



Electronic Worksheet-Based Problem Based-Learning (PBL) Toward Problem-Solving in Science Education: Need Analysis

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Abstract: Both teachers and students require teaching materials to assist learning. This is necessary for students to understand the course and will greatly aid understanding, Problem-solving skills are very important for students, but students feel inadequate in problem-solving skills, so there is a need for teaching materials that contain Problem-Based Learning. This study aims to analyze the need for teaching materials, especially student worksheets based on Problem-Based Learning to improve student problem-solving. This research is qualitative and quantitative. The subjects of this study were students of class VIII SMP Negeri 14 Yogyakarta. Research data were collected using a questionnaire containing 16 questions, interviews, and observations. The methods for data analysis Techniques for analyzing data include using qualitative methods to examine how curriculum, student characteristics, and learning resources are used and presenting the results in forms that may be used for descriptive statistics, such as graphs and standard tables. The results showed that: Based on interviews, questionnaires, and observations on teaching materials, student characteristics, and the curriculum used. It can be said that, on average, 79.8% of students need additional electronic-based teaching materials on the topic of additives and addictive substances, and the unavailability of teaching materials in the form of electronic worksheets based on problem-based learning.

Keywords: Electronic Worksheet; Problem Based Learning; Problem-Solving; Science education

Introduction

The importance of education in preparing the student for the future. Science is one part of education associated with the quality of individuals and the nation's intelligence (Gunawan et al., 2019). The learning process held at the school is based on the applicable curriculum. A new curriculum has been implemented, namely the independent curriculum, where previously, The 2013 curriculum sought to make learning more student-centered. The Merdeka curriculum included a variety of extracurricular activities. Students would have more time to study concepts and develop their competency because the content would be more suitable. To tailor instruction to student's interests and learning needs, teachers have various tools at their disposal (Khoirurrijal et al., 2022). 21st Century Skills are

important abilities that students must possess in developing the information age (Dishon & Gilead, 2021). Collaboration, communication, information, and communication technology literacy, creativity, critical thinking, and problem-solving are some of the most crucial skills, even if this ability is regarded as a 21st-century skill and its definitions vary (Papanastasiou et al., 2019; Voogt & Roblin, 2012).

Different cognitive abilities will make students' problem-solving abilities also experience differences (Lasiani & Rusilowati, 2016), and individual problem-solving is worse than problem-solving in pairs (Chen et al., 2022). An individual's success can be determined based on his thinking skills, especially the ability to solve a problem (Susilo, 2012). Problem-solving skills are part of cognitive activities that help in professional practice and can improve thinking skills to find the right solution

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to a complex problem (Elaby et al., 2022). Problem-solving ability can be reflected based on solving daily problems carefully, precisely, harmoniously, and rationally (Pistanty et al., 2015). However, Indonesia still needs special preparedness and strategy (Safitri et al., 2019). As TIMSS (Trends International Mathematics and Science Study) reported in 2015, Indonesia was in the 44th position out of 49 countries (Hadi, 2013). Research results (Demirhan & Şahin, 2021) say that people believe their problem-solving abilities are lacking.

The Problem-Based Learning Strategy generally emphasizes activities centered on problem-solving and developing student learning creativity (Fatimah et al., 2017; Herdianto et al., 2021; Kurniawati, 2018). (Laamena et al., 2021) explained that one of the instructional approaches that can help students improve their problem-solving skills is the PBL model., making learning more meaningful. The Problem-based learning model promotes active learning by engaging students in problem-solving tasks (Kamala et al., 2022). PBL is a learning model that begins by giving a problem to students where the problems given are daily experiences or have been experienced by students. Then students solve the problems given in order to get new knowledge. The teacher encourages students to participate more actively in the learning process and can widen their understanding of the learning strategies so that the learning process is not monotonous and students are not passive, and their ability to solve mathematical problems improves. The PBL learning paradigm is one of several thoughts to enhance student learning results. Students are introduced to an issue that can sharpen their ability to think critically and creatively and solve problems early in the PBL model learning process. Next, students are organized to learn. When the learning process is underway, the teacher helps the class to solve the problems before presenting the answers for analysis and evaluation. With the application of learning utilizing the PBL model, students are more engaged in the learning process and have a better understanding of the lesson's material. It is also beneficial for students, especially in achieving learning outcomes. The process of searching and finding is done through the process of investigating a problem.

