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Project-Based Educational Development Management to Improve Teachers' Creative Skills Through a Differentiated Teaching Approach

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Abstract

This study aims to develop project-based education development management to improve teachers' creative skills through a differentiated teaching approach. The challenges of 21st-century education demand increased teachers' creative thinking skills, which are very important in teaching. This study involved 63 teachers from two high schools in Solo, Central Java, who were selected purposively. The research instrument was a descriptive test that measured teachers' creative thinking skills after receiving materials with the Differentiated Instruction approach. The development of this model used the 4D approach (Define, Design, Develop, Disseminate), which aims to ensure the validity, practicality, and effectiveness of the model's application. The results showed that applying a differentiated teaching approach significantly improved teachers' creative thinking skills compared to conventional teaching methods. This increase was more visible in the group of teachers with middle and upper ability categories, while in the lower ability category, no significant increase was found. These findings indicate that a differentiated teaching approach, combined with a project-based learning model and the 4D method, can effectively develop teachers' creative skills, so it is expected to improve the quality of teaching in schools.

Kata kunci:
Manajemen Pengembangan Pendidikan,
Berpikir Kreatif, Pendekatan Pengajaran yang dibedakan.

Abstrak

Penelitian ini bertujuan untuk mengembangkan manajemen pengembangan pendidikan berbasis proyek guna meningkatkan keterampilan kreatif guru melalui pendekatan pengajaran yang dibedakan. Tantangan pendidikan abad ke-21 menuntut peningkatan keterampilan berpikir kreatif pada guru, yang sangat penting dalam proses pengajaran. Penelitian ini melibatkan 63 guru dari dua SMA di Solo, Jawa Tengah, yang dipilih secara purposive. Instrumen penelitian berupa tes deskriptif yang mengukur kemampuan berpikir kreatif guru setelah menerima materi dengan pendekatan Differentiated Instruction. Pengembangan model ini menggunakan pendekatan 4D (Define, Design, Develop, Disseminate) yang bertujuan untuk memastikan validitas, kepraktisan, dan efektivitas penerapan model. Hasil penelitian menunjukkan bahwa penerapan pendekatan pengajaran yang dibedakan mampu meningkatkan keterampilan berpikir kreatif guru secara signifikan dibandingkan metode pengajaran biasa. Peningkatan ini lebih terlihat pada kelompok guru dengan kategori kemampuan menengah dan atas, sementara pada kategori kemampuan bawah tidak ada peningkatan signifikan yang ditemukan. Temuan ini mengindikasikan bahwa pendekatan pengajaran yang dibedakan, dikombinasikan dengan model pembelajaran berbasis proyek dan metode 4D, dapat menjadi solusi efektif dalam pengembangan keterampilan kreatif guru, sehingga diharapkan mampu meningkatkan kualitas pengajaran di sekolah.

INTRODUCTION

Creative thinking is a critical mental process that shapes teachers' mindsets in carrying out their duties to provide effective learning (Azizi et al., 2023). This creativity is necessary from the beginning of a teacher's career, as they often face complex situations requiring quick and innovative solutions. Thinking creatively not only assists teachers in dealing with these challenges but also simulates various scenarios of problem-solving and decision-making and satisfies their and students' curiosity (Rofifah et al., 2021). Creative thinking activities also encourage teachers to continue to develop their cognitive abilities, which can ultimately affect their basic skills, such as reading and writing (Nurulloh et al., 2020).

Good language skills and creativity are critical for a teacher to understand and respond to student development in academic and non-academic aspects. However, low language skills and creativity hinder teachers from optimizing their role to support student progress (Arbie, Puspitasari, Telaumbanua, Bangkara, & Khasanah, 2023; Haq & Roesminingsih, 2024; Hrastinski & Wilbur, 2016). Following the Regulation of the Minister of Education and Culture No. 22 of 2016, there is an emphasis on the application of learning based on a scientific, integrated thematic approach (between lessons) and thematic (in one subject). This approach emphasises the importance of discovery or inquiry learning, where students are invited to explore knowledge through their discovery actively. This approach improves students' conceptual understanding and encourages creative thinking skills. A project-based learning model is highly recommended to support the development of these skills. Project-based learning allows students to work in groups, solve real problems, and develop concrete products or solutions. This model improves students' collaboration and communication skills and spurs them to think creatively in every step they take in the learning process (Hakim & Abidin, 2024; Jami & Muharam, 2022).

