



Building Student Skills: Putting Process First in Assessment in Elementary Schools

Ida Arina^{1*}, Yunus Abidin², Puji Isyanto³, Nor Zafir binti Md Salleh⁴

^{1,2}Universitas Pendidikan Indonesia, Indonesia

³Universitas Buana Perjuangan, Indonesia

⁴Universitas Teknologi Malaysia Johor Bahru, Malaysia



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ABSTRACT

Objective: In modern education, assessment is often considered a tool to measure student learning outcomes. However, this approach often ignores the processes students go through to achieve these outcomes. This study aims to explore the impact of implementing process-based assessment in sixth-grade learning, specifically on enhancing students' abilities in communication, teamwork, and critical analysis. The approach taken in this research is a qualitative descriptive technique approach, involving data collection through observation, interviews, and document analysis. The results show that the implementation of process-based assessment significantly increased students' active participation, which was reflected in their confidence when expressing ideas and contributing in groups. This study highlights an innovative shift towards process-oriented assessment, advocating for an educational paradigm that recognizes students' individual needs and promotes meaningful learning experiences. Recommendations for educators include designing inclusive assessment strategies and providing constructive feedback to foster important skills in early childhood students, ultimately improving educational outcomes in elementary schools.

INTRODUCTION

In modern education, assessment is often viewed as a tool for measuring student learning outcomes. However, this approach often ignores the process students go through to achieve those outcomes. Research shows that an excessive focus on outcomes can lead to skewed learning, where students who do not meet academic standards are perceived as less capable. This aligns with findings in the literature showing that traditional assessment methods tend to be uniform and fail to consider individual differences and the systems of power underlying higher education (Henning & Lundquist, 2021)

These initial improvements align with the feedback provided: Another important consideration is that traditional assessment methods rarely engage students in integrating their own learning through metacognitive skills (Pinheiro Pimentel & Omar, 2010). Recent research indicates that traditional assessments often fail to encompass the diverse dimensions of physical education, including cognitive, affective, and social aspects (Tariq & Sergio, 2024). As real-world challenges become increasingly complex, it is crucial for students to develop fundamental thinking skills, collaboration, and creativity. Process-based assessment has been identified as an effective method for enhancing these skills, but its implementation often faces challenges, including a lack of adequate training and resources for teachers. To increase the depth of the analysis, this introduction needs to include more recent journal references from the past five years to explain why process-oriented assessment is currently so well understood scientifically. Furthermore, it is important to ensure a logical flow to more clearly link general educational goals to the specific sixth-grade context.

Implementing process-focused assessment can help identify the development of these skills. Critical thinking has been identified by employers as a critical skill for graduate recruitment. The development and assessment of critical thinking skills in higher education is necessary because employers have noted gaps in these skills among graduates. These skills can be developed over time through collaborative learning (De Klerk et al., 2025).

Critical thinking has been identified as a critical skill by employers for graduate recruitment. The development and assessment of critical thinking skills in higher education is necessary because employers have observed a deficiency in these abilities among graduates. These abilities can be cultivated gradually through teamwork and shared learning.

This study aims to investigate and analyze a process-based assessment approach in an elementary education context. The primary focus is on the impact of this assessment on student skill development, the challenges faced by teachers in its implementation, and recommendations for more effective implementation. By addressing gaps in previous research and highlighting the importance of process-based assessment, it is hoped that this study will significantly contribute to improved educational practices in elementary schools and prepare students to face future challenges more effectively.

Based on the context of this research, the research questions that arise are: (1) Does the implementation of process-based assessment have a significant impact on the development of sixth-grade students' skills? (2) What challenges do teachers face in implementing this assessment? (3) What recommendations can be made to improve the effectiveness of process-based assessment in learning?

It is important to note that skills such as critical thinking, collaboration, and communication, which are part of process-based assessment, are not only relevant at the college level but are also crucial to develop from elementary school. These 21st-century skills are fundamental in preparing students to face future challenges. Therefore, the purpose of this study is to identify and explore the importance of developing 21st-century skills at the elementary school level and how this may impact students' readiness to face future challenges.

