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The Practicality of Electronic Student Worksheets (E-LKPD) Based on Project-Based Learning for Biotechnology Material

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Abstract

The integration of Project Based Learning (PjBL) in science education, particularly in biotechnology, is essential to foster students' critical thinking, collaboration, and problem-solving skills. However, many learning materials, especially student worksheets, often remain conventional and lack digital adaptation, making them less engaging and less practical for classroom implementation. This study aims to determine the practicality of electronic student worksheets based on Project Based Learning for biotechnology material for class X.3 of SMA Negeri 1 Kampar Kiri Hilir and SMA Negeri 1 Kampar Kiri. This study is a quantitative descriptive study. Data collection was carried out using interviews, observations, questionnaires and documentation. The sample in this study was 56 students. The research method used was the Research and Development (R&D) development method with the Plomp model. Data collection was taken in 2 meetings on biotechnology material. The instruments used in this study were student, teacher and observer practicality questionnaires and implementation questionnaires that measured the overall learning activities carried out. In the student practicality questionnaire in both schools, the score was (85.5%) in the very practical category and the teacher practicality questionnaire in both schools had a score of (88.75%) in the very practical category. In the practicality questionnaire, observers in both schools had a value of (94%) with a very practical category. In the questionnaire, the implementation of learning activities in both schools had a value of (98%) with a category that was implemented overall. From the results of the study, it can be concluded that the Student Worksheet based on Project Based Learning Material Biotechnology is practical and implemented overall in class X students of SMA Kampar Regency.

Keywords: practicality, electronic student worksheet, project based learning

INTRODUCTION

The development of the times proceed demand man For enrich knowledge knowledge possessed. With existence developments in the times make device learning as means For make things easier participant educate in mastery material the more developing. Education is always dynamic looking for new things, improving and advancing yourself, so as not to left behind by the times and always try get ready facing the times to come come or For can endure live and work in the same breath with Spirit changing times (Farid et al., 2023) . One of the developments in education in learning media is teaching materials.

In general, teaching materials can be divided into printed and non-printed teaching materials. Printed teaching materials can be defined as a set of materials containing learning materials or content to achieve learning objectives, which are expressed using print technology (Hasanah et al., 2024) . Printed teaching materials contain material in the form of ideas, facts, concepts, principles, rules, or theories covered in the subject. Meanwhile, non-printed teaching materials are teaching materials that are not printed or not in paper form (Aminullah et al., 2022) . One effort that can be made is to develop Student Worksheets that are appropriate to the needs.

Student Worksheets (LKPD) are learning resources in the form of assignment sheets, instructions for carrying out tasks, learning evaluations that must be completed by students, which are made according to the basic competencies that must be achieved (Pawestri & Zulfiati, 2020) . Student worksheets are very necessary to determine students' success in understanding and mastering the material that has been given by the teacher. One learning tool that can be developed is a digital-based student worksheet. Following technological developments, Student Worksheets (LKPD) can be presented in electronic form that can be accessed on laptops or smartphones.

Technology-based student worksheets make educators more creative and innovative in making students interested in learning. Electronic Student Worksheets (E-LKPD) are a learning medium in the form of a series of sheets of paper containing materials, assignments, or evaluations given by teachers to students. E-LKPD contains important points from the subject matter being studied (Septiani & Amir, 2023) . E-LKPD is an electronic learning medium containing assignments that students need to complete and can be used simultaneously with other learning resources or learning media (Apreasta et al., 2023) . In order for E-LKPD to provide optimal learning objectives, a learning model is needed to realize the established strategy.

Learning models must be varied, conventional methods are less attractive among students because they tend to be monotonous and boring, there needs to be a variety of models to be applied, so that it will make it easier for students to understand the lessons being delivered (Mardlatillah & Sa'adah, 2022) . Learning models are educational theories and learning theories from experts that have goals and can be used as guidelines in learning activities and can be used as a reference for research (Ahmad et al., 2024) . One learning model that can be applied is *Project Based Learning (PJBL)*.

Project Based Learning (PJBL) is a teaching method that uses problem-based learning in its system with the aim of facilitating students in understanding and absorbing the theory provided. This model uses a contextual approach and develops students' critical thinking skills (Anggraini & Wulandari, 2020) . *Project Based Learning* (PJBL) is one of the active learning methods that involves students independently with the criteria that this learning will also improve students' thinking skills towards metacognition such as critical thinking about projects that will be worked on through problems that students find (Nababan et al., 2023) . This learning model uses projects or activities as a learning tool to achieve competency in attitudes, knowledge, and skills achieved by students. Projects produced in the learning process take place on biotechnology material.