The learning used in schools today is an independent curriculum. Students still do not fully feel the independence of an independent curriculum with diverse extracurricular learning when building a creative way of thinking (Wardiyah et al., 2023) Due to the limited teacher resources and the accessibility of education provided by educational institutions to teachers is still lacking, even though this independent curriculum makes a free learning model, creative student development will be challenging. Teacher resources are still not fulfilled to develop students' problem-solving abilities in project-based terms (Azizah & Mardiana, 2024; Septiadi, 2019). Preparing manuals and related teacher books will make it easier for teachers to build and implement instruments. The above problems show that the teacher's book is the main guideline for teachers in assessment behaviour. (B. T. Cahyono et al., t.t.). Teacher competence is a qualitative description of the meaningful nature of teacher behaviour that shows that competence is a rational thing that behaves to achieve the necessary goals according to the conditions expected by the educational institution (AL-Momani, 2024; Prihatin, Degeng, Djatmika, & Kuswandi, 2020).

Creative education management in the 21st century is essential to face this century's global challenges and skills needs, such as thinking, creativity, and innovation. With creative education management, teachers can design adaptive and project-based learning methods, improving students' problem-solving ability and encouraging them to think more innovatively (Samsur et al., 2024). This aligns with the demands of an independent curriculum that emphasizes the holistic development of students' potential, including academic and non-academic aspects, and prepares them to compete globally (Masrur, 2023).

Educational management that encourages creative thinking is essential in helping teachers deliver more effective and relevant learning. This management builds the foundation of creative thinking skills, which is one of the main goals of education in Indonesia (Djalilah, Muzakar, Suhardi, & Kartiko, 2024; Fajry, Annur, & Handayani, 2024). In today's modern era, teachers are not only required to deliver material but must also have creative thinking skills that can be applied in project-based learning. This learning allows students to develop practical and innovative skills crucial in a rapidly changing world. Creative education management equips teachers with the ability to understand the material more deeply and deliver it according to the needs of creative projects involving students. Teachers who are managed with a creative approach will be better able to inspire students to think innovatively, solve problems, and collaborate on various projects. However, empirical facts show that the ability to think creatively among teachers and students in Indonesia is still low. Hairida's (2016) research shows that creative thinking skills in Indonesia are consistently at the lowest level compared to other countries. International assessments through the Program for International Student Assessment (PISA) show unsatisfactory results for Indonesia.

In 2012, Indonesia was ranked 64th out of 65 countries, and in 2015, its ranking dropped again to 69th out of 75 participating countries. This illustrates how low thinking and creative skills are among Indonesian students (Suparyati et al., 2024). In addition, 64% of high school students in Indonesia are reported to have low creative thinking skills. This fact confirms that education management in Indonesia, especially related to teacher development, can still not train teachers to have the skills needed (Suprapto, 2016). Teachers have not been optimally prepared to master creative skills, let alone implement project-based learning as independent curricula expect. Especially in the proper subjects, many teachers still show weaknesses in creative thinking skills, which ultimately impacts students who are less active in the learning process. As a result, students only receive material passively without being invited to think creatively (Suwarno, 2020)Thus, improving education management that focuses on creativity and innovation, both at the teacher and student levels, is urgently needed. This will help teachers change how they teach, make students more active, and encourage the creation of a generation capable of creative thinking in line with the demands of the 21st century (Adimsyah, Fauzi, & Rofiq, 2023; Fauzi & Rohmah, 2023; Kamali & Sugiyanto, 2024).

This study aims to analyze and develop a project-based education management model that can improve teachers' creative and innovative thinking skills. In addition, this study aims to evaluate the effectiveness of the Differentiated Instruction approach in helping teachers develop creative thinking skills, which positively impacts students' creativity. This study also intends to provide practical guidance for educational institutions in implementing management strategies that encourage project-based learning based on the demands of the independent curriculum currently implemented in Indonesia (Septiadi, 2019). To overcome the above education management problems, it is necessary to determine various teacher education management models (B. Cahyono, 2023). The teacher's institutional management model must undoubtedly be designed with existing problems in mind so that the results are based on the characteristics of students and can improve learning outcomes through curriculum development and students' creative thinking (Sirojuddin, 2016). The direction and results of creative learning are determined by the management of the Education institution on teacher development, which has a positive impact on the teacher learning model, which, of course, carries out the learning process using a creative and innovative learning