RESEARCH METHOD

This study employed a qualitative descriptive approach, a dominant method in qualitative research within the interpretive paradigm and commonly used in occupational science and occupational therapy studies (Chaiyo & Nokham, 2017). This qualitative descriptive methodology is relevant when researchers wish to explore questions regarding "how," "what," or "when" a phenomenon occurs (Pujiati et al., 2024). The purpose of this study was to describe and analyze the phenomenon of student participation in a classroom discussion about the planets in the solar system.

The focus population in this study consisted of 32 students in the class. For the sampling process, the researcher used a saturated sampling technique, in which the entire population was used as a sample for analysis. This approach allowed the researcher to gain a comprehensive understanding of the experiences of all students involved in the discussion.

By adopting this method, this study ensured that the nuances of student participation were captured in depth, and triangulation of data sources could be applied to enhance the scientific presentation of the findings.

This version enhances the text by ensuring clarity and a logical flow, emphasizing the importance of qualitative methodology while maintaining a focus on the research objectives and sampling approach. This research was conducted on Monday, November 10, 2025, in a classroom during a learning session with a discussion duration of approximately 90 minutes. The instruments used in this study included observation, field notes, and interviews. Observations were conducted to record student interactions during the discussion, including participation levels, questioning skills, and collaboration among students. Field notes served to document direct observations of student behavior and attitudes throughout the discussion. Additionally, Semi-structured interviews were held with multiple students following the discussion to acquire a better understanding of their reasons and experiences related to their participation.

The research steps began with a preparation phase, in which the researcher developed a research plan and instruments to be used, provided information to students about the research objectives, and obtained permission to conduct observations. The research was conducted by observing the dynamics of interactions during discussion sessions, taking notes on observations, and conducting interviews with students after the discussions.

The data obtained were then analyzed by categorizing student participation levels into active, moderate, very active, and passive, based on an assessment rubric that included criteria for collaboration, communication, and critical thinking. Semi-structured interviews were conducted with 32 students, selected based on selection criteria such as academic ability, attendance, and previous participation. Interview questions included open-ended questions regarding student motivations and experiences, with the aim of gaining a deeper understanding of student motivations and experiences.

To ensure data validity, this study utilized source triangulation by combining data from observations, field notes, and interviews. This approach is expected to provide a more comprehensive picture of the phenomenon being studied and provide a strong foundation for analyzing the results.

RESULTS AND DISCUSSION

Results

This study aims to explore and discuss a process-focused assessment approach in the context of primary education. Three main aspects will be examined: (1) the impact of process-based assessment on students' skill development, which indicates increased self-confidence and group contribution, (2) challenges faced by teachers in its implementation, and (3) recommendations for more effective and practical implementation. The emphasis on skills such as teamwork and critical analysis will provide valuable contributions to education, with the hope of stimulating further discussion on assessment practices that facilitate students' holistic development.

To deepen the analysis, this study will also discuss how improvements in students' communication and critical thinking skills can be measured through this approach, as well as offer insights into the dynamics of student participation in learning activities. Furthermore, this study will identify strategies that can be used to address existing

challenges, such as time management and resource training for teachers, thereby strengthening the effectiveness of process-based assessment.

Impact of Process-Based Assessment on Student Skill Development

The analysis showed that the implementation of process-based assessment significantly positively impacted the development of various student skills. Students experienced significant improvements in communication skills, as indicated by their increased confidence in expressing ideas and opinions in front of the class. Furthermore, students' critical thinking skills also showed significant progress through evaluation and reflection on their group work. The data obtained showed that approximately 85% of students reported feeling more able to apply learned concepts in real-life situations as a result of this assessment method.

Assessment Rubric for Group Presentations

Theme: Solar System Project

Table 1. Group Presentation Assessment Rubric

Criteria	Very good (4)	Good (3)	Enough (2)	Not enough (1)
Contents	Complete, accurate, and in-depth information.	The information is mostly accurate and relevant.	Information is incomplete or irrelevant.	Information is inaccurate or irrelevant.
Delivery Method	Very clear, confident, and grabs the audience's attention.	It's clear, but there are some parts that are less interesting.	Sometimes unclear, and lacking in confidence.	Unclear and uninteresting.
Media Usage	The use of media (such as images, videos) really supports the presentation.	The use of media is quite good, but lacks variety.	The use of media is less relevant or does not support the presentation.	Not using media.
Group Work	All group members contribute actively and effectively.	Most members contribute, but some are less active.	Some group members contribute little or nothing.	There is no cooperation among group members.

