

Implementation of Problem Based Learning Model through Differentiated Learning in Class 5C MI Negeri 5 Sukoharjo

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ABSTRACT

This study aims to describe the implementation of the Problem-Based Learning (PBL) model through differentiated learning in science subjects in class 5C MI Negeri 5 Sukoharjo and to identify challenges in its implementation. The research method used is qualitative descriptive, with data collection techniques including observation, interviews, and documentation. The results show that the application of PBL combined with differentiated learning helps students understand the material about the human respiratory system and makes them more active in the learning process. Differentiated learning is applied based on students' learning styles—namely visual, auditory, and kinesthetic—so that learning strategies and media can be adjusted to individual needs. Teachers use various methods, such as videos for visual students, discussion and presentation of material through speakers for auditory students, as well as experiments involving the creation of props for kinesthetic students. Despite challenges in managing a more dynamic classroom and differing levels of student understanding, the implemented strategies support students' involvement in learning. In conclusion, the combination of the Problem-Based Learning (PBL) model with differentiated learning is an appropriate strategy for science education in elementary schools and aligns with the implementation of the Independent Curriculum, which is centered on the needs of students.

KEYWORDS

Problem Based Learning; Differentiated Learning; Learning Style; Independent Curriculum; IPAS



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INTRODUCTION

Education plays an important role in the progress of a country. Therefore, the Indonesian government continues to improve the quality of education by updating the curriculum regularly. Education in Indonesia continues to undergo significant transformations, especially with the *Freedom of Learning* policy launched by the Ministry of Education, Culture, Research, and Technology. This policy emphasizes the importance of learning that is relevant, meaningful, and in accordance with the needs and potential of each student. Khoirurrijal et al.

(Rahmawati et al., 2023) argue that the *independent curriculum* is a varied intracurricular learning curriculum that gives students more space to optimally explore their concepts and competencies.

The Law of the Republic of Indonesia Number 20 of 2003 concerning the Indonesian National Education System states that national education aims to develop the potential of students to become human beings who believe in and fear God Almighty, possess noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (National Education System Law No. 20 of 2003 Chapter II Article 3). The era of *Independent Learning* requires teachers to develop varied and adaptive learning in accordance with educational goals. Learning must be able to relate the material to students' real-life contexts, with the aim not only to increase conceptual understanding, but also to enhance the relevance and practical value for students. The *independent curriculum* requires teachers to play the roles of creative and innovative facilitators in designing meaningful learning experiences so that students can achieve the expected competencies in an interesting and enjoyable manner.

Thus, the implementation of innovative learning models is very important to achieve educational goals that are more adaptive and responsive to student needs. One of the innovative and relevant learning models considered capable of achieving these goals is *Problem Based Learning* (PBL). This model emphasizes problem-based learning that encourages students to think critically, creatively, and collaboratively through real problem-solving. The implementation of PBL in Indonesia is increasingly relevant in the context of the *Independent Curriculum*, which aims to improve the quality of education by giving schools the freedom to design adaptive and contextual learning.

The PBL model is a learning model that uses real-world problems as the first step for students to learn, enabling them to obtain essential knowledge and concepts related to each subject that they have studied before, so that new knowledge is formed (Surya, 2017). According to Arends, *Problem Based Learning* (PBL) is a learning approach in which students are faced with authentic (real) problems so that they are expected to be able to construct their own knowledge, develop high-level skills and inquiry, become independent, and increase their confidence (Hotimah, 2020). The characteristics of *Problem Based Learning*, according to Amir, include beginning with the teacher presenting problems related to daily or real life, group learning and problem formulation based on their respective knowledge, seeking resources, and finding solutions to a problem. The process of searching for materials and finding solutions aims to train students to improve their critical thinking skills. The *Problem Based Learning* model is designed to help students develop critical thinking skills, problem-solving abilities, and foster independence in learning (Wahyu Ariyani & Prasetyo, 2021). In conclusion, *Problem Based Learning* (PBL)

is a model that focuses on using real-world problems as a starting point for students to develop new knowledge. This approach places students in authentic situations that require independent knowledge construction, enhanced critical thinking, and effective problem-solving. PBL also encourages group work, active solution-seeking, and independent learning, so that students not only understand the concepts being taught, but also become more confident and able to apply higher-level skills in real life.

The challenge that often arises in the implementation of *Problem Based Learning* is accommodating differences in students' abilities, interests, and learning styles within heterogeneous classrooms. The diverse needs of students make differentiated learning essential. The *Independent Learning* era emphasizes differentiated learning as one of the key approaches to ensure that every student receives a learning experience suited to their abilities. This aligns with Hamzar's opinion (Arisandi, 2024), who states that one of the learning strategies recommended in the *independent curriculum* is differentiated learning, which is tailored to the needs and abilities of individual students.

