ANTHOR
Education and Learning Journal
Terbit Online pada Website: https://anthor.org/index.php/anthor
Volume 2 Nomor 5 Tahun 2023, Halaman 615 - 620

First Received: 30 Mei 2023 Final Proof Received: 28 Juni 2023

INTERACTIVE DIALOGICS AND ACCURACY OF PHYSICS LKPD MATERIALS BASED ON PBL TO IMPROVE STUDENT'S CRITICAL THINKING SKILLS IN BUSINESS AND ENERGY MATERIALS

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Info Artikel

Kata Kunci:
PBL, LKPD, Media Pembelajaran, Berpikir Kritis.

Abstrak

Dalam konsep usaha yang erat kaitannya dengan konsep energi. Energi dapat diartikan sebagai penyebab terjadinya usaha. Namun, usaha juga dapat menyebabkan perubahan energi. Tujuan dari penelitian ini adalah untuk mengetahui bagaimana kemampuan motivasi dan keakuratan LKS Fisika berbasis PBL meningkatkan berpikir kritis siswa pada materi usaha dan energi. Penelitian ini menggunakan metodologi perencanaan penelitian dan pengembangan. Teknik pengumpulan data yang digunakan adalah lembar validasi sebagai validator. Selain itu, untuk mendapatkan informasi yang relevan tentang alat penilaian, gunakan teknik analisis, metode perhitungan untuk menghitung skor rata-rata setiap komponen dan penelitian literatur. Berdasarkan hasil penelitian yang dinilai oleh ahli materi dan ahli media, LKS berbasis PBL materi usaha dan energi serta kegunaannya dalam kehidupan sehari-hari berada pada kategori sesuai dan LKS berbasis PBL ini juga dapat meningkatkan motivasi belajar siswa, dimana mereka dapat lebih interaktif dalam memahami materi usaha dan energi serta dapat berpikir kritis. Peserta didik juga dapat menyelesaikan masalah tentang materi usaha dan energi dengan baik. Kesimpulannya yang didapatkan dalam penelitian ini yakni kualitas dari LKPD ini memenuhi kriteria sangat baik sehingga LKPD ini dapat dinyatakan valid dan berkualitas tinggi untuk digunakan sebagai salah satu bahan ajar fisika kerja dan energi SMA. LKPD ini telah menghasilkan bahan ajar yang cukup akurat.

Keywords:
PBL, LKPD, Learning Media, Critical Thinking.

Abstract

The concept of effort is closely related to the concept of energy. Energy can be interpreted as the cause of effort. However, effort can also cause energy changes. The purpose of this study was to determine how the motivation ability and accuracy of PBL-based Physics LKS improve students' critical thinking on the material of effort and energy. This study used a research and development planning methodology. The data collection technique used is a validation sheet as a validator. In addition, to obtain relevant information about the assessment tool, use analysis techniques, calculation methods to calculate the average score of each component and literature research. Based on the results of the research assessed by material experts and media experts, PBL-based LKS on the material of effort and energy and its use in everyday life is in the appropriate category and this PBL-based LKS can also increase student learning motivation, where they can be more interactive in understanding the material of effort and energy and can think critically. Students can also solve problems about effort and energy material well. The conclusion obtained in this study is that the quality of this LKPD meets very good criteria so that this LKPD can be declared valid and of high quality to be used as one of the teaching materials for high school physics of work and energy. This LKPD has produced teaching materials that are quite accurate.

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e-ISSN: 2963 – 198X
p-ISSN: 2963 – 2498

INTRODUCTION

Education is one of the pillars on which the strength of a nation can be built. Quality human resources can only be developed through adaptation of dynamic education to the ever-evolving fields of technology and natural sciences (HR). One of the many things that the government has done to help the country progress is to raise the standards of the country's education system. The 2013 curriculum is currently used. The previous curriculum finished with this one.