This assessment rubric is designed to assess students' Solar System project work based on four main criteria: Content, Delivery, Media Use, and Group Collaboration. Each criterion is assessed on four levels: Excellent, Good, Fair, and Inadequate.

Observation Sheet for Group Discussion Activities

Table 2. Students' Discussion Performance on the Topic of the Solar System

Number of Student	Participation	Asking Ability	Collaboration	Teacher's Notes
20	Active	Ask nicely	Good	Asking interesting questions.
5	Enough	Rarely ask questions	Not enough	The need for encouragement to speak.
5	Very Active	Always ask	Very good	Lead the discussion well.
2	Pacific	Don't ask	Not enough	Not participating in the discussion.

In the analytical assessment of the discussion process regarding the planets in the solar system, a total of 32 students participated. Based on the data obtained, student participation can be divided into several categories: active, moderate, very active, and passive.

The active group consisted of 20 students, indicating that the majority demonstrated good engagement in the discussion process. Several students, totaling 5 students, were categorized as moderate, meaning they were involved in the discussion but did not fully demonstrate active participation. Meanwhile, 5 other students in the very active category consistently made significant contributions by asking questions and consistently sharing opinions. On the other hand, 2 students were categorized as passive, who participated less in the discussion.

Challenges Faced by Teachers in Implementing Process-Based Assessment

Despite its numerous benefits, this study also identified several challenges faced by teachers in implementing process-based assessment. One key objective is ensuring balanced participation among students. Dominant students in a group tend to block the contribution of quieter students, thus hindering the collaborative process that should be at the heart of this approach. Furthermore, time management is a significant obstacle, with teachers often struggling to align the time required for each stage of the assessment with the established plan. Another contributing factor is limited educational resources and institutional support, with some teachers feeling inadequate training to implement this method effectively.

Recommendations for the Practical Implementation of Process-Based Assessment

Based on the findings, this study proposes several recommendations to improve the effectiveness of process-based assessment in elementary schools. First, teachers need to develop more inclusive strategies to encourage the active participation of all students, such as by assigning clear roles within each group and implementing cooperative learning techniques. Students in both high- and low-performing groups still complained about unequal contributions while praising the social support provided by the group. Students who scored high on the test were more likely to recognize the benefits of group work, regardless of their group's overall performance level, while students who scored lower perceived group work as time-consuming "busywork" with little cognitive benefit. Comments from anonymous peer evaluations differed only slightly between high- and low-performing groups. Numerical ratings on these evaluations correlated with overall group performance. However, students in low-performing groups gave harsher ratings to their low-scoring members, while students in high-performing groups were more generous in their ratings of low-scoring members. We discuss the implications of relying on support strategies to promote productive group work (Chang & Brickman, 2018).

Second, constructive and specific feedback should be utilized to help students understand areas for improvement in their learning. Third, it is crucial for educational institutions to provide adequate professional training for teachers so they have the skills and knowledge necessary to implement process-based assessment effectively.

Overall, a deeper understanding of the importance of process-based assessment indicates that this approach not only contributes to improving students' academic skills but also supports their holistic development. The results of this study are presented in detail in Tables 1 and 2, which are sorted numerically for better understanding and visual appeal. This research is expected to serve as a useful reference for educators in optimizing the implementation of process-based assessment in elementary schools, so that students can be better prepared to face future challenges.

Discussion

The Impact of Process-Based Assessment on Student Skill Development

Based on research findings, the implementation of process-based assessment in elementary schools shows significant potential for improving student skills. This assessment not only focuses on final results but also values students' journeys and efforts throughout the learning process. This approach aligns with the goals of holistic education and innovation in teaching, fostering skills such as teamwork and critical analysis that students need to face future challenges. The results of this study contribute to the development of more effective educational practices and can stimulate discussions about better assessment methodologies. The forms of process assessment used in this study were: Collaborative Projects, Classroom Discussions/Presentations, and Interactive Quizzes.