Biotechnology is a relatively new subject in Indonesia. Biotechnology is the science that studies living things, both microorganisms and macroorganisms, their development, utilization, and the interrelationships of this field with other sciences (Wahyuni et al., 2024) . Biotechnology is a combination of the words biology and technology, meaning applied science and technology that utilizes living things to produce services or for human use (Radja & Kaleka, 2024) . Biotechnology has currently experienced rapid development because it has a very important role in addressing various problems, one of which is related to agriculture and food.

Previous research is one of the most important parts of this research. Previous research serves as a reference for researchers in conducting research, so that researchers can enrich the theory used in the evaluation of the research conducted. This research is a continuation of previous research that aims to see the practicality (ease) of using E-LKPD in supporting student competencies. So that clear information will be obtained on how practical E-LKPD can be used as an alternative reference in learning. The research that has been carried out by Selvira Aisya from the Biology Education Study Program entitled "Development of Electronic Student Worksheet Guides (E-LKPD) Based on Project Based Learning Biotechnology Material for Class X SMA Kampar Regency" (Aisya, 2024) . However, this research only reached the validation stage.

Based on the results of observations and interviews conducted with teachers and students at SMA Negeri 1 Kampar Kiri, Kampar Regency, Riau and SMA Negeri 1 Kampar Kiri Hilir, Kampar Regency, Riau. Researchers conducted interviews with biology teachers and found that the learning process still uses ordinary student worksheets, not online-based, has never been implemented using Project-based LKPD, the student worksheets used by students are incomplete and the student worksheets come from the teacher's MGMP.

From this information, considerations are made in developing electronic-based learning media that can be accessed by students anywhere and anytime. This learning media is easily adaptable to students because it is easily accessed via smartphones. This learning media is easily adaptable to students because it is easily accessed by more modern students and makes it easier for students who often use gadgets for learning. Based on the above problems, an E-LKPD based on *Project Based Learning* (PJBL) will be developed on biotechnology material for class X at SMA Kampar Regency.

The same research has been conducted by (Geacelyn et al., 2021) regarding "Development of Electronic Student Worksheets (LKPD) Based on *Project Based Learning* for Biotechnology Material for Grade X Senior High School" the results of this research have a high level of validity, a very practical level of practicality and a perfect level of reliability so that E-LKPD can be used as a learning resource for students and can help and support the process of online teaching and learning activities because of its practicality and ease of use and can be used repeatedly because of its high level of reliability.

METHOD

The type of data used in this study is quantitative data. The data source in the study is an internal data source. The internal data used in this study is data from class X students of SMA Negeri 1 Kampar Kiri Hilir

and SMA Negeri 1 Kampar Kiri. In this study, the population is class X students of SMA Negeri 1 Kampar Kiri Hilir and X SMA Negeri 1 Kampar Kiri. In this study, the researcher used a random sampling technique in sampling or random sampling by conducting a lottery and the selected sample was taken from one class X from each school, namely class X.3 and class X.6, totaling 63 people.

In this study, the researchers chose to use the Plomp development model. The researchers chose the Plomp development model because it requires multiple assessments to ensure the product's validity. The instruments used in this study were observation sheets, questionnaires, interviews, and documentation. Data analysis techniques were developed through research and development, specifically quantitative descriptive analysis techniques. This was done to illustrate and explain the practical analysis process.

RESULTS AND DISCUSSION

This study aims to determine the practicality of E-LKPD based on *Project Based Learning* for biotechnology material in class X of Kampar Regency. This study aims to determine the practicality of E-LKPD based on *Project Based Learning* for biotechnology material in class X of Kampar Regency. This study will discuss the implementation of the *Project Based Learning model* in the learning process on biotechnology material (Hartati et al., 2019) . This study was conducted at SMA Negeri 1 Kampar Kiri Hilir and SMA Negeri 1 Kampar Kiri. This study will discuss the practicality and implementation of the *Project Based Learning model* in the learning process on biotechnology material.