Differentiated learning was introduced by Carol Ann Tomlinson in 1999, who stated that it is learning that accommodates, serves, and recognizes the diversity of students in accordance with their readiness, interests, and learning preferences (Handiyani & Muhtar, 2022). Aprima and Sari stated that differentiated learning is a series of learning activities that pay attention to students' needs in terms of learning maturity, learning style profiles, interests, and talents (Arisandi, 2024). Differentiated learning is an effort by teachers to adjust classroom learning activities to meet the learning needs of students, considering their readiness to receive new material, interests, and various profiles or learning styles (Dhahana Aris Saputra et al., 2023). In conclusion, differentiated learning emphasizes the accommodation of student diversity by adapting the learning process to their readiness, interests, and learning styles, so that each student receives an optimal learning experience according to their individual needs.

To accommodate student diversity through differentiated learning, teachers need to choose appropriate strategies to meet the developmental stages and needs of each student. There are various ways or strategies that can be used in differentiated learning to facilitate subject mastery. Notably, there are four main aspects of differentiated learning teachers can control: content, process, product, and the learning environment or classroom climate. This is consistent with Wahyuningsari et al. (Insani & Munandar, 2023), who state that differentiated learning includes four aspects: differentiation of content, processes, products, and learning environments in the classroom. Tomlinson argues that differentiated learning can be implemented in 4 ways: 1) *Content*—related to the curriculum and what material is learned by students; 2) *Process*—how students process information

and ideas; 3) *Product*—an interpretation of what students have learned; 4) *Learning environment*—the state, feelings, and ways students work in learning (Fitra, 2022). Teachers can integrate these four elements into classroom learning, allowing adjustments based on students' current needs.

Additionally, understanding students' learning styles which includes how they respond to, organize, and process information for problem-solving and its application in daily life—is also a critical aspect in differentiated learning. Learning style can be defined as an individual's way of responding to, organizing, and processing information to solve problems and apply it in daily life (Zagoto et al., 2019). This means that each person has unique preferences and strategies for processing information, affecting how they learn, understand, and apply knowledge. By understanding students' learning styles, teachers can adjust teaching methods to be more effective, making the learning process more meaningful and outcomes more optimal.

Gaya belajar can be divided into three types: visual, auditory, and kinesthetic. According to DePorter and Hernacki, there are three learning style types: (1) *visual*—learning by seeing; (2) *auditory*—learning by hearing; and (3) *kinesthetic*—learning through movement or touch (Putri Ningrat et al., 2018). Wahyuni argues that for visual learners, students tend to rely more on vision and better process information through sight or imagination; auditory learners rely on hearing as the primary source for understanding; kinesthetic learners benefit most from physical movement and direct interaction with their environment (Fitriana et al., 2024a).

Furthermore, Wahyuni also stated that "Learning style indicators include the following aspects: Visual learning style—1) Not easily distracted by noise, 2) Remember easily by looking, 3) Enjoys reading independently, 4) Can read quickly and diligently, 5) Remembers visual associations; Auditory learning style—1) Tends to reinforce oneself while working, 2) Can read aloud and is a good listener, 3) Able to learn and remember through listening and discussion, 4) Capable of speaking, discussing, and explaining, 5) Excels, but is less able to write; Kinesthetic learning style—1) Slow to speak, 2) Able to memorize through seeing and movement, 3) Active and dislikes sitting still, 4) Physically oriented and likes to move, 5) Wants to do many things" (Tri Wibowo et al., 2023). Therefore, teachers must recognize each student's learning style and adjust teaching methods accordingly. For example, teachers can use visual materials such as images for visual learners, provide clear and structured oral explanations for auditory learners, and design activities involving physical movement for kinesthetic learners. This helps every student understand the material effectively, making the learning process more inclusive and meaningful.

Teachers continue to strive to implement teaching methods focused on differentiation. An example is in teaching science subjects in the classroom. Yulianti argues that each student is a unique individual with a different environment, life experience, and thinking ability (Nawati et al., 2023). Teachers need to recognize student differences and adjust their approach to ensure all students are engaged in differentiated learning. Differentiated learning, especially in *IPAS (Ilmu Pengetahuan Alam dan Sosial, Natural and Social Sciences)*, is very relevant to the application of the *PBL* model. *IPAS* learning, which often involves solving real-world problems, allows teachers through differentiated learning to adapt their approach based on readiness, interests, and learning styles. The *PBL* model, which prioritizes real problem-solving, provides opportunities for students to engage actively, apply acquired knowledge, and develop critical and collaborative thinking skills. By combining differentiated learning and *PBL* in *IPAS*, teachers can ensure that every student, regardless of background or ability, can participate optimally. This approach not only deepens their understanding of *IPAS* concepts, but also prepares students to face real-world challenges with greater confidence and competence.