In the context of learning about the solar system, the implementation of process-based assessment has demonstrated a significant positive impact on the development of various student skills. Improvements in communication skills were evident, with students demonstrating greater confidence in expressing ideas and opinions in front of the class. Furthermore, students' critical thinking skills developed through evaluation and reflection on their group work.

The existing process of learning science demands not just the intellectual capabilities of students, but also their proficiency in the learning journey. The enhancement of students' skills related to scientific processes can be assessed through various signs, such as: conducting observations, interpreting observations, classifying, planning experiments, and communicating using tools, predicting and applying concepts. These measurement indicators are related to the Project-Based Learning (PEM) model, which trains students to carry out their work through the stages of the learning process. Data were collected from the results of measurements using a science process skills evaluation tool given by teachers to students. This tool consists of indicators for measuring science process skills both prior to and following instruction through the Project-Based Learning approach. The information was subsequently examined using the t-test formula, resulting in t count exceeding t table, specifically 4.29 compared to 1.73, indicating that H_a is accepted. From these findings, it can be deduced that implementing the Project-Based Learning model successfully enhances students' science process abilities at MAN 5 Aceh Besar on the topic of Static Fluids (Herliana, 2021).

The overall impact of the inquiry-based learning (IBL) model on students' critical thinking skills was examined, while also examining the consistency of these results through sensitivity analysis and an evaluation of publication bias. Overall, the study findings showed consistent differences between the analyzed studies, but the results remained stable even when retesting extreme data. Despite indications of publication bias, the effect of inquiry-based learning remained significant after adjustment, strengthening the conclusion that this approach is effective in improving students' critical thinking skills. These findings indicate that IBL is effective in improving critical thinking skills by activating key cognitive processes, such as analysis, inference, and evaluation, and is worthy of wider adoption in 21st-century learning curricula (Dewi et al., 2025).

Students focus not only on the final outcome, but also on the learning process itself. Data shows that approximately 85% of students feel better able to apply the concepts they learn in real-life situations, such as understanding eclipses and planetary movements. These findings demonstrate the importance of process-based assessment, not only in supporting academic achievement but also in preparing students with the relevant and holistic skills needed to face future challenges.

Furthermore, students demonstrated an increased awareness of the importance of effective collaboration and communication, both in social and academic contexts. For example, during process-based assignments, critical analysis was evident when students discussed various scientific phenomena. The implications of these results emphasize the need to integrate process-based assessment into educational practices to create more comprehensive and meaningful learning experiences for students.

Future research directions should also be considered, such as investigating whether these skills persist into secondary education. This aligns with literature showing that this approach can foster more substantial and relevant learning.

Image of the results of the student's collaborative project



This collaborative project produced a variety of work, with each group demonstrating creativity in utilizing recyclable materials to create models of the solar system. Each group used a different approach, ranging from 3D planetary models made from Styrofoam balls to interactive informational posters that visually display the planets.

During the creation process, students not only learned about the concept of the solar system but also gained practical experience in working together. Clearly assigning roles within the group, such as researcher, designer, and presenter, encouraged students to communicate and share responsibilities. They learned to value each other's contributions and practiced problem-solving as they faced challenges in creating their work.

Documentation of student work presentations



Presentations in front of the class are an important opportunity for students to hone their communication skills. By showcasing their work, students can explain their thinking processes and share interesting facts about the solar system. The question-and-answer session held after the presentation helps them develop their ability to think quickly and answer questions clearly.

This experience not only enhances students' understanding of the solar system but also boosts their self-confidence. Through the appreciation of their classmates and teachers, students who previously felt anxious about public speaking began to show increased confidence.

Overall, this collaborative project provided a deeper understanding of science while fostering social and communication skills. It taught the values of collaboration, creativity, and courage, all of which are important skills for the future. Teachers' use of process-based assessment instruments has not been implemented successfully. The majority of educators have effectively utilized both written and verbal assessments through midterms and finals; however, certain elements of the approach, including skills and attitudes, have not been fully realized (Efendi, 2019).