Practicality

Practicality is how well Project-Based Learning (PBL) learning tools can be used by students and teachers. This is achieved by testing the improved learning tools. The results of the trials conducted at SMA Negeri 1 Kampar Kiri Hilir and SMA Negeri 1 Kampar Kiri serve as an assessment of whether the designed tools are practical to use. In this study, a practicality questionnaire was used as an instrument for students and teachers.

In the student questionnaire, there are several aspects that serve as guidelines for measuring assessments. The practicality questionnaire for students has 4 aspects, namely the aspect of use, the aspect of presentation, the aspect of time and the aspect of benefits. The average results obtained in the practicality questionnaire for students at SMA Negeri 1 Kampar Kiri and SMA Negeri 1 Kampar Kiri Hilir were 85.5% with a very practical category. This proves that the E-LKPD based on Project Based Learning for grade X Biotechnology material is very practical to use in the teaching and learning process.

Improvements in all these indicators were due to the influence of the use of learning tools. The learning tools used during the teaching and learning process were modules and e-LKPD. Furthermore, students found the learning tools very engaging, leading to increased enthusiasm for learning.

The students' practicality questionnaire on the usage aspect obtained an average score of 84%. This shows that the use of learning tools is very helpful for students in learning. In addition, through the use of E-LKPD based on *Project Besad Learning,* students are also actively mastering concepts, students are also invited to create a project that is around us.

Through the use of *Project-Based Learning (LKPD),* students are trained to develop awareness and a developing mindset. As developed by Nasril & Ichsan (2023) , students with a developing mindset typically see everything as a reflection of their abilities and intelligence, including academic achievement and the challenges they face. Students with a developing mindset are more likely to think about their academic experiences in the context of learning, growth, and development.

According to Afina et al. (2024) , the selected media is more appropriate and engaging for students. This is evident in the easy-to-read text, informative images, and engaging videos—all of which support the teaching and learning process and help students better understand the lesson.

Meanwhile, the acquisition of practicality value is also in the presentation aspect after the learning process. This increase is shown in statements number 6,7,8 (the material in E-LKPD is clear and easy to understand, the material in E-LKPD is in accordance with everyday life situations and the E-LKPD material includes the integration of cognitive, psychomotor, caring and curiosity aspects) with a very practical category. The increase is due to being influenced by interesting material so that students' enthusiasm arises to read. As well as easy-to-understand material located in the surrounding environment and is cognitive, psychomotor, caring and curiosity.

Caring and curiosity are more focused on emotions, such as interests and attitudes. According to (Ulfah & Arifudin, 2021), cognitive encompasses all mental activities related to the teaching and learning process, enabling individuals to think about and understand material. Psychomotor focuses more on motor skills. Presenting material in a general and focused manner can help students with memorization, skills, and abilities.

The student practicality questionnaire on the time aspect obtained an average score of 90%. This increase is shown in statements number 9 and 10 (Project Based Learning-based E-LKPD on biotechnology material helps students utilize the allocation of learning time well and The time provided for learning the E-LKPD material is sufficient and according to student needs). This shows that the time is used very efficiently because *Project Based Learning- based E-LKPD* is easy to understand and uses structured language so that it is easy to understand and according to the needs of students. This makes the process of understanding the material not take a long time.

As per (Fajhriani. N, 2020) management time is ability For allocate time and resources Power For reach goal. Creating balance between education and life.Management time No only megacu to management time, but more tend to how utilise time. With attitude responsible responsibility and discipline in finish task in accordance with the time that has passed determined, someone will more capable For reach results Study.

In the practicality questionnaire for teachers, there are several aspects that serve as guidelines for measuring assessments. The practicality questionnaire for teachers has 4 aspects, namely the aspect of use, the aspect of time, the aspect of student response and the aspect of achievement of learning objectives. The average result obtained in the practicality questionnaire for students at SMA Negeri 1 Kampar Kiri and SMA Negeri 1 Kampar Kiri Hilir was 88.75% with a very practical category. This proves that the E-LKPD based on *Project Based Learning* for grade X Biotechnology material is very practical to use in the teaching and learning process. Of these four aspects, use has the highest score of 92% while the aspect of time received the lowest score of 85%. Meanwhile, the aspect of student response showed a value of 91% and the achievement of learning objectives obtained a value of 87%.