Initial observations and interviews with teachers implementing differentiated learning through the *Problem Based Learning (PBL)* model in class *5C MI Negeri 5 Sukoharjo* show that teachers begin identifying students' learning styles by observing their gestures. Some students exhibit habits such as discussing, eating candy, reclining at desks, or frequently changing seats. After this observation, the teacher follows up with a non-cognitive diagnostic assessment to determine learning styles. As a result, the class has three learning styles: visual, auditory, and kinesthetic. To accommodate these differences, teachers often use visualizations integrated into students' kinesthetic activities.

To support the different learning styles, teachers use various media according to each style. For visual students, the media includes images, posters, books, or videos; for auditory students, direct explanations by teachers; for kinesthetic students, hands-on practice such as making products or props. An example activity for visual students is drawing a poster based on the material, then presenting it to the class. Auditory students might create or adapt song lyrics relevant to the lesson, while kinesthetic students are often engaged in making reusable teaching materials.

Teachers evaluate the effectiveness of learning media by examining test or assignment results, or by students' ability to explain the material in their own words. There are significant differences in student engagement and learning outcomes when using differentiated learning; students are more active and engaged when learning media matches their style, compared with traditional lecture methods. However, implementing differentiated learning has challenges, such as maintaining student focus, managing highly active classrooms, and needing patience for

repeated explanations. Nonetheless, the 5C class teacher argued that the PBL model is highly suitable for differentiated learning, especially in science, as it effectively increases students' interest and problem-solving abilities.

Relevant research parallels these findings. For example, Septa et al. (Fitriana et al., 2024) concluded that the application of the *Problem Based Learning* (PBL) model effectively improves students' science achievement, with increases noted in cognitive, affective, and psychomotor aspects. Similarly, Nawati et al. (2023) show that differentiated learning strategies implemented with the PBL model have a significant impact on science learning outcomes. This is evidenced by a paired sample t-test significance value of 0.002, indicating a significant difference before and after the strategy was applied. Differentiation in content, process, and product has proven effective in increasing student activity, fostering creativity, and improving learning outcomes.

The purpose of this study is to describe the implementation of the *Problem Based Learning* (PBL) Model through differentiated learning in science subjects in class 5C MI Negeri 5 Sukoharjo, as well as to identify the challenges faced in applying both approaches. Through this research, it is expected to determine the extent to which the PBL model, combined with differentiated learning, can address the needs of students with varied learning styles and abilities, and its impact on conceptual understanding and critical thinking skills. This study aims to provide a comprehensive overview of the implementation of PBL and differentiated learning, their influence on teaching and learning, contributions to elementary school quality, and obstacles in classroom practice.

The practical benefit of this study is to provide concrete guidance for teachers in implementing the *Problem Based Learning* (PBL) Model through differentiated learning, especially in science subjects. The results are expected to help teachers identify effective strategies to support student engagement and outcomes, as well as provide practical solutions to challenges. Additionally, this research can serve as a reference for schools and policymakers when designing targeted teacher training and professional development programs to improve learning quality in elementary schools.

RESEARCH METHOD

The research method used in this study is qualitative research with a descriptive method. Descriptive research does not aim to test a specific hypothesis, but only describes "as it is" regarding a variable, symptom, or circumstance (Rustamana et al., 2024). In this study, the author seeks to present data in accordance with the phenomena occurring in the field and to describe them as they are.

The subject of this study is 28 students of class *5C MI Negeri 5 Sukoharjo*, consisting of 14 males and 14 females. The object of this research is the implementation of the *Problem Based Learning* (PBL) Model through the Differentiated Learning approach in science subjects. This research focuses on the application of both approaches in influencing student engagement and learning outcomes, as well as identifying the challenges faced during the learning process.

The data collection techniques in this study include observation, interviews, and documentation. Nana Sudjana argues that observation is a systematic observation and recording of the symptoms studied (Hasibuan et al., 2023). In observation activities, researchers observe the behavior and involvement of students during differentiated learning. Meanwhile, the definition of interview according to Hakim (Yudiantara, 2021) is an interaction in the question-and-answer process between the source and the interviewer to obtain information. Interviews were conducted in a structured manner with classroom teachers, using a standard instrument consisting of 15 questions to gain an overview of PBL implementation and differentiated learning. In addition, the researcher also conducted unstructured interviews, which were spontaneous questions addressed to teachers without using standard instruments. Documentation is needed to support and reinforce findings from observations and interviews. The documentation collected includes photos of learning activities, teaching modules, student worksheets, assessment results, and other documents relevant to the differentiated learning process. The data obtained from this documentation will be analyzed to provide a more complete picture of the implementation of the PBL model and differentiated learning, and its impact on student activity and learning outcomes in *science* learning. By combining these three techniques, researchers can obtain more comprehensive and accurate data regarding the phenomenon being studied.