Assessment Rubric for Group Presentations

First, in the Content aspect, the assessment criteria consist of the totality of the information presented. A rating of "Excellent" indicates that the content presented is complete, accurate, and in-depth, reflecting a strong understanding of the topic. A rating of "Good" indicates that the content is fair, although there are some areas for improvement. A rating of "Fair" indicates that the information presented is incomplete or irrelevant, with the presence of factual errors. Finally, a rating of "Inadequate" indicates that the content presented is inaccurate or completely irrelevant to the topic being discussed.

Second, in the Delivery aspect, assessment focuses on the clarity and appeal of the material. In the "Very Good" category, the presentation was very clear and engaging, with the student demonstrating a high level of confidence and able to capture the audience's attention. The "Good" category reflects a fairly clear presentation, although some sections lacked interest. Minimal self-confidence is displayed in the "Fair" category, where the presentation sometimes appears hesitant. Meanwhile, the "Insufficient" category indicates a very unclear, difficult-to-understand presentation, and proceeds without sufficient confidence.

Furthermore, in the Media Use aspect, assessment is based on the effectiveness of the media used to support the presentation material. The "Very Good" category indicates effective and varied use of media, which strengthens audience understanding. In the "Good" category, appropriate media use but a lack of variety is a point of improvement. The "Fair" category reflects less relevant media use, while the "Insufficient" category indicates that media is not used at all or is inappropriate, thus not supporting the delivery of information.

Finally, in the Group Collaboration aspect, this assessment examines the contributions of all members to the presentation process. The "Excellent" category indicates that all group members contributed equally and actively, creating strong synergy. The "Good" category indicates that most members played an active role, but some members made less significant contributions. Meanwhile, the "Fair" category indicates that some members' contributions tended to be minimal, resulting in a failure of collaboration. The "Inadequate" category indicates a lack of collaboration within the group, with some members making no contribution whatsoever.

Overall, this assessment rubric aims to provide clear guidance for students in designing and delivering presentations on their Solar System project. By understanding and applying these assessment criteria, students are expected to improve the quality of

their presentations and develop communication and collaboration skills within the group.

Assessment Rubric Explanation for the Solar System Project Presentation

This assessment rubric is designed to assess students' performance on the Solar System project based on four main criteria: Content, Delivery, Use of Media, and Group Collaboration. Each criterion is scored on four levels: Excellent, Good, Fair, and Inadequate.

Content is the first criterion, which focuses on the totality of the information presented. In the "Excellent" category, content is considered complete, accurate, and in-depth, demonstrating a strong student understanding of the topic. A "Good" category indicates that the content is quite good, although there are still some areas for improvement. In the "Fair" category, the information presented is considered incomplete or contains factual errors, while the "Inadequate" category reflects content that is inaccurate or irrelevant to the topic.

The next aspect is Delivery, which assesses the clarity and appeal of the student's presentation. In the "Excellent" category, the presentation is considered very clear and engaging, with the student demonstrating high confidence and the ability to hold the audience's attention. A "Good" category reflects a fairly clear presentation, although some sections may be less engaging. A "Fair" category describes situations where the student frequently appears hesitant when delivering, while an "Inadequate" category indicates a presentation that is unclear, difficult to understand, and lacks confidence.

Media Usage is the third criterion, which assesses the effectiveness of the media used to support the presentation material. In the "Very Good" category, media were used effectively and variedly, enhancing audience understanding. The "Good" category indicates appropriate media use, although there was a lack of variety in the types of media used. The "Fair" category indicates that media use was less relevant, while the "Inadequate" category reflects that no media was used at all or that the media used were inappropriate for the material being presented.

Finally, the "Group Cooperation" aspect assesses the contribution of all members to the presentation process. The "Very Good" category indicates that all group members contributed equally and actively, creating strong synergy. The "Good" category indicates that most members played an active role, although some members contributed less. The "Fair" category reflects that some members contributed minimally, resulting in a failure of collaboration, while the "Inadequate" category indicates a complete lack of collaboration, with some members not contributing.