Then the practicality questionnaire for teachers filled out by biology subject teachers who teach in class X.3 SMA Negeri 1 Kampar Kiri Hilir on behalf of Mr. Sulaiman and in class X.6 SMA Negeri 1 Kampar Kiri on behalf of Mrs. Rina Anggara Kusuma. Based on the results of this study, it is proven that E-LKPD based on Project Based Learning makes it very easy for students to get good grades but can also continue to help students to implement according to learning objectives.

Implementation of Learning by Teachers and Students

The implementation of project based learning in class X.3 SMAN 1Kampar Kiri Hilir with a total of 27 people and in class X.6 SMAN 1Kampar Kiri Hilir with a total of 36 people, was observed by two observers. Based on the data from the learning implementation questionnaire sheet, the percentage of implementation by teachers and students has the same percentage results. This happens because teachers and students have been able to carry out learning using E-LKPD based on *Project Based Learning* very well. The results of the research from teacher teaching activities and student learning can be described as follows.

This study consisted of four meetings (2 x 45 minutes). All meetings were assessed using a checklist to assess the syntax of the biotechnology learning activities. The learning syntax was divided into three activities: introduction, core, and conclusion. If the syntax of the activity was implemented, a score of 1 was given; if it was not implemented, a score of 0 was given.

Based on the research results, the average percentage of 4 meetings of learning implementation at SMAN 1 Kampar Kiri was 98% and at SMAN 1 Kampar Kiri Hilir was 97% with the category of being implemented very well. Thus, it can be interpreted that on average, at each meeting in the learning process, students can carry out *Project Based Learning- based learning activities* on biotechnology material.

The implementation of E-LKPD learning based on Project Based Learning for students at SMAN 1 Kampar Kiri Hilir and SMAN 1Kampar Kiri. The first syntax is observing, namely the teacher first explains the meaning of conventional biotechnology, examples of conventional biotechnology products and the application of conventional biotechnology. This can be seen from the average achievement of student activity, namely 94.65%.

The second syntax establishes the idea, namely observing the surrounding environment of many types of fermentation found from various types of fermentation. By creating a product that can be used by many people both at school and in the school environment. The average activity score obtained in this aspect is 98.5% which is a high score. Students in both schools can determine ideas and ask the teacher.

The third syntax is designing a project that aligns with the ideas obtained, where the design includes the rules for making it, the activities to be carried out, and the tools and materials used to complete the project. During the design activity, students did not experience difficulty in understanding the stages of project completion. This is in line with (Asmaniyah & Muhammad Yusron Maulana, 2024) , who stated that the teacher's role is to support and direct students during the learning process. During this meeting, quite a number of students consulted or asked questions to the teacher. This activity achieved a score of 98.2%, indicating that this syntax is increasing its sustainability.

The fourth syntax involves compiling a project schedule and monitoring students. According to both students and subject teachers, the researcher has fulfilled her responsibilities by assisting students in

planning a project completion schedule. According to research by Dinda & Sukma (2021), teachers need to remind students to complete projects independently. If they feel unable to do so, they can ask their teachers at school. According to teacher observations, the researcher has successfully guided students to collaborate in completing the project. This is supported by the average student activity score of 98.5%, who are actively engaged in learning.

The fifth syntax is evaluation, the researcher directs students and concludes the results of the project. Students can conclude the results of the project correctly and well. According to the teacher, the researcher has implemented this syntax with all groups getting a turn to present the results of the discussion, students also respond to the results of other groups' discussions. The teacher has assessed the results of the project that students have made based on aspects of knowledge, skills and attitudes of students.

Thus, it can be stated that throughout this meeting, the steps for using Project-Based Learning-based E-LKPD by teachers and students have been fully implemented, ensuring that learning objectives are achieved and learning skills are improved. One method to achieve learning objectives is to implement appropriate, engaging, and engaging evaluation tools for students (Fauziah et al., 2024).

CONCLUSION

Based on research on the practicality of Electronic Student Worksheets (E-LKPD) based on Project Based Learning on Biotechnology material in class X of SMA Negeri 1 Kampar Kiri Hilir and SMA Negeri 1 Kampar Kiri, it can be concluded that this E-LKPD is very practical and suitable for use in the learning process, both according to the assessment of students and subject teachers in the two meetings conducted. In addition, the implementation of learning during the two meetings in both schools was also assessed as very good by observers, students, and teachers, which shows that the implementation of learning with E-LKPD based on Project Based Learning runs optimally and is very suitable for implementation in both schools.

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