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Empowering Teachers to Design 6C-Integrated Project-Based Learning for 21st-Century Classrooms

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ABSTRACT

Teachers' poor ability to connect abstract mathematical concepts with contextual phenomena is a major challenge in secondary schools. Consequently, student engagement is low, 21st-century skills are poorly developed, and learning innovations are rare. This situation demands solutions that are not merely theoretical but also practical, contextual, and easy to implement. This community service activity aims to increase the capacity of partner teachers in designing, implementing, and evaluating project-based mathematics learning that integrates six 21st-century competencies (Critical Thinking, Creativity, Collaboration, Communication, Citizenship, and Character). The proposed solution is the implementation of the 6Cs-based Mathematics Learning Project Design Model, which combines 21st-century pedagogical principles with a Project-Based Learning (PjBL) approach. The implementation method included: outreach, teacher training on the 6Cs and PjBL concepts, intensive mentoring in project design and implementation, and evaluation. The results showed that the training went smoothly and received a positive response. Participants participated in all stages of the activity, and mathematics teachers were able to develop learning projects according to what was explained during the training. During the implementation process, subjects were also able to implement and receive positive responses in learning. This was evident in the improvement in students' pretest and posttest scores. Activity data indicates an increase in teacher competency after they received training and mentoring, with average scores on several dimensions increasing to 3.44–3.50. The initial impact on student learning achievement is also evident in the increase in the average score from 78.20 to 80.75 and the lowest score from 60 to 70. These findings underscore that the implementation of Project-Based Learning combined with 6C skills not only strengthens teacher readiness but also plays a role in improving student learning outcomes in a more contextual and meaningful way.

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INTRODUCTION

The changing times, marked by technological advancements, globalization, and increasingly complex social issues, demand that the education sector continue to adapt. These demands focus not only on the acquisition of knowledge but also on the development of 21st-century skills, which include critical thinking, creativity, collaboration, communication, character development, and a sense of global citizenship. These six skills, known as the 6Cs, serve as a crucial framework for preparing the younger generation to compete and contribute in this dynamic era (Fullan & Langworthy, 2009; Trilling & Fadel, 2009). Today's education must move beyond the paradigm of simply transferring information, toward learning that empowers students to actively engage, solve real-world problems, and develop human values. This ensures that learning becomes a process relevant to their lives while simultaneously aligning with future challenges.

Mathematics, as a subject that hones logic, reasoning, and analytical skills, has significant potential to support the development of the 6Cs. However, mathematics learning practices in many schools still tend to be procedural and focus on memorizing problem-solving steps (Safitriana et al., 2025). This approach often leaves little room for students to explore concepts independently or relate them to real-world contexts (Boaler, 2022). As a result, students potentially miss opportunities to develop higher-order thinking skills, creativity, and collaborative attitudes. However, when mathematics is presented as contextual and meaningful challenges, students can develop a deeper understanding and build confidence in their own abilities. Teachers, in this regard, play a strategic role in creating learning conditions that encourage the development of these competencies.

Initial assessment results of the project partners, namely teachers from private junior high schools in East Java, revealed a gap between curriculum targets and classroom implementation. A survey of 16 teachers from various subjects found that 88% had never received training on project-based learning (PjBL) design integrated with the 6C framework. Furthermore, 84% admitted to experiencing difficulties designing projects relevant to students' lives. This finding aligns with an OECD report, which asserts that many teachers in developing countries still lack access to in-depth professional training related to innovative learning (OECD, 2020). In this program, all teachers will participate in a general training session, while intensive mentoring will focus on two mathematics teachers to support deeper implementation in the subject. This strategy is expected to create a ripple effect, where successful implementation in one subject can inspire other teachers.

Project-Based Learning (PjBL) is an effective approach to integrating skills into the teaching and learning process. This model positions students as active participants, solving authentic problems, collaborating, and producing tangible products (Bell, 2010). In the context of mathematics, PjBL encourages students to connect the concepts they learn with real-world applications, thereby simultaneously developing conceptual understanding and problem-solving skills (Savery, 2015). Careful planning is needed to implement PjBL effectively, starting from project formulation, implementation strategies, to authentic assessments that can measure student competencies comprehensively (Suhartini, 2024; Thomas et al., 2000). Teachers also need to ensure that character values such as responsibility, integrity, and cooperation are embedded during the project work process.