The 2013 curriculum helps students to be able to adapt to technology and scientific developments that address complex futures, think critically and are also able to apply skills that can be used in daily activities. Along with the development of technology led to increased renewal in the world of learning. For example, the application of learning models in schools. In the 2013 curriculum there are several learning models namely, Model*Discovery Learning, Problem Based Learning, dan juga Project Based Learning.*

The ability to think rationally, analytically, analogously, and imaginatively is all necessary for the growth of learning in the twenty-first century. To help students make sense of the world and learn how to apply what they have learned, this is an important subject (Simanjuntak et al., 2021). In the problem-based learning model, physics education also involves learning models and media that can assist learning activities and connect students with actual situations. This PBL approach, however, calls for the use of multimedia tools in the form of learning environments filled with learning challenges that can foster critical thinking (Hasin et al., 2020)

The problem that is often faced by students in learning activities at school is a lack of understanding of the concept or material of physics itself. Because physics requires concepts as well as practice, for this reason teachers are required to make learning activities that are not boring by utilizing existing technology. Teachers can teach using LKPD so that students are more active. LKPD itself is generally in the form of print and non-print (multimedia).

Regarding a lesson that is taught in high school, namely Natural Sciences (IPA) which is also included in one of them is physics learning. This in learning physics is very important to help develop the existence of a technology that has just emerged and is not underdeveloped from the world of Technology and Science (IPTEKS) and can prepare diverse creative human resources capable of solving various variations of actual problems in life. . Physics is also included in a field of science that discusses a lot about nature and its phenomena which have a real nature (obviously seen) to be abstract or theoretical in nature. So that in this PBL-based Physics LKPD students are expected to be able to think critically. Critical thinking is an important aspect of learning (Susilawati et al., 2020). According to (Yunita et al., 2020) Critical thinking skills are very important for understanding subject matter in physics courses. One definition of critical thinking is "the capacity to conceptualize, analyze, and predict knowledge in order to use it in such a way as to solve a problem, choose a course of action, learn more about a topic, or draw conclusions" (Nurwahyuningsih et al., 2019).

Solving problems in everyday life requires a level of critical thinking (Ananda et al., 2021). The abilities to analyze and propose strong arguments, to convey classifications, to provide evidence, to reason, to analyze the meaning of opinions, and to draw conclusions are examples of the types of abilities that students need to apply when faced with complex problems (Reichenbach et al., 2019). Student worksheets (LKPD) are learning tools that can be used to cultivate students' critical thinking skills and encourage them to investigate their own academic interests and abilities (Putri et al., 2020). (Marlina et al., 2021) stated that LKPD is a set of rules that students must follow when they do their studies and when they describe their knowledge. Activity sheets, instructions, and directed learning mechanisms are all included in the LKPD so that it is easy to recognize the types of thinking skills and processes that are useful for solving problems in a way that is consistent with various indicators for achieving competence which will later be achieved through the discovery of Physics concepts through theory, performance, and studies (Ulfa et al., n.d. 2021). In most cases, LKPD is still only available in paper form, as stated by (Rahmi et al., 2019).

Business ideas and energy concepts are interrelated and interdependent. The presence of a driving force is the essence of energy. As a result of such efforts, energy states can shift. There are many other types of energy that we can identify, but the most relevant to our problem are kinetic energy, which is energy associated with motion, and potential energy, which is energy associated with rest. Work is defined as anything that is done by a force on an object so it can move, and throughout these mechanical materials, the understanding of the physics behind this definition is assumed. For action to take place, a force must be applied to an object until it is capable of moving a certain distance (Maison et al., 2020).

Labor presence and movement is necessary for the legality of the company. If an item accumulates power but remains immobile, no attempt is made to move it. Another way of looking at it is that there is no effort on the part of the person if the force they apply to an object does not cause the object to move. The

e-ISSN: 2963 – 198X
p-ISSN: 2963 – 2498

amount of work done on anything can be expressed mathematically as: W = F. Δx with: W = work done on an object, F = force acting on an object, Δx = displacement experienced by the object. The unit for work is the joule (J) where the value is 1 J = 1 N x 1 m = 1 Nm.

The direction in which the force acts also affects how much effort is exerted on an item. In simple terms, the work done on an item decreases if the direction of the force acting on it is opposite to the direction of its displacement. Less work is done on the item when the angle between the direction of force and the direction of displacement is greater (Aulia et al., 2022).

