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ANALYSIS OF THE IMPLEMENTATION OF CONSTRUCTIVISM IN SCIENCE EDUCATION: A CASE STUDY

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Abstract: The values of constructivism in science learning are demonstrated in how students construct their knowledge. However, science learning still needs to implement this learning concept fully. Therefore, this research aims to analyze the presence of constructivism in the implementation of science learning at a Junior High School in Sungai Raya. The study was conducted using a qualitative method. Data collection was done through interviews, observations, and documentation. The data analysis technique used was descriptive analysis. The research results show that constructivism in implementing science learning at a Junior High School in Sungai Raya can be seen in the planning, implementation, and evaluation of learning. Overall, the presence of constructivism is indicated by student involvement, learning model selection, learning strategies, and assessment forms. Although the presence of constructivism in science learning at a Junior High School in Sungai Raya has been identified, there is still a need for improvement in learning support facilities, assessment, and innovative learning approaches to accommodate students' more empirical and contextual learning experiences.

Keywords: Analysis, constructivist, science learning.

INTRODUCTION

The goal of science education in Junior High School (SMP) is to support students' systematic and multiperspective thinking abilities implemented through scientific methods (Singh, 2015; Bahtogh, 2013). Undoubtedly, the natural science (IPA) taught in schools is crucial for our world and communities (Bradley, 2005; Maesyaroh et al., 2020).

Detagori et al. (2017) revealed that implementing science or IPA learning in schools is essential in improving students' understanding of scientific concepts and principles. Therefore, in its actualization, science is closely related to the constructivist learning theory, which

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emphasizes the active involvement of students in constructing their knowledge (Weasenforth, 2018; Mansir & Karim, 2020). The translation of the constructivist theory into science learning is carried out through inquiry-based learning. According to Herianto Lestari (2021), inquiry-based learning is based on the constructivist theory, which emphasizes the importance of cognitive change when a person's initial concepts are challenged by new information. The characteristics of learning activities in this approach include active student involvement through questioning, discussing, and supportive learning media.

Several experts in constructivism have articulated their perspectives regarding the critical aspects that warrant attention while fostering students' cognitive development. These experts have highlighted the following key points as integral to nurturing compelling learning experiences:

The Construction Process through Diverse Avenues. These experts emphasize that the process of knowledge construction for students goes beyond traditional classroom instruction. It involves utilizing various tools, such as learning media, project assignments, and assessment methods. This multifaceted approach encourages students to actively engage with various learning resources and apply their learning through practical tasks and projects.

Meaningful Learning with Reflection. Constructivist thinkers stress the significance of meaningful learning experiences. Learning is meaningful when students are actively engaged and able to connect new information to their existing knowledge. Furthermore, they encourage students to reflect on their learning outcomes, fostering a deeper understanding of the material and its real-world applications.

Multiperspective Understanding. The experts underscore the importance of nurturing students' multiperspective understanding of concepts. They advocate for an approach that encourages students to explore topics from various angles and viewpoints. This enriches their comprehension and promotes critical thinking and the ability to consider different perspectives.

Collaborative and Cooperative Learning. Collaborative and cooperative activities are highlighted as effective strategies for constructivist learning. John Dewey, Jerome Bruner, Lev Vygotsky, and Jean Piaget all emphasize the value of social interaction in learning. Through group discussions, teamwork, and peer interactions, students can exchange ideas, challenge assumptions, and collectively construct new knowledge.

Incorporating these principles into educational practices aligns with the essence of constructivism, as these experts advocate. By acknowledging the significance of diversified learning approaches, fostering meaningful engagement and reflection, promoting multiperspective understanding, and encouraging collaborative learning, educators can create an environment that empowers students to participate actively in their cognitive development.

Learning experts recommend using the constructivist paradigm to enhance the quality of the learning process and outcomes (Mulianingsih et al., 2020; Suzana et al., 2020). The notion that students merely receive information from the teacher take notes, and memorize it needs to be transformed into students sharing knowledge actively seeking and discovering knowledge through inquiry-based approaches, thus improving their understanding (Surawan, 2020). Educators can utilize innovative approaches, strategies, models, or teaching methods (Widiyawati, R., 2020; Lisyanti et al., 2022).