The characteristics of the teachers at this school demonstrate significant potential for empowerment. Most of them are full-time educators with more than five years of teaching experience, active in teacher communities and school forums, and highly motivated to improve themselves. They demonstrated a strong desire to try new, more interactive and relevant learning methods. Openness to innovation was

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crucial to the program's success, despite the fact that the majority of students lacked direct experience in creating learning projects. These findings align with research conducted by Husniza, who stated that teachers' openness to new approaches, especially with ongoing mentoring, is key to the success of professional development programs (Husniza & Yacob, 2023). The limited availability of concrete examples and references to locally relevant teaching materials was the most challenging obstacle. This condition aligns with research (Hammond et al., 2017), which states that a lack of contextual learning resources is often a major barrier to learning progress in schools. Furthermore, teacher participation in learning communities such as MGMPs can accelerate the adoption of new methods by enabling the exchange of experiences and collaboration in solving learning problems (Vescio et al., 2008). Therefore, regular training and mentoring are essential for transforming their teaching practices.

Although numerous studies highlight the importance of incorporating 21st-century competencies into the teaching and learning process, its implementation in schools remains suboptimal, particularly in systematically integrating the Project-Based Learning model with the 6Cs framework. This situation indicates a gap between curriculum expectations and the reality of classroom learning. Therefore, this program aims to strengthen teachers' capacity in designing and implementing project-based learning aligned with the 6Cs skills, as well as assessing its impact on teacher preparedness and student achievement.

This community service activity aims to support the national education agenda and meet the need for better education. Recent research shows that teachers' ability to integrate contextual learning with 21st-century skills significantly impacts the success of improving education quality (Oudeweetering & Voogt, 2018). Furthermore, research by Saito (2022) found that project-based training designed collaboratively by teachers and academics can help teachers develop innovative learning strategies that are aligned with local and global needs. Other research also shows that collaboration between universities and schools significantly helps accelerate the adoption of more innovative learning approaches. By enhancing teachers' ability to develop project-based learning relevant to local contexts and global needs, it is hoped that a flexible, resilient, and superior young generation will be formed to face future challenges. Strengthening teachers' ability to create project-based learning rooted in local contexts and global needs is expected to make a real contribution to preparing a more flexible, resilient, and superior young generation with competencies now. This program is expected to have a sustainable impact. A sustainable mentoring strategy will build a culture of innovative learning in schools.

This community service activity aims to increase the capacity of partner teachers in designing, implementing, and evaluating project-based mathematics learning that integrates six competencies (Critical Thinking, Creativity, Collaboration, Communication, Citizenship, and Character). The proposed solution is the implementation of a 6C-based Mathematics Learning Project Design Model, which combines 21st-century pedagogical principles with a Project-Based Learning (PjBL) approach.

METHOD

This activity was conducted at a junior high school in East Java. The training subjects were the school's teachers. A descriptive approach was applied in this activity to assess the implementation of the community service program. Data collection aimed to observe changes in teachers' understanding and readiness after participating in a series of activities. The tools used included a Likert-scale questionnaire, pre- and post-tests, and were supported by observations and documentation during the activities. The trial subjects were three mathematics teachers who teach mathematics. This community service activity was designed using a participatory approach that positions teachers as active partners in every aspect

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of the activity. The entire program was implemented in stages so that it was not merely a short-term training but also had a lasting impact on classroom learning practices.

The activity began with a preparation and outreach phase. During this phase, the implementation team conducted initial coordination with the principal and teachers to build understanding regarding the program's goals and direction. Furthermore, partner needs were re-identified to ensure the designed activities were truly aligned with the conditions and challenges faced in the field.

The next phase was training, conducted in the form of a workshop. This activity focused on strengthening teachers' competencies in designing project-based learning. Teachers were guided to develop learning designs that integrated 21st-century skills (6Cs) while utilizing educational technology to support the learning process. During the training, participants not only received materials but also directly developed learning tools that would later be used in the classroom.