While teachers act as mentors as well as facilitators for students to foster appropriateness, challenge questions, and trigger student-generated investigations in learning. The problem-solving signs involved are: (1) recognizing the issue, (2) formulating a plan, (3) carrying it out, and (4) reviewing the progress accomplished (Olatide, 2015).

The success of the learning process is also aided by the use of high-quality teaching resources, which enable teachers to convey learning materials as effectively as possible. Teaching materials should be arranged by

following certain systematic rules, meaning that good teaching materials should have a compilation syntax tailored to the purpose of forming these teaching materials. Additionally, the success rate of the learning process can be impacted by well-designed and arranged instructional resources (Kurniawan et al., 2018). According to observations made on the learning materials or tools used in class VIII at SMP Negeri 14 Yogyakarta, books and student worksheets are still being used, but they are still unable to encourage students' problem-solving skills. According to the findings of teacher interviews, no student worksheets can foster students' capacity for problem-solving. To examine the demands of instructional materials, particularly student worksheets, is the goal of this study, which needs to be developed in the material of additives and addictive substances for class VIII through initial observation sheets needs, questionnaires and interviews with teachers. such as research conducted by (Nabila, 2022; Wahyuni et al., 2020; Yakin, 2021) that PBL-based electronic student worksheets can improve problem-solving abilities.

Method

This research was carried out in October 2022 and is a descriptive Qualitative and Quantitative study. Three subjects were chosen for this initial study: eighth-grade junior high school students, junior high school science teachers, and junior high school science curriculum and teaching materials. The science instructor at the junior high school's VIIIth grade was consulted to learn more about integrating scientific instruction in classrooms. In order to gather this knowledge, two science professors were questioned. The second source of knowledge on integrating science learning materials and their application is the curriculum and instructional resources. There were 33 students engaged.

The three components of the data gathering methodologies used in this preliminary investigation were interviews, documentation, and questionnaires. Data on the adoption of integrated science learning by science instructors was gathered through interviews. (Wati et al., 2020) Information regarding integrating science learning resources and their application is gathered through documentation. The syllabus, science textbooks for classes VIII and science worksheets for classes VIII and junior high school are all included in the papers. A student observation questionnaire with 16 closed-ended questions was the tool that was employed. Data presentation in usable descriptive statistics, such as graphs and regular tables.

Result and Discussion

Results of interviews with teachers

The results of interviews with science teachers regarding the need for teaching materials in learning are divided into three topics. The topics of the interviews included teaching materials, student characteristics, and

the curriculum used. The results of interviews about the curriculum are presented in Table 1. The results of the interviews on teaching materials are presented in Table 2. The results of interviews regarding the characteristics of students are presented in Table 3.

Table 1. The Results of Interviews About the Curriculum

Question Topic	Answer
Curriculum used	The curriculum set at SMP N 14 Yogyakarta is the 2013 curriculum for grades VIII and IX and the independent curriculum for grade VII.
Learning methods that are often applied	The learning methods that are often used are discussions and lectures, and Q&A
Problems regarding the learning curriculum	In group learning, the teacher must guide students in learning activities or practicum.

Table 2. The Results of The Interviews on Teaching Materials

Question Topic	Answer
Availability of teaching materials	Teacher's Books, Student Books and other relevant sources such as the internet, encyclopedias, and others.
The intensity of the use of teaching materials	The dominant teaching materials used by teachers are student handbooks and sometimes use modules and worksheets from the internet or those developed by teachers
Problems regarding teaching materials	sometimes only rely on existing teaching materials because of the limited time the teacher has
Expectations for the development of teaching materials	There are teaching materials that are more complete and can stimulate students' enthusiasm for learning
Desired elements such as completeness of teaching materials	The material presented is complete, concise, concise, and clear

Teachers' reactions if students use teaching resources for learning. According to evidence gathered from unstructured interviews with one of the subject professors, most pupils struggle with learning, especially when they are taught to use common teaching tools. Additionally, students mostly use textbooks provided by the government; in some cases, if pupils exclusively use these resources, their learning continues.

To increase student interest in learning, it is intended that there will be instructional resources that can promote more diversified learning. This frequently occurs due to the children's continued reading and comprehension challenges. Students are more engaged if they study in groups and put what they've learned into practice.