model so that it can condition students to have creative reasoning (Fakhriyah, 2014). So, the status of the management process of educational institutions in caring for teachers is to condition students to actively build their concepts and knowledge and be able to think creatively and innovatively. The management of academic institutions that can condition this is project-based education management (Sastrika et al., 2013). Project-based management can certainly develop the skills needed in the 21st century, such as creative and innovative thinking. Creative and innovative teachers start to run in students' thinking, and creativity will run and give students more developed skills(Sirhan, 2007).

Various education management models for teachers must be developed to overcome the previously mentioned education management problems. (B. T. Cahyono et al., 2024) The teacher's institutional management model must be designed by considering the existing problems so that the results are based on students' characteristics and can improve learning outcomes.(Amelia et al., 2022) Curriculum development and improvement of students' creative thinking must be the main foundation of the design. The direction and results of creative learning are primarily determined by how educational institutions manage teacher development, which positively impacts the learning models teachers use. Using creative and innovative learning models, teachers can create a conducive learning atmosphere where students are encouraged to have creative reasoning (Fakhriyah, 2014).

The process of managing educational institutions must also ensure that teachers get sufficient support to condition students to be active in building their concepts and knowledge. This will allow students to think creatively and innovatively. One form of education management that can support creating a creative learning environment is project-based education management (Sastrika et al., 2013). Project-based management has proven effective in developing skills needed in the 21st century, such as creative and innovative thinking skills. When creative and innovative teachers guide students, students' creativity will be triggered so that they will have better-developed skills (Sirhan, 2007). Thus, educational management focusing on creativity and innovation helps teachers learn and prepares students to become individuals capable of independent and creative thinking. This is crucial in facing the challenges of the ever-changing modern world.

The Differentiated Instruction approach has improved teachers' ability to solve problems and develop creative and innovative learning methods (Hidayati et al., 2024). This approach is designed to suit the diverse learning styles, students' readiness levels, and classroom communication patterns teachers use (Azizi et al., 2023). This aligns with implementing the independent curriculum currently used in learning in Indonesia. Differentiated Instruction allows teachers to tailor teaching materials and methods based on students' individual needs so that they can reach their maximum potential. Research (Ditasona, 2013) reinforces this view by showing that this approach can improve learning effectiveness. This study also explores whether developing project-based educational institution governance can improve teachers' creative and innovative skills. This is in line with the demand for teachers to support the implementation of independent curricula, which encourages a more flexible and project-based approach to learning. (B. T. Cahyono et al., 2022). This study aims to improve educational institutions' management by emphasising the importance of creativity and innovation among teachers through the Differentiated Instruction approach.(Jami & Muharam, 2022) This approach is also expected to help teachers explore their potential to encourage students to think creatively and innovatively. Thus, teachers can better facilitate project-based learning that promotes active student

engagement. Differentiated instruction is a powerful alternative in education management, focusing on improving teachers' quality before implementing project-based learning for students. This ensures that teachers are prepared to face the challenges of modern learning and can significantly impact student development.

RESEARCH METHODS

The method in the study uses the adaptation of the development model in 4D or 4M in Indonesian (Define, Design, Develop, and disseminate) based on the 4M development model, which has a procedure that is easy for teachers to understand because it is suitable for use in learning development (Thiagarajan & Others, 1974). Educational institution owners need to develop easy methods like this to improve teachers' abilities. This study also uses quasi-experimental methods, usually called pseudo-experiments, because the researcher accepts the research subject as it is, meaning that the subject is not randomly grouped. The experimental design in this study is a Pre-test and Post-test control group design. This study's population is all teachers in Solo City, Java Province high schools (Thiagarajan, 1998).

This research method adapts the 4D development model (Define, Design, Develop, and Disseminate), which is based on the model developed by In addition, this 4D development model has procedures that are easy for teachers to understand, so it is suitable for learning development. A simple method like this needs to be applied by the owner of an educational institution to improve teachers' abilities.