Next, in the implementation phase, teachers begin implementing the learning plans developed during the training. Project-based learning is implemented in the classroom, actively involving students and supported by the use of relevant technology. The entire process and student activity outcomes are documented as part of the implementation data and as a reflection tool.

To ensure optimal implementation, the program continues with a mentoring phase. During this phase, the community service team conducts direct and indirect monitoring and provides technical and pedagogical support to teachers. The mentoring phase also includes providing feedback on challenges that arise during the learning process, enabling teachers to make continuous improvements.

The final phase is evaluation and reflection. This process identifies good practices that can be maintained and challenges that need to be addressed. The evaluation results are then formulated into recommendations as a basis for future program development. Furthermore, to test effectiveness, a questionnaire was administered to teachers, along with a pre- and post-test.

The collected data were analyzed simply using descriptive statistics, such as means and percentages, and pretest and posttest results were compared to identify changes. Observation and reflection findings supported the quantitative findings.

RESULTS AND DISCUSSION

This activity was implemented in several stages. These stages were designed so that each stage reinforced the next, starting from establishing a common understanding to developing post-program sustainability strategies. The activities carried out at each stage are as follows:

- Socialization

The socialization activity began with an opening and introduction to the program. This activity emphasized the relevance of the activity to the real needs of teachers and the demands of the current curriculum. This activity also aimed to build a shared understanding of the importance of innovative mathematics learning that aligns with the development of 21st-century competencies.

Next, there was a presentation of the background and urgency. This activity aimed to connect the real-world conditions of the school with the solution designed by the proposing team. This explanation provided an overview of the challenges faced by teachers in mathematics learning and the reasons why the 6C skills-based project approach was considered a relevant solution.

Next, a detailed explanation of the activity stages included the schedule, targets, success indicators, and role allocation. Furthermore, participants were provided with an overview of the activity flow, from

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training, classroom implementation, to mentoring and evaluation.

- Training

This stage aimed to introduce the basic principles of PjBL and its implementation stages. In this session, participants were introduced to the basic concepts of Project-Based Learning (PjBL) and its implementation stages, from problem definition to project evaluation, so that teachers systematically understand the flow of project-based learning. Participants learned how critical thinking, creativity, collaboration, communication, character, and citizenship skills can be integrated into mathematics learning activities so that the learning process focuses not only on conceptual mastery but also on the development of 21st-century competencies.

The facilitator presented several examples of learning tools that have implemented the PjBL approach and the 6C skills as a reference for teachers in understanding the structure and steps of developing project-based learning.

In this stage, teachers also directly developed learning project designs that could be implemented in their classrooms, taking into account the suitability of the material, student characteristics, and the learning context at school.

FIGURE 1. Teacher Training in Designing Integrated 6C Project-Based Learning

- Implementation of Technology and PjBL

This stage is the actual implementation in the classroom. Teachers implement the learning designs resulting from the training, integrating PjBL, 6C skills, and educational technology. Each teacher implemented at least one project-based learning activity relevant to students' daily lives, utilizing technology for planning, implementation, and presentation. For example, see Figure 2.

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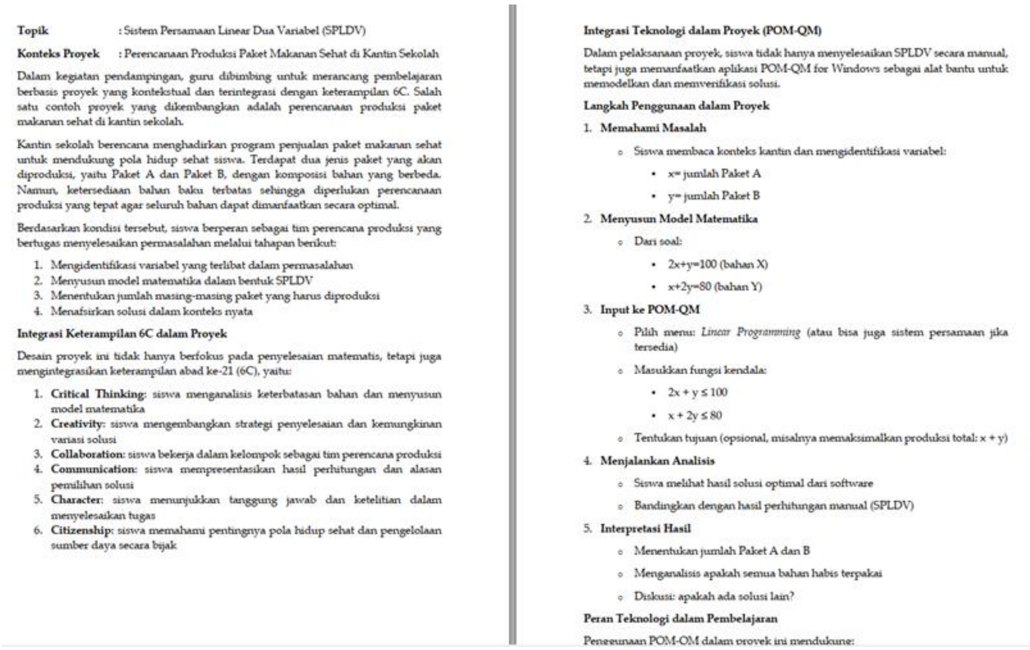