Thus, the discourse in this research pertains to how the constructivist approach is implemented in the context of Natural Science (Science) education. Furthermore, it will delve into the fundamental concepts of constructivism, how they are applied in Science education, and the ensuing impact on student learning.

Essentially, constructivism is an instructional approach that underscores the active role of students in constructing knowledge through experiences and interactions with their environment. This concept stimulates students to build their understanding through exploration, reflection, and discourse. As a result, the address within this research will encompass an analysis of how educators implement constructivist principles in lesson planning, employ methods, and how students engage in meaningful and active learning processes.

The position of this research will seek concrete evidence showcasing the aspects of constructivism within Science education. This research might analyze instructional materials, teaching strategies, classroom interactions, student exploration support, hands-on learning tools, and students' abilities to formulate questions, develop comprehension, and connect new concepts with existing knowledge. The position of this research can fall within the realm of education and educational science. This research can contribute to understanding how the constructivist approach can be effectively applied in Science education, thereby enhancing student learning outcomes. Meanwhile, in educational science, this research can provide insights into the effectiveness of various instructional approaches and their implications for learning theory and curriculum development.

Several previous studies support the statements above. Research by Sari (2019) states that by implementing teaching strategies based on the values of constructivism, teachers can assist students in developing their critical thinking skills. Additionally, research by Noviandayanti (2021) found that inquiry-based learning in science education at the junior high school level can enhance students' motivation and interest in learning and improve their understanding of scientific concepts.

The difference between this study from the previous ones lies in the fact that the earlier research focused on the development of student's critical thinking skills through the implementation of constructivist teaching strategies and was concerned with the use of inquiry-based learning at the junior high school level and its impact on student's motivation, interest, and understanding of science. Meanwhile, in this study, the emphasis will be placed more on the application of constructivism in Science education across various aspects. Hence, it can contribute to empirical support regarding the role of constructivism in education and provide a broader insight.

However, numerous studies have been conducted, and related articles have been published that paint a bleak picture regarding science education, particularly at the junior high school level (SMP). The central claim is that science education remains unpopular among students (Hofstein et al., 2011; Holbrook, 2008; Osborne & Dillon, 2008).

Many of these articles conclude that students are less interested in learning science and need more motivation (Jenkins, 2005; Osborne et al., 2003; Karim & Hartati, 2020). One frequently cited reason is that students do not have real-life experiences that shape their knowledge (Dillon, 2009; Gilbert, 2006; Holbrook, 2008). This notion is supported by research conducted by Amanda (2018) on "Improving Students' Critical Thinking Skills in Science Education." The study revealed that science education still predominantly focuses on content delivery, with teachers merely presenting concepts and theories already found in the textbooks.

The statement above highlights the gap between the idealism of constructivist theory and its implementation in actual teaching practices. Furthermore, based on interviews and observations conducted at a Junior High School in Sungai Raya, it was found that the implementation of science education experienced by students still needs to be improved. Teachers acknowledge that the learning experiences provided only partially guide students in constructing their knowledge. However, teachers have tried to meet constructivist learning requirements by creating an active learning environment through discussions.

Therefore, considering the importance of integrating constructivism in science education at the junior high school level, which can help students discover and construct their knowledge for meaningful learning, it is necessary to analyze the presence of constructivism in science education. Thus, the formulation of this research is how constructivism in Science Education at a Junior High School in Sungai Raya encompasses planning, implementation, and assessment activities. As a result, the findings of this analysis will serve as input for the improvement of elements requiring the application of constructivist approaches. Hence, this research aims to analyze the presence of constructivism in the implementation of science education at a Junior High School in Sungai Raya.

METHOD

The existence of constructivism in Science Education at a Junior High School in Sungai Raya is an essential factor needed to enhance the implementation of constructive learning for students. The research method used was a qualitative case study. The case study method is intended to describe a specific event or occurrence conducted in actual conditions while still using theories and references as a basis for analysis (Alwasilah, 2003).

