Indicator	Percentage of Cycle I (%)			
		I	II	III	IV
1.	Group Cooperation	51	53	53	58
2.	Adjusting to group friends	48	51	56	60
3.	Responsible for group work	52	52	55	61
4.	Discuss in making decisions	46	48	56	60
5.	Communicate well in groups	59	54	57	57
Average/meeting		49.2	51.6	55.4	59.2
Average (%)		53.85			

Based on research conducted at SMKS Muhammadiyah Bungoro, it was shown that the percentage of students participating in activities was still low, and there were still students who had not participated in discussions.

Table 3. Student creativity observation sheet with the Project Based Learning Cycle II learning model

No.	Creativity Indicator Student	Cycle I								Average (%)
		Frequency				Percentage (%)				
		I	II	III	IV	I	II	III	IV	
1.	Have a great curiosity	20	22	23	23	80	88	92	92	88
2.	Often ask meaningful questions	17	18	20	21	68	72	80	84	76
3.	Providing many ideas and suggestions in a problem	13	13	15	16	52	52	60	64	57
4.	Able to express opinions spontaneously and without hesitation	15	17	18	20	60	68	72	80	70
5.	Have and appreciate a sense of beauty	10	11	11	12	40	44	44	48	44
6.	Have your own opinion and can express it, without being influenced	6	8	11	10	24	32	44	40	35
7.	Have a strong imagination	5	5	8	9	20	20	32	36	27
8.	Able to put forward thoughts, problem solving ideas that are different from others (original)	15	17	17	19	60	68	68	76	68
9.	Enjoy trying new things	8	10	12	13	32	40	48	52	43
10	Able to develop or detail an idea (elaboration ability)	6	7	9	8	24	28	36	32	30

Table 4. Observation sheet of students' collaboration skills with the Project Based Learning Cycle II learning model

No.	Indicator	Percentage of Cycle II (%)			
		I	II	III	IV
1.	Group Cooperation	76	80	88	92
2.	Adjusting to group friends	79	84	87	91
3.	Responsible for group work	73	80	81	88
4.	Discuss in making decisions	76	86	85	91
5.	Communicate well in groups	72	80	90	94
Average/meeting		75.2	82	86.2	91.2
Average (%)		83.65			

Based on the research conducted in cycle II, it is shown the percentage of students who participate in activities during the learning process. At the same time, students have focused on paying attention to what the teacher says. Students have also started to be active and very creative in asking questions, and the teaching and learning conditions are very supportive.

5. Discussion

Data Analysis of Student Creativity

The results of research activities in both cycles I and II in class X LAS for the subject of the Science Project are presented in tables 1 and 3. From the data found, student creativity increased for all observation categories in cycle II compared to cycle I. So, it can be concluded that using the Project Based Learning model provides increased creativity in students because Project Based Learning can involve active, innovative and skilled students and can develop ideas and concepts through projects that have been made.

In this stage of activity, students' abilities begin to appear in the indicator of high curiosity when students are given basic questions about the project to be carried out. In the aspect of authenticity (originality), students put forward thoughts, problem-solving ideas that are

different from others, so that students are able to create unique and interesting projects. In the aspect of elaboration, students are able to explain in more detail the concept of the project that has been created, in the aspect of flexibility, students are able to answer questions well. This is in accordance with research that project-based learning allows students to find new ideas that make students more creative.

Data Analysis of Students' Collaboration Skills

Based on tables 3 and 4 above, it can be seen that the results of observations of students' collaborative learning abilities in class X LAS SMKS Muhammadiyah Bungoro in cycle 1 showed an increase in students' collaboration abilities with an average percentage of 53.85% of 25 students, which means it cannot be said to be successful because the expected success score is 80% of 25 students. Based on observations that have been made in cycle I, it was found that students' collaboration skills are still included in the "less" category. In the learning process, there are still many students who have not shown good cooperation skills. This can be seen from several phenomena, such as some students still disturbing their friends during the learning process, some students still seem reluctant to work with group friends chosen by the teacher and some students are seen who still don't care about their group friends or don't want to help their group friends. Based on the reflection and results of cycle I, cycle II research is needed by considering these findings to design a more effective implementation of cycle II in improving students' cooperation skills. So researchers still need to do the next cycle.