Topik : Sistem Persamaan Linear Dua Variabel (SPLDV)

Konteks Proyek : Perencanaan Produksi Paket Makanan Sehat di Kantin Sekolah

Dalam kegiatan pendampingan, guru dibimbing untuk merancang pembelajaran berbasis proyek yang kontekstual dan terintegrasi dengan keterampilan 6C. Salah satu contoh proyek yang dikembangkan adalah perencanaan produksi paket makanan sehat di kantin sekolah.

Kantin sekolah berencana menghadirkan program penjualan paket makanan sehat untuk mendukung pola hidup sehat siswa. Terdapat dua jenis paket yang akan diproduksi, yaitu Paket A dan Paket B, dengan komposisi bahan yang berbeda. Namun, ketersediaan bahan baku terbatas sehingga diperlukan perencanaan produksi yang tepat agar seluruh bahan dapat dimanfaatkan secara optimal.

Berdasarkan kondisi tersebut, siswa berperan sebagai tim perencana produksi yang bertugas menyelesaikan permasalahan melalui tahapan berikut:

1. Mengidentifikasi variabel yang terlibat dalam permasalahan
2. Menyusun model matematika dalam bentuk SPLDV
3. Menentukan jumlah masing-masing paket yang harus diproduksi
4. Menafsirkan solusi dalam konteks nyata

Integrasi Keterampilan 6C dalam Proyek

Desain proyek ini tidak hanya berfokus pada penyelesaian matematis, tetapi juga mengintegrasikan keterampilan abad ke-21 (6C), yaitu:

1. **Critical Thinking**: siswa menganalisis keterbatasan bahan dan menyusun model matematika
2. **Creativity**: siswa mengembangkan strategi penyelesaian dan kemungkinan variasi solusi
3. **Collaboration**: siswa bekerja dalam kelompok sebagai tim perencana produksi
4. **Communication**: siswa mempresentasikan hasil perhitungan dan alasan pemilihan solusi
5. **Character**: siswa menunjukkan tanggung jawab dan ketelitian dalam menyelesaikan tugas
6. **Citizenship**: siswa memahami pentingnya pola hidup sehat dan pengelolaan sumber daya secara bijak

Integrasi Teknologi dalam Proyek (POM-QM)

Dalam pelaksanaan proyek, siswa tidak hanya menyelesaikan SPLDV secara manual, tetapi juga memanfaatkan aplikasi POM-QM for Windows sebagai alat bantu untuk memodelkan dan memverifikasi solusi.

Langkah Penggunaan dalam Proyek

1. **Memahami Masalah**
   - Siswa membaca konteks kantin dan mengidentifikasi variabel:
     - x= jumlah Paket A
     - y= jumlah Paket B
2. **Menyusun Model Matematika**
   - Dari soal:
     - $2x+y=100$ (bahan X)
     - $x+2y=80$ (bahan Y)
3. **Input ke POM-QM**
   - Pilih menu: *Linear Programming* (atau bisa juga sistem persamaan jika tersedia)
   - Masukkan fungsi kendala:
     - $2x + y \leq 100$
     - $x + 2y \leq 80$
   - Tentukan tujuan (opsional, misalnya memaksimalkan produksi total: $x + y$)
4. **Menjalankan Analisis**
   - Siswa melihat hasil solusi optimal dari software
   - Bandingkan dengan hasil perhitungan manual (SPLDV)
5. **Interpretasi Hasil**
   - Menentukan jumlah Paket A dan B
   - Menganalisis apakah semua bahan habis terpakai
   - Diskusi: apakah ada solusi lain?