Overall, this assessment rubric aims to provide clear guidance for students in designing and delivering their Solar System project presentations. By understanding these assessment criteria, students are expected to improve the quality of their presentations, as well as their communication and collaboration skills within groups.

Observation Sheet for Group Discussion Activities

Students' question-asking skills are also a key consideration in this assessment. Students who are active in discussions generally demonstrate good question-asking skills, being able to ask relevant and engaging questions. Meanwhile, students in the moderate category tend to need more encouragement to ask questions. Students in the highly engaged category not only demonstrate active participation but also consistently ask questions that reflect a deep understanding of the topics discussed.

Collaboration is also a focus in this assessment. Students with active participation demonstrate strong collaboration skills, supporting one another in discussions. Students deemed highly collaborative are able to lead discussions effectively, facilitating the exchange of ideas among their peers.

Teacher notes highlight several observations during the discussions. Some active students have been shown to raise interesting and relevant questions, thus showing the potential to become discussion leaders. Conversely, there is a need to encourage less active students to be more involved in future discussions.

Interactive Quizizz documentation



Assessment and technology are two crucial components of education. Assessment is at the heart of education, providing teachers with a wealth of information about their students, and technology helps them achieve learning objectives more easily. Teachers can leverage the integration of technology and assessment to gain detailed information about student performance and create effective teaching processes. However, few teachers truly consider assessment and its washback effects on student learning (Pitoyo & Asib, 2020)

Kahoot, Quizizz, and Google Forms are educational tools that are creating innovative methods for classroom instruction. With a teacher's computer linked to a projector, a stable internet connection, and students' mobile phones, tablets, or laptops, the interaction between teachers and students can be improved and increase student motivation, engagement, and learning (Chaiyo & Nokham, 2017). The rapid development of technology has brought significant advances in educational applications, which enhance learning experiences and outcomes (Pujiati et al., 2024).

Quizizz is a platform that uses games for educational purposes, enabling educators to design engaging quizzes and assess students' grasp of different subjects. With a user-friendly interface, students can confidently take quizzes from any device, such as a computer, tablet, or smartphone.

One of Quizizz's key features is the ability for teachers to create quizzes with various question types, including multiple-choice, true/false, and matching. The colorful and engaging design makes quizzes more enjoyable for students. Furthermore, students can take quizzes individually, in groups, or competitively, with an on-screen ranking. Once all questions are answered, students receive instant feedback, including scores and error analysis.

Quizizz offers several benefits for students. First, the platform encourages active learning, enabling students to engage directly in the learning process, making it more enjoyable. Immediate feedback allows students to immediately assess their understanding of the material and identify areas for improvement. Furthermore, the fun quizzes help students practice and retain information better. In classrooms, teachers administer interactive Quizizz to assess students' understanding of the material.

Education that focuses solely on outcomes can lead to students feeling stressed and losing interest in learning. By prioritizing process-based assessment, teachers can create a more inclusive learning environment and support the development of students' social and emotional skills. This is increasingly relevant in an increasingly complex world, where critical thinking and collaborative skills are essential.

Challenges Faced by Teachers in Implementing Process-Based Assessment

In implementing process-based assessment in solar system learning, teachers face several significant challenges that can impact the effectiveness of learning. One key goal is ensuring balanced participation among students. In groups, some students often dominate discussions, stifling the contributions of others who tend to be quieter or less confident. This can hinder the collaborative process, which is at the heart of a process-based assessment approach, where all students should have equal opportunities to contribute and share ideas.

Peer-to-peer feedback is an important means of conducting process evaluation, and online collaborative learning provides strong support for collecting peer-to-peer evaluation data. In process evaluation, emotional factors play a crucial role in student learning status and outcomes (Fan et al., 2024).

Group dynamics in Project-Based Learning curricula can impact educational results, but there has been limited research that combines the available findings. This overview reviews the studies that look into how group performance affects individual student outcomes in PBL. The main conclusions of the review show that (1) group performance is a stronger predictor of hands-on PBL results compared to academic or behavioral outcomes, and (2) the different tiers of Kirkpatrick's outcomes do not show a strong correlation with one another. More investigation is required to comprehend the intricacies of group interactions in PBL tutorials across different contexts of study and to enhance training and course development (A. Li et al., 2022).