The analysis technique used in this study is the Miles and Huberman model of data analysis. Data analysis, according to Miles and Huberman (Kase et al., 2023), consists of several stages: (1) Data collection, (2) Data reduction, (3) Data display (data presentation), and (4) Drawing conclusions or verification. Thus, researchers can develop a qualitative data analysis framework based on research on the implementation of the *Problem Based Learning* (PBL) model through differentiated learning in *science* subjects in class *5C MI Negeri 5 Sukoharjo*, as follows:

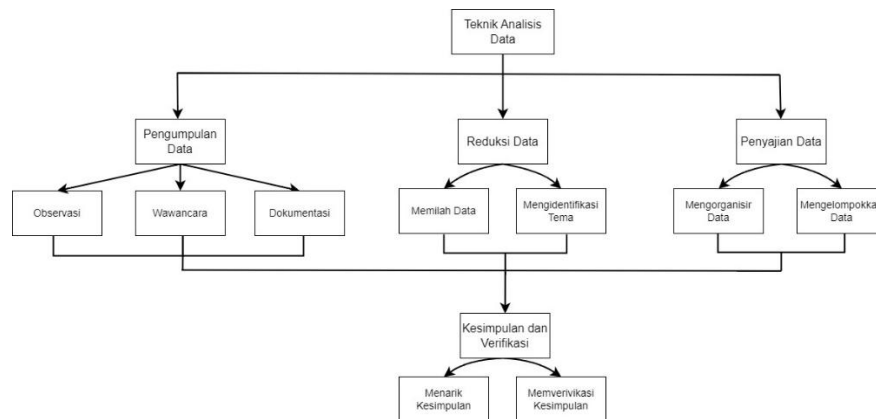


Figure 1. the Problem Based Learning (PBL) model

Uma Sekaran stated that the *frame of mind* is a conceptual model of how theory relates to various factors identified as important problems (Suartini, 2013). Thus, the *framework of thinking* in a study is a conceptual guide that explains how previous theories, concepts, and findings relate to the research question being examined. The *framework of thinking* helps in identifying key variables and the relationships between them, as well as providing a logical foundation for decision-making in the research process. The steps of qualitative data analysis in this study are described to explain the process of data collection, reduction, presentation, and conclusion drawing in order to understand the implementation of *PBL* in differentiated learning in science subjects in class 5C MI Negeri 5 Sukoharjo in depth and comprehensively.

The data analysis steps applied include: (1) *Data Collection*. Data was collected through observation, interviews, and documentation. Observation was carried out by observing students' behavior and involvement during learning. Structured and unstructured interviews were conducted with teachers to obtain an overview of *PBL* implementation and differentiated learning. Documentation, such as photos of learning activities, was also collected to support the findings. (2) *Data Reduction*. Data reduction was conducted by filtering relevant information from observations and interviews, grouping the data based on the observed variables, namely *PBL* implementation, differentiated learning, student learning styles, learning media, student activity, and learning outcomes. Data that were irrelevant or less supportive of the research focus were eliminated, while core data describing the processes and challenges faced in the application of these two approaches were retained. (3) *Data Presentation*. The data are presented in the form of a descriptive narrative that explains how teachers apply *PBL* through differentiated learning, including how teachers identify students' learning styles (visual, auditory, kinesthetic) and select appropriate learning media. The data presentation also includes observation results regarding differences in student activity and learning outcomes using this learning method compared to traditional methods. (4) *Drawing Conclusions/Verification*. Conclusions were drawn by verifying the data that had been presented and evaluating the effectiveness of *PBL* implementation and differentiated learning in influencing student activity and learning outcomes.

Verification was carried out through data triangulation, by comparing the results of observations, interviews, and documentation to ensure the consistency of findings.

Triangulation is a technique for checking the validity of data that utilizes something other than the data itself as a comparison point (Prabowo & Heriyanto, 2013). The data validity technique in this study was carried out using triangulation methods. *Triangulation methods* are conducted by comparing information or data in different ways (Susanto et al., 2023). This triangulation is conducted by comparing information or data obtained through various means, such as interviews, observations, and documentation. Thus, in this study, data was collected through structured and unstructured interviews to obtain a more comprehensive view of the implementation of *PBL* in differentiated learning from teachers. In addition, observation was used to directly observe the application of the learning model in the classroom. Documentation was also needed to supplement the information obtained from observations and interviews, such as photos of learning activities, teaching modules, worksheets, and student learning outcomes. By using this method of triangulation, the validity of the data can be increased because the information is verified from various perspectives and sources, so that the conclusions drawn are more accurate and reliable.