Based on the results of the research cycle I, the researcher still needs to continue cycle II because it has not achieved the researcher's objectives. Based on tables 4.4 and 4.6 above, the percentage of successful student collaboration skills increased by 83.65%, which means that the student collaboration skills success score has been achieved. The results of a significant increase in student learning collaboration from the pre-cycle, cycle I, and cycle II are presented in tables 4.2, 4.4, and 4.6. This increase can be seen from the initial 48%, in cycle I it increased to 53.85%, and in cycle II it increased again to 83.65%. This has achieved the expected indicator of 80% with the "collaborative" category. This step was taken to improve collaboration skills by implementing the Project based learning method to improve learning activities, such as starting from forming groups with freedom to choose, clear division of tasks, and giving rewards. The findings of this study based on data obtained from cycle II, it can be said that the application of the Project based learning model has succeeded in improving students' collaborative learning skills in the IPAS Project learning process, and exceeding the expected indicator of 80%. In cycle II, students in their groups have shown good collaboration skill criteria. They can work together, adjust to group mates, be responsible for group work, and always discuss decision making within their groups to achieve common goals.

6. Conclusion

This study concludes that the creativity and collaboration skills of Grade X LAS students at SMKS Muhammadiyah Bungoro were initially low, as indicated by the preliminary observations. However, the implementation of the Project-Based Learning (PjBL) model in Project IPAS significantly improved students' creativity across various indicators. Additionally, PjBL positively impacted students' collaboration skills, increasing from 48% in the pre-cycle to 53.85% in Cycle I and further improving to 83.65% in Cycle II, surpassing the targeted 80% threshold categorized as "collaborative." These findings suggest that PjBL is an effective instructional approach for fostering student engagement, creative thinking, and teamwork in vocational high school settings.

Despite these promising outcomes, the study has several limitations. The research was conducted within a specific timeframe (January–March 2025) and focused on a single school, limiting the generalizability of the results. Additionally, variations in students' learning styles and prior knowledge may have influenced the effectiveness of PjBL, suggesting that future research should incorporate a more diverse sample across different schools and educational levels. Another limitation concerns the potential influence of extraneous factors, such as student motivation and classroom dynamics, which were not controlled in this study. Further research should consider a longitudinal approach to assess the long-term impact of PjBL on students' creativity and collaboration skills.

Teachers should adopt Project-Based Learning as a core instructional method to enhance student creativity and collaborative abilities in vocational education settings.

Students must take an active role throughout the learning process, engaging from the project planning phase to execution and evaluation, to maximize the benefits of PjBL.

Future researchers should explore additional instructional strategies that complement PjBL, addressing potential gaps and refining its implementation to optimize student learning outcomes.

7. Limitation

One limitation of this study is its restricted scope, as it was conducted within a single school, SMKS Muhammadiyah Bungoro, with a specific group of Grade X LAS students, limiting the generalizability of the findings to broader educational settings. Additionally, the study was conducted over a relatively short period (January–March 2025), which may not fully capture the long-term effects of Project-Based Learning (PjBL) on students' creativity and collaboration skills. The study also did not control for external factors such as students' prior knowledge, motivation levels, or classroom dynamics, which may have influenced the outcomes. Furthermore, the assessment of creativity and collaboration relied on observational data, which, while structured, may be subject to observer bias and interpretation. Despite these limitations, the research provides valuable insights into the potential of PjBL as an instructional approach, but future studies should consider expanding the sample size, extending the study duration, and incorporating a more controlled methodology to strengthen the validity and applicability of the findings.

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