Table 3. The Results of Interviews Regarding the Characteristics of Students

Question Topic	Answer
Total Students	The students used as the sample are 33 students
Student learning outcomes	The learning outcomes of grade 8b students are quite good, but there are some students whom their friends leave behind
Student learning interest	Students' interest in learning highly depends on the methods and learning models used. Students tend to have a high interest in learning if practicum or group learning
Problems that often arise	Students are often bored easily during learning hours, and students are often not conducive in class
Hope for the future	There are teaching materials that can stimulate students in learning so that students can enjoy fun learning

The use of teaching materials in the learning of subjects in schools helps to increase teacher effectiveness and boost student achievement. Making learning more engaging, useful, and realistic is possible using instructional materials. Utilizing instructional resources

also encourages active participation from both teachers and students, which improves the effectiveness of learning. Teaching resources can give students a place to learn and practice new skills, while also fostering their self-esteem and self-actualization (Olayinka, 2016). The

meaning that if teachers encounter problems regarding teaching materials, the learning process cannot take place optimally.

The results of the needs analysis questionnaire for students

Table 4. The results of the needs analysis questionnaire for students

Question Topic	Answer (%)
Do you have a personal smartphone	Yes 100
Interest in science learning	Yes 100
IPA material that is considered difficult	Additives and addictive substances 48.3
The reason the material is difficult to learn	a lot of confusing terms 72.4
Teaching materials used in learning	58.6. test book
Characteristics of teaching materials	Not loading troubleshooting indicator 100

From the results of the needs analysis obtained from student questionnaires, it turns out that there are no teaching materials that contain problem-solving indicators previously presented; it is obtained data that students are interested in learning science. However, on the topic of additives and addictive substances, students find it challenging to understand because it contains many terms that are difficult to understand. by students the chemical material that students learn in class VIII SMP is additive and addictive substances. The expected basic competence is KD 3.6 Curriculum 2013, which describes different chemicals in food and beverages, addictive compounds, and their effects on health. When using these crucial competencies (Monica et al., 2018). Moreover, the available teaching materials do not yet contain indicators for the development of student problems, so PBL-based student worksheet is needed to improve students' problem-solving skills. Such as research conducted by (Gültekin & Altun, 2022; Ruchaedi & Baehaki, 2016), who said that PBL-based learning could improve students' problem-solving abilities.

The Results of Observation of learning activities in class

Learning starts from the introduction to the last activity. The Penda Huluan activity begins with praying and attendance, and the teacher motivates the students. Teachers apply lecture and question-and-answer methods using PPT media and student books and discuss together in core activities. On activities students make a summary and flex their activities during a day of studying at school. The application of teaching aids is still carried out with the use of student books. In addition, teachers take advantage of LCD and computer

equipment for me to display materials and practice questions together. When answering questions using Quizizz on each student's smartphone, students are highly excited but less passionate about the learning process overall.

Table 5. The Results of Observation of learning activities in class

Question Topic	Answer
Opening, core activities and closing Lessons	It follows the RPP used
Material Presentation	Using PowerPoint and question and answer method
Class mastery	The teacher is good at mastering the class; although some children tend to be hyperactive, the teacher can master the class situation well so that learning activities can run quite conducive
How students respond	Some students are still less active in learning, so only 1 or 2 students ask questions

The findings obtained from the results of ob service include the following. (1) Student prefer to learn from a smartphone than using books and (2) enthusiastic students when the teacher gives questions in the quiz. From the description above, it can be said that students have high learning motivation with fun learning. Students require engaging, technologically based educational tools. Determine the teaching materials to be used; students may have access to electronic student worksheet.

Conclusion

According to the results of interviews, questionnaires, and observations conducted on the topic of teaching materials, student characteristics, and the curriculum used, it can be said that, on average, 79.8% of students need additional electronic-based teaching materials in the topic of additives and addictive substances and absence of electronic worksheets for problem-based learning as a type of teaching materials. This research is only the initial stage or pre-survey, namely identifying needs analysis. Therefore, Making instructional resources in the form of digital worksheets will help to carry out this research in the future. After the prototype is complete and perfect, it is then validated by experts. Thus, this prototype at stage 1 has not been completed and has not yet been tested for validation and field trials, both on a limited and wide scale.

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