In addition to using the Miles and Huberman analysis, this study also utilizes *NVivo* software to assist in the management and analysis of qualitative data. *NVivo* is used for data analysis and is a program that supports qualitative and mixed methods analysis. It helps users organize, analyze, and find insights in qualitative data, such as interviews, public survey responses, articles, social media, and websites (Jailani & Saksitha, 2024).

In this study, *NVivo* was used to organize and categorize observation data systematically. The data obtained were analyzed using the coding feature in *NVivo*, which allowed researchers to identify patterns, main themes, and relationships between data categories. With the help of *NVivo*, the process of data reduction and presentation became more structured, making it easier to draw conclusions based on more valid and objective evidence. Thus, by combining manual analysis using the Miles and Huberman model and *NVivo* software, this study was able to process the data more systematically, ensure the validity of the findings, and present more in-depth and structured results.

RESULT AND DISCUSSION

The results of this study show that MI Negeri 5 Sukoharjo has implemented the Independent Curriculum in an effort to improve the quality of education in Indonesia. This curriculum is a solution in overcoming various problems in the learning process by providing flexibility to teachers and students in determining the most effective way of learning. The curriculum emphasizes student-centered learning, where they are required to be more active in the learning process. In this context, the application of the Problem Based Learning (PBL) model becomes relevant because it encourages students to think critically, solve problems independently, and work together in groups. In addition, differentiated learning is also applied to adjust learning methods and media to students' learning styles, so

that they can understand the material more optimally. Teachers act as facilitators who guide and provide support to students throughout the learning process.

As a result of observations in the field, the application of *the Problem Based Learning* (PBL) Model in differentiated learning in science subjects in class 5C MI Negeri 5 Sukoharjo has been adjusted to the principles of the Independent Curriculum. In this approach, teachers act as facilitators who guide the learning process, while students are encouraged to take an active role in building their own understanding. The implementation of *the Problem Based Learning* (PBL) Model implemented by teachers is in accordance with the syntax of the *Problem Based Learning* (PBL) Model which consists of five stages, namely: (1) Orienting students to problems, (2) Organizing students to learn, (3) Assisting in independent and group investigations, (4) Developing and presenting works and exhibiting them, (5) Analyzing and evaluating the problem-solving process.

In line with the principle of differentiated learning, the implementation of PBL in class 5C MI Negeri 5 Sukoharjo is carried out by considering the learning style of students. At the beginning of learning PBL syntax 1, namely Orienting Students to Problems, the teacher sparked students' curiosity with questions such as, "Why do we have to breathe?". In addition, teachers ensure that the triggered questions given encourage students to think critically and relate the material to their daily experiences.

In syntax 2, namely Organizing Students to Learn. After identifying the problem, the teacher organized the students into 3 groups based on their learning styles, namely visual, auditory, and kinesthetic. This group division is carried out by taking into account the students' learning tendencies, which have previously been identified by the teacher. Differentiated learning is applied by adjusting learning methods and media to students' learning styles. Students with visual learning styles utilize learning video-based teaching materials that they access through personal gadgets to understand concepts visually. Students with auditory learning styles gain understanding through explanations of the material and played songs about the respiratory system delivered through speakers as well as group discussions, which allow them to hear and discuss concepts with their peers. Meanwhile, students with a kinesthetic learning style are involved in making props from scrap items, such as plastic bottles, straws and balloons to simulate the work of the lungs before demonstrating them in front of the class. Teachers provide different instructions for each group, adapting to their needs, as well as ensuring that each student can access information in the most effective way.

At this stage, teachers divide students into groups based on their learning tendencies. This division is not carried out randomly, but based on observations of student characteristics. These observations include an analysis of the students' visual, auditory, or kinesthetic learning styles and their level of understanding of the material. Thus, teachers can adjust more effective learning strategies, such as the use of visual media for students with visual learning styles, audio media and discussions for auditory students, and movement-based activities for kinesthetic students. As explained by Mrs. Hardina Wisudawati, S.Pd who is the homeroom teacher of class 5C at MI Negeri 5 Sukoharjo that:

“Visually, children tend to find it difficult to memorize. For children who have more difficulty memorizing, I don't like to read, I lead them to visuals. So, I don't offer it. Because if I offer, children will choose something fun, namely they hold a laptop, gadget or something like that. So, indeed, I group myself based on their body style when I receive lessons from me. Then if the auditory one, the tendency for students who are more accomplished, when I give the lecture method, they are quicker, so it doesn't take long for them to understand my language. That's the auditory one. Yes, I group them for the top 10 rankings usually. For the kinesthetic, I give it or group it to children who tend to be active in the classroom, don't want their children, tend to run around, go for a walk, do it, the term is not fast. They often procrastinate on what activities they are engrossed in, so finally I give them kinesthetic ones.” (Interview with Mrs. Hardina Wisudawati, S.Pd on February 8, 2025).