Data collection was conducted through interviews, observations, and documentation. Interviews were used to gain a deep understanding and information about the presence of constructivism in science education at a Junior High School in Sungai Raya. This study conducted interviews with a science teacher and two seventh-grade students. The obtained interview results are in the form of narratives containing descriptions and explanations from the research subjects. The observation method was used to directly observe science education activities at a Junior High School in Sungai Raya, resulting in observational notes. The documentation method involved collecting and analyzing relevant documents, including teaching modules, lesson objectives, and student worksheets, and documentation of activities in descriptive form to provide supporting information.

In collecting data, Miles and Huberman (as cited in Ali, 2014) suggest a three-step data analysis process, which includes data reduction, data display, and data verification and conclusion. This research uses descriptive analysis for qualitative data to describe and explain data obtained from interview transcripts, observation notes, and documentation notes. The results from these three descriptive data sets are then analyzed and interpreted, and conclusions are drawn.

RESULT AND DISCUSSION

The constructivist values in science education analyzed in this study are as follows: 1) Construction process through learning media, project assignments, and assessment; 2) Meaningful learning involving student engagement and reflection on learning outcomes; 3) Students' multiperspective understanding of concepts; 4) Collaborative and cooperative activities in learning (John et al.).

These four constructivist values, which serve as indicators in the implementation of science education, are also related to the standards of science education according to the National Science Education Standards, which include (1) inquiry-based learning, (2) guiding and facilitating learning, (3) assessment, (4) creating a conducive learning environment, (5) fostering learning communities, and (6) planning and developing learning in schools (NSES, 1996, p.43).

Based on the interviews conducted with science teachers at a Junior High School in Sungai Raya, it was found that the actualization of the learning process was designed comprehensively, from the planning stage to implementation and assessment. Managing learning is closely related to activities ranging from instructional planning, teaching implementation, and learning assessment. Planning is the initial phase that serves as the starting point for execution and task allocation within management, providing a framework for further innovation and integration functions (Hrivnak, 2019).

Planning of Science Learning

In the planning stage of science learning, the teacher prepares teaching modules and the sequence of learning objectives (ATP) that will serve as guidelines for implementing the learning process according to the provisions of the Merdeka curriculum. Based on the documentary study conducted on the teaching modules and ATP documents prepared by the science teachers at a Junior High School in Sungai Raya, it was found that the selection of learning resources used by the teachers still relies on the use of the science textbook, as shown in Figure 1.

PENGETAHUAN PRASYARAT
Peserta didik telah memahami faktor biotik pada suatu ekosistem.
SARANA DAN PRASARANA
Sarana: Lembar Kerja Peserta Didik (LKPD), *Handphone*, Papan Tulis, Spidol, Prasarana: Ruang Kelas.
SUMBER BELAJAR
Internet (mesin pencari Google), Buku Paket IPA SMP Kelas VII (Kurikulum Merdeka)

Figure 1. Learning resources in the teacher's teaching module.

However, teachers have also used technology like Google to support learning. Therefore, although the number of learning resources students use may be limited, technology integration in teaching has been considered in lesson planning, even if it is only limited to search engines like Google.

In the planning phase of science teaching, it is evident that the teacher has aligned the instructional module format with the stipulated process standards. In practical terms, the teacher also meticulously plans the instruction, starting from defining the learning objectives, structuring the content, formulating the media to be employed, devising instructional steps, and culminating in assessment. However, it can be observed within the planning encapsulated in the instructional module crafted by the teacher that the presence of constructivism is exemplified, including through the incorporation of learning media and the utilization of technology therein.

According to Masgumelar Mustafa (2021), constructivism should encompass various types of learning media to provide learning opportunities for students with different learning styles. Furthermore, determining the teaching strategies outlined in the teaching modules revealed that the teacher implements cooperative learning. However, the specific model used by the teacher needs to be clearly described. The selection of the teaching model or strategy should also reflect the presence of constructivism in the implementation of science education at a Junior High School in Sungai Raya. Sudawan (2016) stated that, generally, constructivist learning is conducted through stages such as preconception, exploration, discussion, and concept development and application. Thus, based on the documentation, the lesson planning for science education at a Junior High School in Sungai Raya already accommodates the concept of constructivist learning.

The research findings presented above provide valuable insights into the planning stage of science learning. However, a few areas could be identified; one example is that while the presence of constructivism is mentioned in the instructional module, the extent to which it is effectively implemented and its impact on students' learning experiences must be thoroughly explored. The research could benefit from a more detailed analysis of how constructivist principles are translated into practice.