Another significant challenge is time management, where teachers often struggle to align the time required for each stage of assessment with the established plan. For example, when conducting a solar system model project, the planning and group discussion stages may take longer than expected, disrupting the time allocated for model creation and presentation. This can cause students to rush through assignments, which in turn can reduce the quality of their work.

The examination additionally reveals that a significant challenge in performing evaluations within the classroom is related to how students perform and manage their time. At the same time, the tools that educators utilize to support students during classroom assessments highlight the importance of digital materials. As a result, it can be inferred that the process of assessing in the classroom implemented by teachers has not achieved the goals set by the Ministry of Education (Kemendikbud), and teachers need more resources to implement classroom assessments to achieve learning outcomes (Hashim et al., 2021).

Furthermore, limited educational resources are also a challenge faced by teachers. Many schools, including SDN Wadas 3, may lack adequate access to the teaching aids, technology, or learning materials needed to support the implementation of process-based assessment. This limitation can hinder student creativity and reduce teaching effectiveness. Furthermore, some teachers feel they lack adequate training to effectively

implement process-based assessment methods, which can reduce their confidence in carrying out this process.

While these challenges are significant, it is important for teachers to find strategies to overcome them. For example, teachers can implement group management techniques that encourage all students' participation and assign clear roles within groups. Furthermore, the use of visual aids and technology can help create a more engaging and interactive learning experience, while professional training for teachers can enhance their understanding of these methods.

Overall, the challenges faced by teachers in implementing process-based assessment in solar system learning at SDN Wadas 3 include uneven student participation, difficult time management, and limited educational resources. By understanding these challenges, teachers can develop more appropriate strategies to maximize the benefits of process-based assessment, thereby enhancing students' learning experiences and enriching their understanding of solar system material.

Through this more focused approach to the learning process, it is hoped that students will develop relevant skills and be prepared to face future challenges. This research makes an important contribution to understanding more effective and sustainable educational practices, while also opening up opportunities for further research in this area.

Recommendations for the Practical Implementation of Process-Based Assessment

According to the results of this research, there are various suggestions that can be put into practice to enhance the efficiency of process-oriented evaluations in primary education. These suggestions aim to boost student involvement and optimize the benefits of a more holistic evaluation approach.

First, it is important for teachers to develop more inclusive strategies that encourage the active participation of all students. One way to achieve this goal is to assign clear roles within each learning group. By assigning roles, each student will assume specific responsibilities, making them feel valued in the learning process. For example, in a learning project about the solar system, students could be assigned roles such as presenter, researcher, and note-taker. Furthermore, the application of cooperative learning techniques can create a collaborative atmosphere that encourages positive interactions among students. In this context, cooperative learning not only improves students' understanding of the material but also their social skills.

Current studies on new positions in computer-supported collaborative learning (CSCL) have primarily concentrated on identifying who performs specific tasks instead of understanding the reasons behind it, specifically, what factors contribute to the development of a certain role. Thus, our objective is to fill this void and explore the factors that clarify how roles emerge (Saqr et al., 2024).

Collaborative problem solving (CPS) is commonly implemented in K-12, universities, and casual learning environments to enhance the quality of students' education. Comprehension the relationship between learning engagement and group performance is crucial for CPS pedagogy and analytics. However, few empirical studies have investigated the role profiles of individual engagement in CPS and the impact of individual engagement, as reflected in the configuration of role profiles within groups, on learning performance. In this research, deep learning techniques were applied to assess student engagement, while cluster analysis was performed to uncover

engagement role types. Additionally, qualitative case studies were utilized to thoroughly examine how role profiles vary between high-performing and low-performing groups. The findings revealed six unique role profiles that reflected different degrees of cognitive and socio-emotional engagement: free-rider, normal constructor, immersed engager, balanced engager, questioning refuter, and active constructor. Moreover, it was found that high-performing groups tended to display prevailing role profiles of active constructors and balanced engagers, whereas low-performing groups were primarily identified by the presence of free-riders. Drawing from these results, several suggestions for enhancing effective collaborative learning through the careful design and organization of collaborative problem-solving activities are explored (X. Li et al., 2024)

Supporting active student being involved in maker-focused project-based learning can pose difficulties in classrooms that embrace inclusivity. Studies indicate that discussions led by teachers, which promote reflection, enhance students' ability to work together and foster engagement. Thoughtfully arranged group dynamics enable educators to offer targeted assistance to those students who require it the most (Sormunen et al., 2020).