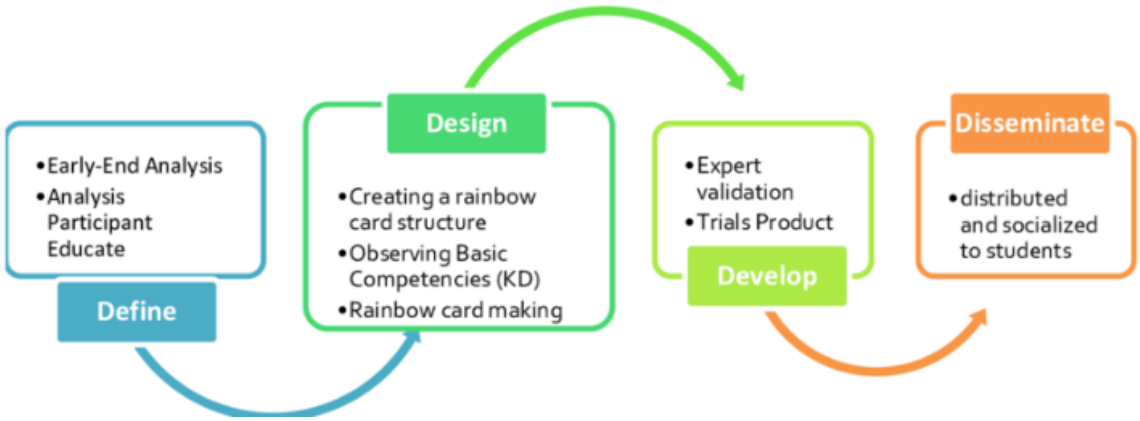

Figure 1. Development Stage Method

The study also used a quasi-experimental approach, often called a pseudo-experiment, because the research subjects were not randomly grouped. The experimental designs used were pre-test and post-test with the control group. The population of this study is all teachers in high schools in Solo City, Central Java Province. Sampling was conducted using a purposive sampling technique, with two schools as samples: school A with 31 teachers as the experimental group and school B with 32 teachers as the control group. The variables in this study consist of independent, dependent, and control variables. The independent variables were teacher performance with the Differentiated Instruction approach given to the experimental group and regular performance given to the control group.

The dependent variable is the teacher's creative thinking ability. In contrast, the control variable is (a) the upper-level teacher group, (b) the middle-level teacher group, and (c) the lower-level teacher group (Thiagarajan, 1973). The research instrument uses a test in the form of a set of description questions to measure creative thinking skills. This research involves practitioners of educational institutions and lecturers with expertise in managing educational institutions. The data is analysed descriptively to evaluate the developed product's validity, practicality, and effectiveness (Guevremont & Hammad, 2019). The validity of the product is analysed by practitioners of educational institutions and lecturers who are experts in the field of education management. The results of this development are compared with the differentiated instruction approach for the implementation of development and teacher response by measuring the effectiveness of comparing pre-test and post-test results (McCouch et al., 2007).

RESULT AND DISCUSSION

Result

The research products produced in this study include modified learning models and supporting learning tools, such as Learning Implementation Plans (RPP) and Student Worksheets (LKS). Based on the validation results of experts, the developed learning model is classified as very feasible, with an average feasibility percentage of 94%. The main aspects assessed in this learning model include learning objectives, underlying theories, learning syntax, social systems, reaction principles, support systems, and instructional and accompanying impacts. Thus, based on the results of this validation, the learning model is considered very feasible to be implemented in an educational environment. These findings are a solid basis for developing supporting learning tools, including lesson plans and worksheets. The RPP developed in this study is also considered very feasible, with an average feasibility percentage of 93.23%. "*I strongly support this modified learning model. An interactive approach engages students more in the learning process, and I see positive changes in student motivation when using this model. (Results of interviews with teachers*)"

The designed lesson plan has met the expected standard components in the learning process, including school identity, Core Competencies and Basic Competencies (KI-KD), teaching materials, learning activities, indicators, learning objectives, learning resources, and assessment techniques. The learning steps in this lesson plan have been adjusted to the learning model that has been developed. In addition, this study also produced LKS that was considered very feasible, with an average feasibility percentage of 95.17%.