Peran Teknologi dalam Pembelajaran

Penggunaan POM-QM dalam proyek ini mendukung:

FIGURE 2. Example One Project by Teacher

Teachers are encouraged to utilize a variety of easily accessible technological tools, such as presentation applications, digital learning platforms, or interactive visual media, which can help students understand mathematical concepts more concretely. This technological integration is expected to not only support the delivery of material but also facilitate student collaboration, the exploration of ideas, and the presentation of project results more engagingly and communicatively. Figure 3 illustrates an example of the use of technology in solving mathematical problems, specifically using POM QM.

This documentation serves as an important data source for assessing the effectiveness of project-based learning implementation in the classroom. Furthermore, the documentation can be used as a reflection for teachers to improve future lesson plans and as examples of good practices that can be shared with other teachers in the school.

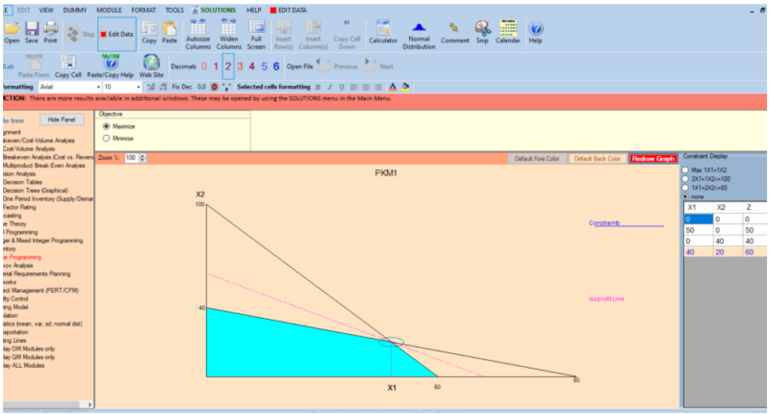

FIGURE 3. Technology using in the class

Mentoring and Evaluation

This activity begins with a review of the lesson plan before implementation. The community service team and teachers hold discussions to ensure that each learning step aligns with the principles of PjBL

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and the integration of the 6C skills. Additionally, adjustments are made to accommodate student characteristics, the availability of resources, and the allocation of classroom learning time.

The team is present in class, provides direct input, and helps address any challenges. This mentoring aims to ensure that the lesson plan can be optimally implemented in real-life learning situations. The team also observes interactions between teachers and students to provide constructive feedback on the ongoing learning process.

Teacher Characteristics and Level of Participation in Implementation

Analysis of teacher characteristics is necessary to understand the initial context of community service participants. Teaching experience, training history, and teacher involvement in mini-project implementation are important factors influencing program success and the rate of adoption of innovative learning.

TABLE 1. Characteristics of Teacher Community Service Participants

Indicator	Result
Average teaching experience	9,9 years
Teaching experience	4 – 15 years
Have participated in PjBL training	10 teacher (55,6%)
Have not participated in PjBL training	8 teachers (44,4%)
Have implemented mini-projects	4 teachers (22,2%)

Based on Table 1, the average teaching experience of the participating teachers was 9.9 years, with a range of experience ranging from 4 to 15 years. This indicates that most participants have substantial teaching experience in classroom learning practices. This relatively extensive teaching experience is crucial for implementing learning innovations, as teachers already have an understanding of student characteristics, classroom dynamics, and the demands of the school curriculum.

In terms of training experience, 10 teachers (55.6%) had participated in training related to Project-Based Learning (PjBL), while 8 teachers (44.4%) had not. This situation indicates that teachers' initial understanding of the project-based learning approach varies. Therefore, training and mentoring activities within this community service program are crucial for establishing a common understanding and strengthening teachers' competencies in designing more innovative and student-centered learning.