This shows that teachers understand the learning needs of individual students and try to optimize the learning process so that each student can understand the material in the way that suits them best. Dividing groups based on this learning style, students not only absorb information more easily, but also feel more comfortable and motivated in learning. This approach also helps to make learning more effective, reduce boredom, and create a more conducive and interactive classroom atmosphere.

Syntax 3 is Assisting Independent and Group Investigations. At this stage, students begin to explore more deeply the given problem. Teachers provide opportunities for students to process information and ideas independently with an approach that suits the way they learn new concepts. The visual group was given time to observe a learning video about the respiratory system, then they created a chart showing the airways in the body. The teacher gives direction, but students are given the freedom to process ideas and information in their own way. The auditory group was given the opportunity to discuss in the group about the material and songs they had heard through the speakers. They structure their understanding in the form of oral presentations, using explanations as a way to delve into the material verbally. The kinesthetic group worked on practical experiments to create models or props of the respiratory system and simulate the respiratory process. They worked together to observe and discuss the results of their experiments. Teachers act as facilitators, providing guidance and ensuring that students remain focused in finding solutions to the problems given. The learning environment is also made flexible so that students feel comfortable when exploring.

Syntax 4 Developing and Presenting Works. After the investigation process, each group develops a learning product that reflects their understanding of the human respiratory system. The visual group generated a chart of the respiratory organs clearly and informatively based on what they understood after observing the learning video. They emphasized visual details, such as images of respiratory organs and flowing airflows, and they were able to explain them in front of the class. Their work demonstrates a deep understanding of the structure of the respiratory system, which translates into a form that is easily visually understood. The auditory group produced an explanatory conclusion about the respiratory organs that they understood from listening to the explanation of the material through

speakers and group discussions. Their presentations demonstrate an understanding of the respiratory process through words and narratives, in a way that connects theory to the way of speaking and listening. The kinesthetic group demonstrated an experiment with a model of lung prop using plastic bottles and balloons, which they made together. They explained how balloons inflate and deflate to demonstrate the process of inhalation and exhalation, with results demonstrating their understanding of how the lungs work physically.

The results of this work show how each group expresses their ideas and understanding of the respiratory system through the medium they master. Teachers give positive feedback on this diversity of expressions, acknowledging that each product reflects a deep understanding of the material being taught, according to their individual learning styles. In addition, through presentations and demonstrations, students also practice communication, collaboration, and confidence skills in delivering their learning outcomes in front of the class.

Syntax 5 Analyzing and Evaluating the Problem Solving Process. At this stage, the teacher invites students to reflect on the process they have gone through. The teacher facilitates group discussions. Each group was asked to evaluate the strategies they used in understanding the respiratory system and compare it with other groups. The visual group reflected on how the use of learning videos and charts helped them understand the material more clearly and memorably. They feel that observing videos and visually connecting information is very effective for them. The auditory group reflected on their experience in listening to explanations and discussing. They stated that listening to explanations and speaking or discussing the material orally helped them remember and understand better. The kinesthetic group revealed that conducting experiments and creating models directly provides a stronger understanding of how the lungs work. They find it easier to understand concepts in a way that involves movement and direct action. This reflective discussion helps students understand that each individual has a different way of learning and there is no method that is the most correct, but rather the method that suits each individual best.

However, in the application of the Problem Based Learning (PBL) learning model through differentiated learning in science subjects in class 5C MI Negeri 5 Sukoharjo, the group division process has challenges in ensuring that each student gets a fair learning experience. Teachers realize that in group learning, there are students who tend to rely on more capable friends. If this condition is left unchecked, the student may continue to be passive and not try to develop his or her own abilities. Therefore, teachers apply strategies to separate students who are too dependent on smarter friends, so that they can more actively think and complete tasks independently. As conveyed by Mrs. Hardina Wisudawati, S.Pd, homeroom teacher of class 5C MI Negeri 5 Sukoharjo:

"Yesterday, a parent asked, 'why does my child join a child who is less able?' I explained that my daughter was actually capable, but she was too dependent on her friend. I want to develop their potential by separating them from their smarter friends, so that they think for themselves and don't continue to depend on them." (Interview with Mrs. Hardina Wisudawati, S.Pd on February 8, 2025)

This approach not only aims to encourage students to think independently, but also to prove that they actually have the ability to complete tasks individually. By being separated from superior friends, students who were initially dependent begin to face new challenges that require them to work harder. As time went by, they began to show progress in understanding the material and completing tasks independently.