The practicality of the products developed in this study is evaluated through two leading indicators. Namely, the review of the implementation of the learning process and the responses given by students to the learning experiences presented (Fahmi et al., 2018). In this case, the implementation of learning refers to the extent to which teachers can apply learning tools that have been designed by existing steps and guidelines, as well as how the process takes place in authentic learning situations in the classroom. The results of the implementation observation show that all aspects of learning have been successfully implemented very well, which is demonstrated by the implementation rate, which reaches an average percentage of 81.25%. "*The prepared RPP and LKS were easy to understand and followed existing standards. The RPP was well prepared, and the LKS effectively supported learning activities. I had no difficulty implementing them in class. (Results of teacher representative responses).*"

This figure shows that most learning elements are carried out by the previously prepared plan regarding material delivery, the implementation of teaching and learning activities, and student participation. In addition, students' responses to the developed learning also provide a strong indication of the product's practicality because students are directly involved in the learning process and can provide feedback on the effectiveness of the methods and tools used. Thus, the results of the implementation observation, which shows that the category is very well implemented, are crucial empirical evidence that the learning model and its supporting tools are feasible and effective in achieving the desired learning goals. Based on these results, the developed product can be considered to have a high level of practicality and is suitable for implementation in a broader educational context.

The learning model developed in this study is tested for effectiveness by applying it to learning materials about electrolyte and non-electrolyte solutions in class X MIPA 1. Effectiveness data was obtained by testing students' creative thinking skills to measure the effectiveness of the learning model. This testing process was carried out by comparing the results of students' creative thinking skills tests measured by pre-test and post-test learning using the model developed. The method used to determine the improvement of students' skills is to calculate the n-gain value, the difference between the normalised pretest and posttest scores against the maximum score. Based on the analysis of the data obtained, the results show that the level of effectiveness of the learning model is moderate or quite effective, which means that there is an increase in students' creative thinking skills, but not significantly at a very high level.

Figure 2. Teacher Preparation and 4D Learning Activities

The data analysed is the data or *pre-test scores* of the classroom teacher who provides experiments about the picture and controls the class about the initial ability to provide teaching. This method uses Post-test data or scores to see the teacher's final performance after being given different treatments. Meanwhile, in the analysis stage, the N-Gain score was used to measure the ability and improvement of teachers' creative and innovative thinking in the experimental and control groups after treatment. The T-test (Independent sample t-test*) tests this statistical hypothesis*.

In this product, research on teacher performance learning outcomes supports the supervision and development of teacher competence. Based on the results of expert validation.

> "I suggest continuing to conduct periodic evaluations and get feedback from students. Maybe we can add more variations of activities to keep students' interest high and provide additional training for teachers to understand this model more deeply. (Results of Principal Interviews)"

We designed teacher performance. Other valuable aspects of teacher performance include goals, enthusiasm for teaching, classroom atmosphere, social system, support system, and instructional impact. Based on the results of this validation, the teacher's performance is assessed to be continued or appreciated. This must be used to develop learning based on teachers' central supervision and professional competence. The critical performance that is designed or executed certainly contains components or standards of the identification process. Primary and based supervision on learning planning, implementation, material mastery, classroom management, assessment and evaluation, and professional development. Furthermore, academic supervision, performance evaluation, career development, discipline enforcement, mentoring, and teacher reporting. This research is also developed on the professional competence of teachers made in secret research.

Table 1. Research Result

Phase	Description	Result
Define	Identify the need to improve teachers' abilities and develop learning models.	Learning models that need modification and supporting devices, such as lesson plans and worksheets, have been identified.
Design	We are designing learning models and supporting devices according to standards.	Based on expert validation, the learning model was declared very feasible (94%), RPP (93.23%), and LKS (95.17%).
Develop	Develop the final product and evaluate the practicality of applying learning in the classroom.	The implementation of learning reached an average of 81.25%, indicating that the product could be implemented well.
Disseminate	We are applying learning models and measuring effectiveness through pre-tests and post-tests.	The model's effectiveness is in the medium category, with an increase in students' creative thinking skills.

Source: Primary data Processed, 2024

Discussion

The project-based learning model developed by applying *the design thinking* method aims to condition students to empower one of the primary skills of the 21st century, namely creative thinking skills. This model improves students' ability to systematically analyze, evaluate, and solve problems through an innovative and iterative approach. The learning syntax developed results from the elaboration of project learning syntax by integrating *the design thinking* method into all stages of the learning process. These stages include problem identification, idea exploration, solution design, prototyping, and solution testing. By applying *the design thinking* method in project-based learning, it is hoped that students will develop creative thinking skills and collaborate,

innovate, and communicate effectively in solving authentic problems. The details of the learning syntax developed can be explained as follows.