In summary, while the research offers valuable insights into the planning of science learning and the integration of technology, there are opportunities for further exploration and a more balanced consideration of various aspects, including student engagement and the effectiveness of the implemented teaching strategies.

Implementation of Science Learning

In implementing science education at a Junior High School in Sungai Raya, teachers start the lesson by providing preconception activities related to contextual problems or information. This aims to acquire the students' initial conditions and knowledge, which will be used as a turning point in the learning process. The teacher provides an apperception in the form of a contextual question, "Have you ever seen a rat eating rice?". This statement is consistent with the findings of Imamah (2012) that constructivism emphasizes contextual learning that is closely connected to students' everyday lives.

Furthermore, in the implementation, teachers facilitate student learning through Learner's Worksheets (LKPD). An example of the instructions in the LKPD is shown in Figure 2.

Based on the Students Worksheets (LKPD) shown in Figures 2 and 3, it can be seen that the science teacher has made efforts to create worksheets that accommodate students' analytical thinking skills. However, when related to the latest revised Bloom's taxonomy theory, the instructions in the LKPD used by the students above still need to accommodate higher-level cognitive abilities. This is because, in the instructions, students are only asked to identify and classify food chains. Therefore, further stages, such as providing reasons, are needed, which are part of level 3 of Bloom's taxonomy or the highest level. According to Azhar (2016), constructivism encourages students to think critically, analytically, and creatively.

Bacalah ilustrasi berikut dengan seksama dan buatlah jaring-jaring makanan pada bagan yang telah disediakan!

Suatu pagi saat pelajaran IPA berlangsung di kelas VII SMP Negeri 2 Sungai Raya, guru IPA memberikan tugas kelompok kepada murid untuk mencari informasi mengenai faktor biotik yang terdapat di beberapa ekosistem. Guru membagi menjadi empat kelompok belajar. Kelompok 1 mengamati ekosistem laut. Kelompok 2 mengamati ekosistem kebun. Kelompok 3 mengamati ekosistem sawah, dan kelompok 4 mengamati ekosistem hutan. Hasil pencarian informasi oleh setiap kelompok adalah sebagai berikut:
1. Kelompok 1: Ikan Paus, Lobster, Udang, Ikan Teri, Ikan Tuna, Burung Pelikan, Plankton.
2. Kelompok 2: Belalang, Katak, Tikus, Sawi, Bunga Sepatu, Burung Pipit, Ulat, Burung Elang.
3. Kelompok 3: Padi, Pohon, Tikus, Belalang, Ulat, Ayam, Katak, Ular, Burung Elang.
4. Kelompok 4: Tumbuhan Hijau, Kelinci, Tikus, Kambing, Kucing Liar, Jakal, Singa, Ular, Burung Elang, Burung Hantu

Berdasarkan ilustrasi di atas, marilah kita buat jaring-jaring makanan dari faktor biotik pada masing-masing ekosistem dengan bantuan bagan-bagan di bawah ini.

Figure 2. Instruction in LKPD.

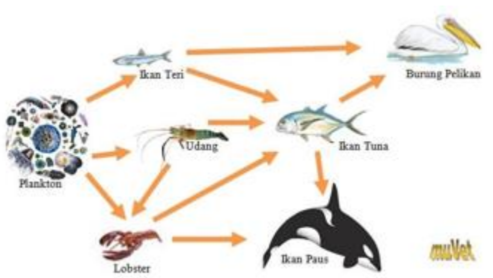

Figure 3. Example answer key for LKPD.

Based on the conducted observations, it is known that students are also allowed to form groups and engage in discussions (Figure 4). The teacher facilitates group learning activities to assist students in collaborating and communicating. This is one aspect of constructivist learning, where students can share ideas, observations, and knowledge to enrich their perspectives (Lathifah, 2021).

Figure 4. The activity of group learning.

After the discussion, students can present or communicate their discussion outcomes in front of the class at the end of the lesson. This activity allows students to share their thoughts, findings, and understanding with their classmates and teachers. This activity is depicted in Figure 5.