This strategy yielded positive results, where students who previously lacked confidence turned out to be able to think and complete tasks well. This shows that providing opportunities for students to face challenges directly can build independence and increase their confidence in the learning process. As explained by Mrs. Hardina Wisudawati, S.Pd :

"In fact, I managed to break like that yesterday, so a child who usually depends on his friend who is smarter, yesterday he had to try, had to explore his abilities again, right, the grades were not bad even though previously they depended on those who were smarter, the grades were also good, but the good thing is that it is carried away or inherited from his friend, not his own results. So actually, in children they are capable, it's just because it depends on the nature of the dependency that we have to eliminate, we solve, so I think everything is fair, can feel everything, have to think about everything." (Interview with Mrs. Hardina Wisudawati on February 8, 2025)

In addition, in this study, data analysis was carried out using NVivo software to organize and interpret qualitative data. The data collected through observation were categorized into key themes, such as differentiated learning strategies, PBL effectiveness, and student involvement in learning. Through NVivo, various data are analyzed using coding techniques to identify patterns and relationships between observed variables.

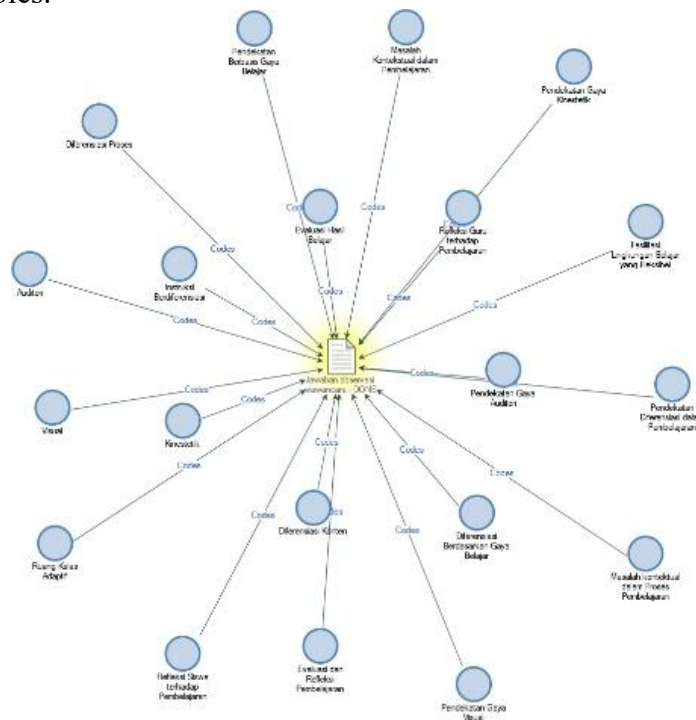


Figure 2. Visualization of PBL Implementation Data through Differentiated Learning

This study shows that the application of the *Problem-Based Learning* (PBL) Model through differentiated learning in science and science subjects in class 5C MI Negeri 5 Sukoharjo has a positive impact on student activity and learning outcomes. PBL allows students to actively participate in real problem-solving, thereby improving concept understanding, critical thinking skills, and independence in learning. Differentiated learning supports this process by adapting teaching strategies based on students' learning styles, both visual, auditory, and kinesthetic, so that learning becomes more inclusive and effective. Despite the challenges in managing more dynamic classrooms and differences in student understanding levels, the strategies implemented by teachers in adjusting learning methods have successfully overcome these obstacles. Thus, the combination of the Problem-Based Learning (PBL) Model and differentiated learning can be an effective strategy in supporting the quality of social science learning in elementary schools and supporting the implementation of the Independent Curriculum which focuses on developing students' potential optimally.

Discussion

The Problem Based Learning (PBL) model is one of the approaches that can be applied by teachers in the Independent Curriculum to encourage active involvement of students in the learning process. *Problem Based Learning* (PBL) is a learning model that is student-centered by exposing them to various real problems that must be solved. Learning in this model is focused on problem solving, where students are responsible for analyzing and finding solutions independently. The role of educators in PBL is not as the main source of information, but as a facilitator who guides, provides direction, and supports the process of critical thinking and exploration of students in finding solutions to the problems they face.

This is in line with the findings of Wena (Meilasari et al., 2020) This Problem Based Learning (PBL) learning model is a student-centered learning model by exposing students to various problems faced in real life and students trying to solve these problems. This model focuses on a problem that must be solved by students, so that students have the responsibility to analyze and solve the problem with their own abilities, while the role of educators is only as a facilitator and provides guidance to students.

However, in its implementation, *Problem-Based Learning* (PBL) faces various challenges, especially in accommodating the diversity of students in one class. One of the main challenges is the differences in students' abilities, interests, and learning styles, which can affect the effectiveness of problem-based learning. Not all students have the same skills in analyzing and solving problems, so some students may have difficulty following the learning process independently. In addition, active and dynamic classroom management in PBL is also a challenge for teachers, especially in ensuring that each student remains focused and involved in discussions and problem solving. To overcome this challenge, a more flexible learning strategy is needed, one of which is by implementing differentiated

learning. This approach allows teachers to tailor learning methods to the needs and characteristics of each student, so that they can understand the material in a way that is most effective for them.