The first stage in the project-based learning model with *design thinking* is the Empathy-Define-Project Determination stage. At this stage, students are directed to identify the guiding questions that are the basis for learning activities and find relevant solutions or answers. This stage provides a significant opportunity for students to empower their creative thinking skills (Nurhayati & Harianti, 2020). The initial step in this stage involves facilitating students to collect and identify data from various sources of information related to the questions asked. This process is necessary because students are conditioned to empathise and deeply understand their problems. Empathising is one of the essential elements of creative thinking skills, allowing students to understand situations from multiple points of view and foster sensitivity to the problem at hand (Henriksen et al., 2017).

After data collection, students are expected to clarify the data obtained, as well as understand the concepts and procedures related to the problems that have been identified. At this point, students' creative thinking skills are tested in analysing, limiting, and determining the core problems that the project will focus on. This process includes the creation of the correct problem formulation, which is one of the essential steps in ensuring that the solution developed can later answer the relevant problem (Irawan, Padmadewi, & Artini, 2018). After students have successfully understood and formulated the problem, they are then directed to determine the project to be done as a solution to the problem that has been identified. The project serves as a framework within which students will explore, design, and develop creative and innovative solutions, allowing them to actively apply the creative thinking skills they have developed.

The second stage in the project-based learning model with *the design thinking* method is the ideate–prototype–project–Project Planning stage. At this stage, students are directed to design a project plan after first *brainstorming* ideas and turning those ideas into more concrete (Sutrisno & Nasucha, 2022). This process is critical in empowering students' creative thinking skills because they are expected to be able to construct arguments, provide logical reasons, propose real examples, and consider various alternative solutions before choosing the best solution. The first step in this stage is for students to gather various alternative ideas to work on a predetermined project. Idea gathering is done through a *brainstorming* process, where students are encouraged to think creatively and generate many ideas without any initial restrictions (Scheer & Plattner, 2012).

This process improves divergent thinking skills and helps students develop creative thinking skills in solving complex problems. Once the various ideas have been collected, students are asked to categorise them, identify their strengths and weaknesses, and narrow down the options until only one or a few ideas are most likely to be realised in the project. This is an essential step in the creative thinking process, as students must be able to evaluate and assess ideas based on relevant criteria such as feasibility, effectiveness, and efficiency (Hl, Nasruddin, Sejati, & Sugiarto, 2023).

Once the idea is chosen, students are directed to make a physical prototype. The prototype serves as an initial representation of the proposed solution and allows students to see firsthand how the idea can be implemented realistically (Sándorová et al., 2020). Prototyping also involves creative thinking skills, as students must adapt to resource constraints and test how their ideas can be applied in the project context. The final step in this stage is to draw up a more detailed project plan. Students are expected to design project completion steps by considering various aspects,

such as selecting relevant supporting activities, time management, task distribution, and required resources. Effective project planning will ensure that the ideas developed can be implemented systematically and by the learning objectives that have been set. Thus, this stage teaches students to think creatively and trains them in analytical and strategic thinking, a core component of creative thinking skills (Hariyanto, Mz, Su, & Rindawati, 2022).

Schedule Preparation is the third stage in the project-based learning model with *the design thinking* method. At this stage, students must draw up a detailed schedule that includes all the activities required to complete the project. The preparation of this schedule involves the ability of students to identify and consider various significant aspects, such as the total duration of time needed to complete the project, determining deadlines for each activity that must be done, and identifying creative activities that should not be delayed. In this process, students develop time management and creative and analytical thinking skills because they must be able to prioritise tasks and assess the urgency and interconnectedness between existing activities (Sahid, Wasliman, Muchtar, & Insan, 2021; Susanti & Rokhman, 2022). Scheduling in this stage is an essential component in developing project management skills. Students must be able to design a realistic and measurable schedule that aligns with the project scope they are working on. In project-based education, time management skills are crucial because students must complete various tasks within a specific time limit while maintaining the quality and accuracy of the results. At this stage, students are trained to consider the total duration needed to complete each project stage and divide that time into smaller blocks for each activity (Zhou, Heesom, Georgakis, & H.M. Tah, 2014).