LKPD is very useful for students and teachers. Student worksheets are needed for guidelines in self-taught learning and evaluation tools to see the extent of their understanding of learning physics. LKPD is made to provide knowledge by training students' critical thinking skills. For teachers, LKPD can make it easier for teachers to convey and direct students in carrying out learning. Using interactive multimedia worksheets will save learning time, create interaction between teachers, students, and the media used, and can explain abstract physics concepts or which cannot be presented directly in physics learning, so students can understand concepts independently. The role of the teacher as a facilitator in the learning process can be carried out properly (Lusia et al., 2022).

RESEARCH METHODS

This research technique is one of research and development. In such cases, R&D studies are used in production processes and quality assurance checks, as stated by (Elfina &; Sylvia, 2020). Therefore, this kind of research and development (R&D) produces goods or learning materials that are tested on students. Since the end goal of any R&D-based product is to increase efficiency and productivity in the classroom, researchers often use R&D-based research methodologies in this setting.

Then the data collection technique used in this study is in the form of a validation sheet as a validator. The LKPD assessment consists of 4 components/criteria or rating scale, namely (1) very poor (invalid), (2) less (valid enough), (3) good (valid) and (4) very good (very valid). To obtain appropriate data using assessment instruments also use analytical techniques, calculation methods to calculate the average score for each component and study the literature. Calculation of the average score is done to determine the feasibility of LKPD and the results of the scores are converted into qualitative data.

RESULTS AND DISCUSSION

The physics worksheet tool, based on the Problem Based Learning (PBL) methodology used in corporate education, was created after extensive study and design. LKPDs that are published generally contain learning that focuses on problem solving, where students are introduced to a case related to the material being discussed. Students are then asked to find solutions to solve these cases or problems. In this LKPD model it can be said that it has helped students but it is still not optimal, as far as the author's observation, generally LKPDs are made simple which some people and the writer view are still less effective. For this reason, it is necessary to present LKPD which has a model or which can involve all aspects, namely knowledge, skills, communicative, and attitudes of students.

In making this LKPD, students in a team are divided by the theme of the material by the lecturer and then the students determine the title, objectives and determine the learning strategy. Furthermore, the lecturer corrects the progress of the LKPD every week. So that the preparation of LKPD is in accordance with the plan and includes clear steps and relevant tasks. The LKPD validation sheet is prepared by students and assesses whether the LKPD made meets the standards and then the lecturer evaluates the accuracy of the validation sheet with the LKPD.

This LKPD has gone through the entire research and development process, from defining and designing it to creating and implementing it. In this study, an instrument used was a validation sheet specifically related to the field of physics. The purpose of using the instrument is to ensure the validity of the LKPD in the context of that field of knowledge. In this case to test and understand the concept of PBL in LKPD which contains problem-based learning or a method that introduces students to a case or by being asked questions in the form of questions in order to improve critical thinking skills and can motivate students and will foster level of accuracy, of course students will be more focused on finding solutions to solve the case or problem. The results of this research validation effort provide qualitatively useful outputs for the development of LKPD through Problem-Based Learning (PBL) on business and energy content.

The results of the validation were carried out by 2 respondents consisting of two lecturers in the Physics Learning Media course which were then analyzed with descriptive statistics so that the results were obtained in the table 1. Based on the average value of the two components, it can be concluded that the quality of these LKPD falls into the "very good" and "good" categories. By paying attention to the data

e-ISSN: 2963 – 198X
p-ISSN: 2963 – 2498

criteria that have been mentioned, it can be concluded that this LKPD meets the standards and is of good quality so that it can be used as one of the physics teaching materials for work and energy materials at the high school level. In this LKPD, the accuracy of the material is related to the research that is carried out carefully and thoroughly so that it produces information that is quite accurate. Furthermore, some of the questions contained in the LKPD have more or less been able to foster students' learning motivation in the field of science, namely physics in the material of work and energy.

Table 1. Table of Validity Criteria

Percentage value validity	Validity criteria
$85 < V \leq 100$	Very valid
$70 < V \leq 85$	Valid
$30 < V \leq 70$	Less valid
$20 < V \leq 30$	Invalid
$0 < V \leq 20$	Totally invalid

Documents were provided to each subject matter expert as part of the LKPD validation process and instructions for use. Expert evaluations of the resulting items or tools find them highly credible. However, the author is open and willing to implement some of the validator's suggestions for improvement, such as adding an application or event, perhaps in the form of an image, which is consistent with the content of the worksheet and serves to broaden the reader's understanding of the topic and inspire them to learn more. Therefore, the resulting equipment is theoretically sound and feasible for experimentation. The updated validation findings will be referred to as LKPD version 1.0 from now on (before being directly tested on research subjects).