Research conducted by Maulani et al., (2023) shows that the application of the Problem-Based Learning model with a differentiated learning approach can improve the cognitive learning outcomes of students of class X Science 2 in the subject of ecosystem material biology. In addition, the accompanying impact was obtained in the form of increased student participation in the discussion and problem-solving process.

This research is in line with the research of Afelia et al., (2023) it can be concluded that the PBL model combined with differentiated learning in the classroom creates a pleasant learning atmosphere because the learning process is adjusted to the learning needs and characteristics of students. Mapping students' learning styles formed in a group can improve the collaboration skills of students in class X of SMAN 1 Bangorejo. The results of the study showed that there was an increase in students' collaboration skills in each cycle. So that the implementation of the *problem based learning* (PBL) model based on differentiated learning can improve students' collaboration skills in learning Biology class X.

Another relevant research is the results conducted by Fitriana et al., (2024) stating that the analysis of differentiated learning with the PBL model in science subjects in grade V confirms that the combination of the two approaches is very effective in increasing understanding and motivation for learning. The differentiated approach pays close attention to students' needs and learning styles, synergizing with PBL which emphasizes problem-solving through real-world projects, creating. combination Thus, it not only improves the understanding of IPAS concepts, but also develops critical skills, problem-solving, and cooperation. The application of this learning model raises high learning motivation for students, creates active engagement, and stimulates interest in the learning process.

The *Problem Based Learning* (PBL) approach is in line with the concept of differentiated learning, which emphasizes the importance of adapting the learning process to the needs, interests, and learning styles of each student. This is in line with the opinion of Ningrum et al., (2023) one way of student-centered learning is by implementing differentiated learning. Differentiated learning is a form of effort in a series of learning that pays attention to the needs of students in terms of learning readiness, student learning profiles, interests and talents. Differentiated learning is in line with the philosophy of Ki Hajar Dewantara (Dwi Putriana Naibaho, 2023), that education (opvoeding) provides guidance to all the natural strengths possessed by students in order to be able to achieve the highest safety and happiness, both as a human being and as a member of society.

The *Problem Based Learning* (PBL) model is applied in a differentiated manner, teachers not only guide students in solving problems, but also provide various learning strategies and media that suit their characteristics, both visual, auditory, and kinesthetic. Thus, each student can be actively involved in exploration and problem-solving in the most effective way for them, so that the learning process becomes more inclusive, meaningful, and able to accommodate diversity in the classroom.

The application of *Problem Based Learning* (PBL) in learning science helps students understand concepts more deeply. By exposing students to real problems that are relevant, they are encouraged to analyze, search for information, and find the right solutions, so that their understanding of the material becomes stronger. Additionally, through differentiated learning, teachers can tailor teaching strategies to student characteristics, ensuring that each individual can learn in a way that works best for them. This approach allows students to be more active, independent, and involved in the learning process, which ultimately has a positive impact on the learning outcomes of IPAS, both in terms of concept understanding, critical thinking skills, and scientific attitudes. This is relevant to Pratiwi's research (Sarief, 2022) which states that the *Problem Based Learning* (PBL) Learning Model has a great influence on student learning outcomes in elementary school in science learning. In addition, Mahmud's research (Sarief, 2022) also concluded that there was an increase in student activities and learning outcomes of grade VI elementary school students after implementing the Problem Based Learning Model learning model.

CONCLUSION

The conclusion of this study shows that the implementation of the *Problem Based Learning* (PBL) Model through differentiated learning in *science* subjects in class 5C MI Negeri 5 Sukoharjo has proceeded well and has had a positive impact on student activity and understanding. Learning tailored to students' *visual*, *auditory*, and *kinesthetic* learning styles helps them understand the concepts of the human respiratory system more effectively. Teachers act as facilitators who not only guide students through the learning process, but also ensure that each group learns using methods suited to their individual characteristics. The unique aspect found in this study is the teacher's strategy in dividing groups, based on observations of students' learning tendencies, and the effort to separate students who are overly dependent on more capable peers so that they can become more independent in thinking and completing tasks.

However, this study also reveals several limitations in the application of *Problem Based Learning* (PBL) through differentiated learning, particularly in the more complex classroom management required due to variations in learning methods within a single learning environment. Some students still tend to be passive or dependent on more active classmates, which indicates the need for specific strategies to increase their independence. Furthermore, the implementation of differentiated learning requires careful planning to ensure that each student receives a learning experience that is fair and suited to their individual needs. It is therefore suggested that future research explores more flexible strategies for implementing PBL in order to accommodate differences in students' abilities more optimally.

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