These skills teach students the importance of strategic planning and time resource management, which is also very relevant in the professional world. In addition, students are invited to understand the concept of creative paths in projects. These activities should not be delayed because they can affect the completion of the entire project. Understanding these priority activities will help students manage projects more efficiently and effectively. In addition, determining deadlines for each activity involves analytical thinking. Students must consider the interconnectedness between assignments and how procrastination in one assignment may affect another. In this way, students learn to minimise the risk of procrastination and understand the importance of task linkages in project completion. By planning a good schedule, students also practice developing self-discipline and the ability to work independently and in teams. They must account for their time and ensure that each project stage goes according to plan. Thus, this stage of Scheduling not only serves as a guide for project execution but also as a tool to develop the skills necessary for success in a professional environment that demands good time management skills, strategic thinking skills, and the ability to work in a team (Endo et al., 2002).

Project-test completion is the fourth stage in the project-based learning model with *the design thinking* method. At this stage, students are directed to implement the project that has been planned by implementing all the plans and designs developed in the previous stage. In this process, students can empower their creative thinking skills through various activities, such as applying pre-arranged work procedures, managing available resources, data analysis, and developing relevant basic skills. Completing this project is iterative, meaning that students can make various adjustments and improvements repeatedly until optimal results are obtained and by the project objectives**.** The Project-Test Completion Stage is the implementation phase of the entire project-based learning process. At this stage, students move from the planning phase to the execution phase, where they must apply the theories, concepts, and plans they have previously formulated

into concrete actions. This stage reflects the essence of project-based learning: connecting theory with practice (Dawood & Sikka, 2009).

By executing the projects they have designed, students have the opportunity to develop a variety of skills, especially creative thinking skills. The application of work procedures in this phase involves the ability of students to follow systematic steps in completing the project. They must understand how each stage contributes to the overall project and ensure that each step is followed accurately. This requires students to think analytically, double-check that the procedures followed are by the plan, and make adjustments if necessary. Furthermore, students are also trained to manage resources effectively, be it human, time, or material resources. Resource management is an essential component in the development of project management skills.

Students must be able to prioritise tasks, allocate resources wisely, and optimise limited resources to achieve maximum results. In addition, students' data analysis in this stage strengthens their ability to evaluate the project's progress. By analysing the results obtained at each step, students can make better decisions about the next steps, including whether improvements or adjustments to the initial strategy are needed. This analysis process encourages students to think reflectively and creatively, allowing them to continue to learn from mistakes and formulate better solutions. More importantly, the iterative process at this stage will enable students to conduct repeated experiments and tests until the desired results are obtained. It introduces students to continuous improvement, where they learn that failure or unsatisfactory results are not the end but part of the learning process. By revising and retesting, students develop more in-depth problem-solving skills and can create better solutions (Benjaoran & Bhokha, 2009).

The fifth stage in the project-based learning model with *the design thinking* method is Report Preparation and Presentation. At this stage, students are directed to prepare a written report on the project work carried out and present the results to the audience. This process is designed to develop students' ability to analyse, make decisions, and report and account for the results of observations or projects they have worked on. Students must also draw conclusions based on the collected data and the analysis carried out during the project process. As such, this stage allows students to synthesise information, communicate results effectively, and build strong presentation skills. The Report Preparation and Presentation stage is the reflection and communication stage in project-based learning. After completing the project, students are directed to prepare a written report covering all the stages passed during the project, from planning and implementation to completion. This report is a means for students to document the steps they took, the analyses they performed, and the results achieved. Report drafting requires high creative thinking skills, as students must be able to analyse the data and information they collect during the project process.

They must also be able to decide which information is relevant to include in the report and how to structure it systematically so that the audience can understand it. In addition, students learn to account for the results of their observations, meaning that they must be able to explain and justify the decisions made during the work on the project and answer any questions or criticisms that may arise. The preparation of conclusions is also an essential element in this stage. Students must be able to draw conclusions based on their data analysis and reflect on what they have learned during the project work process (Hartmann, Gao, & Fischer, 2008).