Meanwhile, in terms of implementation, only 4 teachers (22.2%) had previously implemented mini-projects in their lessons. This data indicates that project-based learning practices are still relatively limited in their daily learning activities. Through the training and mentoring program, it is hoped that more teachers will be encouraged to integrate project activities into mathematics learning, enabling students to develop critical thinking, collaboration, and problem-solving skills relevant to real life.

Teachers' Initial Understanding of Project-Based Learning (PjBL) and the 6C Skills (Pre-test)

Teachers' initial understanding was measured to obtain a snapshot of the situation before the program intervention. This data serves as a reference point for assessing the extent to which the training and mentoring have impacted teacher capacity development.

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TABLE 2. Descriptive Statistics of the Teachers' Initial Understanding Questionnaire

Measured Aspects	Average Score
Understanding of basic PjBL concept	3,39
Understanding the meaning of skill 6C	3,44
Habit of relating material to real world context	3,39
Experience designing project-based learning	3,44

Based on the pre-test results presented in Table 2, teachers' initial understanding of the basic concepts of Project-Based Learning (PjBL) averaged 3.39. This score indicates that teachers generally have a basic understanding of project-based learning, although their understanding is still moderate. This indicates that some teachers are familiar with the concept of PjBL, but still need reinforcement, especially in terms of more systematic implementation in the learning process.

For understanding the meaning of the 6C skills, the average score was 3.44. These findings indicate that some teachers already know the PjBL concept and 6C skills, but their understanding is still limited and has not been fully implemented in learning activities. The teachers relatively understand the importance of 21st-century skills, including critical thinking, creativity, collaboration, communication, character, and citizenship, in learning. However, this understanding has not yet been fully followed by the ability to effectively integrate the 6C skills into mathematics learning activities in the classroom. This condition is common because the implementation of innovative learning requires not only conceptual understanding, but also continuous practical experience (Kwangmuang et al., 2021).

Meanwhile, for the habit of linking material to real-world contexts and experience in designing project-based learning, average scores were 3.39 and 3.44, respectively. This indicates that some teachers have attempted to connect learning materials to everyday life situations, but the practice of designing project-based learning has not been optimally implemented. Therefore, this pre-test data serves as an important basis for implementing training and mentoring to improve teachers' understanding and skills in designing project-based learning integrated with the 6C skills.

Teacher Understanding and Skills After Training (Post-test)

Following the training and mentoring, a re-measurement was conducted to assess changes in teachers' understanding and skills. The primary focus at this stage was the extent to which teachers felt capable of designing project-based learning integrated with the 6C skills and were ready to implement it in the classroom

TABLE 3. Descriptive Statistics of Teacher Questionnaires After Training

Measured Aspects	Average Score
Understanding the steps of 6C-based PjBL	3,39
Ability to design 6C-based projects	3,44
Ability to integrate technology	3,44
Learning becomes more contextual	3,44
Readiness to implement mini-projects	3,50

Post-training measurement results indicate an increase in teachers' understanding of the implementation of Project-Based Learning (PjBL) based on the 6C skills. According to Table 3, the average score for teachers' understanding of the 6C-based PjBL steps reached 3.39, indicating that teachers have a more structured understanding of the stages of project-based learning implementation. This understanding encompasses the project planning process, student collaborative activities, and the

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evaluation of project outcomes in learning.

For the ability to design 6C-based projects, the average score was 3.44. These results indicate that after participating in the training, teachers are beginning to be able to design learning activities that focus not only on delivering material but also on integrating various 21st-century skills. This indicates that training and mentoring make a significant contribution to teachers' readiness to implement more innovative learning. The project designs developed by teachers generally included activities that encourage students to think critically, collaborate, and communicate their work.

Furthermore, for the ability to integrate technology into learning, the average score also reached 3.44. This indicates that teachers are beginning to utilize various technological tools to support the implementation of project-based learning. The use of this technology can take the form of digital presentation media, online learning platforms, or applications that assist students in processing and presenting their project results.