In the constructivist approach, students are regarded as builders of their knowledge. Therefore, students actively seek information through presentation activities, organize concepts, and present their knowledge (Budyastuti & Fauziati, 2021). However, the implementation of reflective activities by students is still hindered by time constraints, so not all students can present their findings and discussions.

Figure 5. The student shows the result of the discussion.

This was conveyed from the interview results, stating that alternative approaches must be found to overcome these time limitations, one of which is through project-based activities. However, not all topics can be assigned project-based tasks in implementation.

Furthermore, the teacher expressed that many areas still need improvement in implementing constructivist principles in science education at a Junior High School in Sungai Raya. Among them is the limitation in conducting direct outdoor and environmental activities, although efforts have yet to be implemented. Therefore, innovative learning approaches that can accommodate students' more empirical and contextual learning experiences need to be developed to strengthen the application of constructivism in science education. Similar opinions were shared by students, stating that they find it easier to understand science lessons that involve projects and direct activities outside the classroom. Additionally, there is a need for improvement in supporting facilities such as projectors and laboratory facilities to enhance students' learning experiences in a better and more innovative way.

Overall, these findings highlight the importance of continuously enhancing the implementation of constructivism in science education at a Junior High School in Sungai Raya. In constructivism, experiential-based learning through project activities and direct engagement with nature and the environment allows students to construct their knowledge (Riyanti, 2021; Martini, 2017). However, challenges such as time constraints, subject matter, and supportive resources must be addressed through relevant instructional innovations and the development of adequate supporting facilities.

Assessment of Science Learning

The assessment conducted in implementing science education at a

Junior High School in Sungai Raya consists of formative and summative assessments. Formative assessments are daily assessments for each lesson, such as written tests or quizzes. According to Rafi (2016), formative assessment provides continuous feedback to students to gradually build their understanding. On the other hand, summative assessment is the end-of-semester evaluation. Although summative assessment usually provides a final review of students' achievements, in the context of constructivism, it can also be used as a means of reflection and feedback for students. Students can assess the extent to which they have achieved learning goals and monitor their progress throughout the semester. This aligns with the constructivist principle of encouraging students to monitor and regulate their understanding (Astuti, 2016).

One example of assessment conducted during the learning process is asking the group leader to assess their group members. This is one way for teachers to assess the achievement and engagement of all students in the discussion process. Constructivism emphasizes exploring students' learning processes, not just the outcomes. However, it should be understood that in assessing science education, evaluation is not only based on students' final products or answers but also their thinking processes, collaboration, and reflection during the learning process (Fitri, 2017).

However, it is known that teachers still face difficulties in implementing diagnostic assessments for students. Therefore, diagnostic assessment has yet to be carried out in implementing science education at a Junior High School in Sungai Raya. Diagnostic assessment in constructivism also plays a role in designing authentic and relevant learning experiences. By understanding students' prior knowledge, teachers can create activities, tasks, or questions that trigger reflection, critical thinking, and constructing new knowledge based on their previous understanding (Azman, 2020).

CONCLUSION

In conclusion, the research findings presented in this study underscore the pivotal role of the constructivist learning paradigm in science education implementation. Through the constructivist approach, learners are positioned as active knowledge architects, shaping their understanding through dynamic interaction with their surroundings. The implications of this research indicate that constructivism's presence within science education at a Junior High School in Sungai Raya manifests distinctly across the phases of planning, execution, and evaluation. The foundational tenets of constructivism are mirrored in students' active engagement throughout the learning journey, the discerning selection of educational resources, the strategic formulation of pedagogical approaches, and the comprehensive evaluation of learning outcomes.

Specifically, delving deeper into the specific insights, the research findings emphasize educators' need to tailor instructional strategies to foster higher-order cognitive engagement, thereby facilitating optimal knowledge construction among students. Moreover, the results accentuate the exigency for enhancements in learning support infrastructure and innovative teaching methodologies. These adaptations are envisioned to provide a conducive learning milieu, enabling students to immerse themselves in empirical and contextually rich educational experiences. Additionally, integrating diagnostic assessments emerges as a salient recommendation to fortify the efficacy of science education implementation. By embedding such assessments, educators can tailor their teaching approaches to address individual needs, propelling the constructivist ideals towards more tailored and effective learning outcomes.

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