One approach to encourage inclusive involvement and evaluation is to take into account three key aspects that affect students' participation: (a) the atmosphere in the classroom, (b) straightforward expectations, and (c) opportunities for getting involved in class. There are various methods to guarantee inclusive assessment, such as establishing learning goals, cooperative participation agreements, and scoring guides (Bondura, 2023).

Second, constructive and specific feedback must be encouraged so that students can understand aspects of their learning that need improvement. Providing feedback that is not only positive but also detailed allows students to identify their strengths and weaknesses. For example, after a presentation about the solar system, teachers can comment on the brightness, use of props, or even group dynamics. This focused feedback has the potential to increase students' motivation to improve, resulting in a more effective learning cycle.

Third, it is crucial for educational institutions to provide adequate professional training for teachers. This training should include skills and knowledge in effectively implementing process-based assessment, including how to design process-oriented learning activities and techniques for providing constructive feedback. With appropriate training, teachers will be more confident in implementing this assessment method and able to apply strategies appropriate to the characteristics of the students in their classes. This will support the creation of a more productive and innovative learning environment.

Overall, the implementation of these recommendations aims to improve the effectiveness of process-based assessment in elementary schools, with an emphasis on inclusivity, constructive feedback, and professional development for teachers. With these steps, it is hoped that students' learning experiences can be improved, so that students not only achieve good academic results, but also develop skills that are relevant for their future lives.

CONCLUSION

Based on research findings regarding the implementation of process-based assessment in sixth grade, it can be concluded that although this method significantly improves students' communication, collaboration, and critical thinking skills through active participation in learning, there are challenges that teachers need to address. These challenges include difficulties in ensuring balanced engagement among students, effective time management for each stage of the assessment, and limited supporting educational resources.

Therefore, it is crucial for educational institutions to develop more inclusive learning strategies. This includes providing clear assessment rubrics to increase transparency and providing constructive and specific feedback to students so they can understand areas for improvement. Furthermore, adequate professional training for teachers is also needed so they have the skills and knowledge necessary to implement process-based assessment effectively.

These steps are expected to improve students' overall educational experience and prepare them for future challenges. Thus, process-based assessment contributes not only to academic achievement but also to the development of holistic skills essential for students' future lives.

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***Ida Arina (Corresponding Author)**

Master of Elementary School Teacher Education Program,
Universitas Pendidikan Indonesia,
Jl. Dr. Setiabudi No.229, Isola, Kec. Sukasari, Kota Bandung, Jawa Barat 40154, Indonesia
Email: Idaarina17@upi.edu

Yunus Abidin

Doctor, Lecturer at the Faculty Master of Elementary School Teacher Education Program,
Universitas Pendidikan Indonesia,
Jl. Dr. Setiabudi No.229, Isola, Kec. Sukasari, Kota Bandung, Jawa Barat 40154, Indonesia
Email: yunus.abidin@upi.edu

Puji Isyanto

Doctor, Lecturer at the Faculty of Economics and Business,
Universitas Buana Perjuangan,
Jalan Ronggo Waluyo Sirnabaya, Puseurjaya, Telukjambe Timur, Karawang, Jawa Barat 41361
Email: puji.isyanto@ubpkarawang.ac.id

Nor Zafir binti Md Salleh

Doctor, Lecturer at the Faculty Continuous Learning and TNE, Johor Malaysia
Universitas Teknologi Malaysia
Jalan Iman, 81310 Skudai, Johor Darul Ta'zim, Malaysia
Email: nor.zafir.md@utm.my