For the aspects of learning contextuality and readiness to implement mini-projects, the average scores reached 3.44 and 3.50, respectively, the highest scores in the table. This indicates that training and mentoring make a significant contribution to teachers' readiness to implement more innovative learning, and teachers feel more prepared to implement project-based learning that connects material to real-life situations close to students' lives. Similarly, research conducted by Hasyim et al.(2025) and Nuria (2024), suggests that with increased readiness, teachers are expected to be more confident in implementing innovative learning that can increase student engagement and understanding of mathematics material. These results confirm that continuous teacher professional development plays an important role in improving the quality of learning.

Initial Impact of Implementation on Student Learning Outcomes

As part of the initial impact evaluation of the program, an analysis of student learning outcomes was conducted in Mathematics classes that implemented mini-projects. This analysis aimed to determine whether the changes in learning approach were beginning to impact student achievement.

TABLE 4. Descriptive Statistics of Student Pre-test and Post-test

Statistics	Pre-test	Post-test
Number of Students	20	20
Minimum score	60	70
Maximum score	92	92
Average	78,20	80,75

Based on Table 4, changes in student learning outcomes are evident after the implementation of mini-project-based learning in Mathematics. The average student score increased from 78.20 on the pre-test to 80.75 on the post-test. This improvement indicates that the learning approach integrating project activities is beginning to impact students' understanding of the material being studied.

In addition to the increase in the average score, changes can also be seen in the students' minimum score, which increased from 60 on the pre-test to 70 on the post-test. This indicates that students who previously had relatively low learning outcomes began to experience progress after participating in project-based learning. This increase in the minimum score indicates that the learning approach was able to help some students better understand mathematical concepts.

Meanwhile, the maximum student score remained at 92 on both the pre-test and post-test. This indicates that students with high academic ability were able to maintain their learning performance after

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the implementation of mini-projects. Thus, project-based learning not only helps low-achieving students but also supports students with high abilities to maintain their learning outcomes.

In the pre-test, 9 students (45%) were in the high category, and 11 students (55%) were in the medium category. After implementing project-based learning, the number of students in the high category increased to 11 (55%), while the number in the medium category decreased to 9 (45%). This increase indicates that project-based learning methods have begun to have a positive effect on students' understanding, especially for those with low initial abilities. This statement is in line with the constructivist approach, which emphasizes that knowledge is formed through active and contextual learning experiences (Arafah et al., 2025).

The increase in the number of students in the high category indicates that some students experienced progress in their understanding of mathematics material after participating in project-based learning. Project activities involving problem exploration, group discussions, and presentations of work provide opportunities for students to be more active in the learning process (Amaliya & Kubro, 2025; Anggraini & Wulandari, 2020). This allows students to develop a deeper understanding of concepts through contextual learning experiences.

Furthermore, no students were in the low category in either the pre-test or post-test. This indicates that, in general, student learning outcomes have been at a fairly good level since the beginning of the learning process (Marfine & Sahrani, 2024; Syarifudin et al., 2024). With the increase in the high category after the implementation of the mini-project, it can be concluded that the project-based learning approach has begun to have a positive impact on the quality of student learning outcomes in mathematics learning.

While the data shows improvement, these findings should be critically examined. Not all teachers are immediately able to optimally implement project-based learning, as evidenced by the fact that some participants have not yet implemented projects in their classrooms. This indicates that successful implementation is not solely influenced by training but also by other factors such as teacher readiness, time constraints, and school environmental support.

These results are consistent with numerous studies confirming that project-based learning can improve student participation and academic achievement. However, other research has shown that implementing PjBL is not always effective if teachers are inexperienced or if supporting resources are limited (Ningrum et al., 2025). Therefore, the findings of this study confirm that training alone is insufficient without ongoing mentoring (Arum et al., 2026). This helps develop more contextual learning models, especially in mathematics education, which has so far been dominated by procedural approaches.

CONCLUSION

Based on the results of the activity, it can be concluded that the training conducted had a positive effect on the quality of learning, both from the perspective of teachers and students. Teachers became more focused in designing learning and began to be able to combine various competencies through a more contextual project-based approach. However, the implementation of project-based learning still faces obstacles, especially related to teacher readiness and limited time and experience in managing more complex learning. Therefore, ongoing mentoring is needed for optimal implementation. In the future, similar activities need to be developed with a wider reach and longer duration to assess a more in-depth impact.

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