The ability to draw the correct conclusions demonstrates the ability of students to think synthetically, combining various information and findings into a more holistic understanding. Once the written report is complete, students are faced with a presentation assignment, where they

must communicate the results of their project to the audience. These presentations train students in communication skills effectively, both verbally and visually. Strong presentation skills include organising information logically, explaining concepts clearly, and answering questions from the audience in a structured and in-depth way (Öberg dkk., 2000).

The sixth stage in the project-based learning model with the *design thinking* is Evaluation. At this stage, students are directed to convey their experiences and reflections during the project process. This evaluation not only focuses on the project's final result but also on the learning process that has been passed so that students can analyse and evaluate the results of their work in depth. In addition, students are invited to develop their analytical skills collectively based on the project results achieved to evaluate the effectiveness of the approaches used and improve the strategies and methods applied in the project work (Nurhasanah & Sobandi, 2016).

The evaluation stage is an Essential Component in project-based learning because it serves as a means for students to reflect on and assess the processes and results from the projects they have worked on. Evaluation not only focuses on the final result but also the learning experience experienced by students during the project process. By providing room for reflection, students can identify the challenges they face, the strategies they use to solve problems, and the lessons they learn. Reflection In this context, it involves the ability of students to review their experiences, including aspects that are going well and those that need to be improved. Students learn to look at their experiences creatively, understand how their decisions affect the outcome and look for ways to improve the process in the future (Yusuf, 2023).

This is crucial in developing reflective thinking skills, which are part of creative thinking skills. Collective project evaluation also creates the ability for Cooperation and Collaborative Thinking. Students are invited to share their perspectives on the project and provide feedback to each other. Through this process, they learn to look at the project from a different perspective, which helps them evaluate the project's results more comprehensively. In addition, collective evaluation allows students to openly discuss and analyse the project's successes and shortcomings, which can encourage future project quality improvements. This evaluation stage is also essential in developing Metacognition, i.e., the ability of students to be aware of their thought processes. By evaluating the steps they take during the project, students can better understand the Learning Strategies that are most effective for them. This allows students to continuously improve their analytical, problem-solving, and decision-making skills in different learning situations.

Table 2. Research Findings Analysis Data

Phase	Description	Skills developed
Empathy-Define-Project Determination	Students identify problems and guiding questions, collect data, analyse problems, and formulate projects to be worked on.	Creative thinking, analytical thinking, empathy, problem formulation, and problem-solving skills.
Ideate-Prototype-Drafting Project Planning	Students brainstorm ideas, choose the best solution, create prototypes, and develop detailed project plans.	Divergent thinking, evaluation of alternative solutions, prototyping, strategic planning.
Schedule Preparation	Students draw up a detailed project implementation	Time management, creative thinking, project management, strategic thinking skills, and priorities.

	schedule, including determining deadlines and task priorities.	
Project-Test Completion	Students implement the planned project, analyse the results, and make adjustments through an iterative process until Optimal results are obtained.	Problem solving, resource management, analytical thinking, creative thinking, and practical skill development.
Preparation of Reports and Presentations	Students compile a written report and present the project's results to the audience.	Analytical skills, synthetic thinking, effective communication, and presentation skills.
Evaluation	Students evaluate the project process and outcomes, reflect on the learning experience, and provide feedback collectively.	Reflective thinking, collective evaluation, metacognition, collaboration, and self-analysis skills development.

Source: Discussion Analysis, 2024

CONCLUSION

Project-based learning models that apply *the design thinking* method are declared feasible and practical for the learning process. The validity and practicality of this model are supported by the feasibility test results, which show that the model meets practical learning standards, both in terms of its application in the classroom and its benefits in improving student skills. In addition, this learning model has proven to have the potential or effectiveness to enhance students' creative thinking skills, one of the critical skills in the 21st century. This model consists of six syntax stages: Empathy, Define Project Determination, Prototype Idea, Prepare Project Planning, Prepare Schedule, Complete Project, Prepare Reports and Presentations, and Evaluation.

These stages are interrelated and are designed to direct students through the process of creative thinking and reflection in completing projects**.** The development recommendations include further implementation of this learning model for different levels of education. Thus, students at various levels of education can feel the potential benefits of the project-based learning model supported by *the design thinking* method. In addition, this model can also be developed and implemented for other learning topics so that students can develop creative thinking skills in various subject matter contexts. This model also has the potential to be designed to train other 21st-century skills, such as collaboration, communication, and creative thinking skills.

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