Material Expert Assessment

Furthermore, if seen from the results of data analysis obtained from material experts with the components developed, the dialogic and interactive components are worth 3 and 4 in the good and very good categories, and the material accuracy components are worth 3 and 4 in the good and very good categories. The validation index values for all aspects and types of components developed by material experts for LKPD can be seen in the graphic below.

Evaluation of Media Members

Furthermore, when viewed from the completeness of the material, the quality of communication, and the functions of the media as a whole, it can be concluded that these LKPD have different validation values. The validation index values of all aspects by media experts for LKPD can be seen in the graphic below.



Figure 1. Graph of validation index values

Based on the graph above, it can be seen that the media in this LKPD is very interactive and easy to understand so that it can motivate students to learn without any difficulties in learning, especially in the material of effort and energy. The difference between this research and previous studies is that the development of LKPD is carried out more interactively and motivates students to learn more. Student engagement, critical thinking, and problem-solving skills in business and energy will all benefit from PBL-based worksheets because of this motivational boost. William, Rice and Rogers (Severin & Tankard, 2009, p. 448) define interactivity as the level of participants in the communication process and participants have control and can change roles mutually beneficially. One level of the concept of mutual benefit, exchange, control and participation is the interactivity obtained in information systems that does not allow user intervention to change content. This is in line with the research objective in creating a learning atmosphere that influences student learning motivation, resulting from the involvement of color as a component of space. Cognitive interaction involves psychological, emotional and intellectual participation between humans and systems (Nyoman Larry Julianto et al., n.d).

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In addition to developing students' interactive attitudes, students can also easily understand the concepts of work and energy. For example, when students experience events that refer to work and energy, students can draw conclusions and be able to examine concepts related to the physics material that has been taught. So from this, this LKPD must also be developed, namely on business and energy materials.



Figure 2. Graph of average validation ratings

Based on the graph above, it can be explained that the value of the material validation aspect which consists of material completeness, material accuracy, material up-to-date and contextual has an average value of 8. In the systematic aspect which consists of presentation techniques it has an average value of 7. Language which consists of communicative, dialogic & interactive components, as well as suitability for student development has an average value of 4. As for the last component, namely the contextual aspect which consists of contextual nature and contextual components, has an average value of 4. Component values The validation is obtained from the validation sheet that has been tested by material experts so that it can be seen that the most prominent are the material validation components and presentation systematics. The validation component values can be seen in the graph below.



Figure 3. Graph of developed component assessment score

This LKPD is more prominent in the validation component of material accuracy as well as dialogic and interactive. This is because this LKPD was developed using practice questions to make it easier to solve existing problems. It is believed that students' ability to think critically about business and energy topics can be enhanced by creating PBL-based worksheets. According to proponents of LKPD, this approach can inspire students to learn and assist them in finding answers to classroom challenges. The development of this LKPD is also devoted to dialogic and interactive aspects, where the material contained in this LKPD has the ability to motivate students so that students can easily understand the material being taught and can improve critical thinking skills.

CONCLUSION

The results of the descriptive statistical analysis indicated that the LKPD met very high quality standards, making it a viable choice for inclusion as a chapter in a high school physics textbook on business and energy. This LKPD has produced a fairly accurate teaching material. The questions contained in it can foster students' learning motivation in the field of physics. So that overall the development of LKPD is based on supporting theories and is feasible to be tested in SMA. And after validating the LKPD that has been made on a PBL basis in the form of a physics LKPD. The goal of LKPD is to inspire students by making them more aware of the importance of matter, energy and labor in their daily lives. Experts in the field of materials and media were consulted for the validation of this LKPD product. So, this LKPD has different validation in terms of material completeness, communication quality, and media functions as a whole which shows that this LKPD is included in the feasible category.

e-ISSN: 2963 – 198X
p-ISSN: 2963 – 2498

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e-ISSN: 2963 – 198X
p-ISSN: 2963 – 2498