

# Implementation of an interactive e-student worksheets integrated by STEM on uniform straight motion and non uniform straight motion material towards student concept understanding

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**Abstract:** This research aims to find out how students' understanding of the concept of uniform straight motion and uniform straight motion changes after implementing the STEM integrated interactive E-LKPD. This research was conducted class with the research sample selected using purposive sampling techniques. This research uses a descriptive quantitative method with a one group pretest-posttest design. Research data was collected through pre-test and post-test using test instruments arranged according to indicators of concept understanding. This research was carried out in 4 meetings. The results of the research were that students' understanding of concepts increased after implementing the interactive E-LKPD integrated with STEM GLB and GLBB material. It is known that the average score for students' pre-test scores is 9.25 and the average score for students' post-test scores is 11.94. The results of the Wilcoxon test will produce a value (Asymp. Sig. 2-tailed). If the value of Asymp. Sig. 2-tailed is less than the significance level of 0.05. The conclusion of this research is that STEM integrated interactive E-LKPD can improve students' understanding of learning concepts in the material of uniform straight motion and uniform changing straight motion in class XI MIPA 2 SMAN 2 Sungai Penuh

**Keywords:** Concept Understanding, e-student worksheet, Implementation.

## Introduction

In the digital era and increasingly developing information technology, education is also experiencing significant changes. The use of technology in the learning process is a necessity to increase the effectiveness and efficiency of education. One important aspect of education is the learning process. One important aspect of education is the learning process.

Physics learning does not only rely on learning concepts through theory in the classroom

but teachers encourage students to be active in learning. Learning physics is learning that is considered difficult so that in the learning process the teacher's direct role is very important to achieve maximum effectiveness in learning physics (Widoyoko, 2021). Therefore, as teachers should help the development of students to be able to accept, understand and master science and technology.

In their development, students are not always able to achieve learning goals as expected. There are still many students who think that learning physics is difficult and scary, resulting in poor student learning outcomes. The learning results show that students' conceptual understanding abilities are very low. Basically, this ability is included in the cognitive aspect and as a result of the learning process, understanding is formed. Understanding this cognitive aspect is conceptual understanding. Concept understanding occurs if there is knowledge in the cognitive structure that can be used to relate newly received information. Meanwhile, concept discovery occurs when there is no knowledge in the cognitive structure to relate the newly received information. However, students often have difficulty understanding and applying concepts concretely.

Conventional learning methods that only rely on textbooks and teacher lectures are often inadequate to facilitate deep and interactive understanding. Teachers also often face difficulty in explaining these concepts in a way that can be understood by all students in a diverse classroom. To overcome this obstacle, an innovative and interactive learning approach is needed that can increase students' understanding of concepts. One interesting solution is to use LKPD.

According to (Khairul et al., 2018) using LKPD will open up opportunities for students to be active and creative in the learning process. LKPD is a learning tool as a complement or means of supporting the implementation of learning. However, printed LKPD is a little difficult and less efficient, supported by the statement (Hidayah et al., 2020) which states that teaching materials in the form of printed LKPD do not attract students' interest in learning and students find it difficult to understand the subject matter, especially in exact subjects such as physics. then electronic LKPD (E LKPD) is used.

E-LKPD itself is an alternative to LKPD which is prepared in digital form. The E-LKPD that is suitable for increasing students' understanding of concepts is the E LKPD developed by Sastra (2022). The LKPD developed is a STEM integrated LKPD. The material presented in this developed LKPD is rectilinear motion material. The material is presented in simple language so that it is easy for students to understand. In this LKPD there are various student activities including quizzes, multiple choice questions, join with arrows, for drag and drop, as well as illustration experiments. This interactive E LKPD was prepared using the Liveworksheets website which was prepared as additional teaching material as an aid for teachers in presenting and delivering material. This teaching material is prepared electronically so that it can be used independently anywhere as long as it is connected to an internet connection. Due to the demand to fulfill 21st century skills, this E-LKPD was prepared with STEM integration. Based on the results of a literature study taken easy to use manner and connecting with technological developments so that it can be useful for students and teachers.

## Method

Every research definitely requires research methods and data collection techniques that are appropriate and appropriate to the problem to be studied. In this research, researchers used quantitative research. The quantitative descriptive research method aims to explain a phenomenon using numbers that describe the characteristics of the subject being studied. The research design used was a pre-experimental design. The research sample in this study was class XI MIPA 2 students at SMAN 2 Sungai Penuh. The sampling technique used was purposive sampling. According to (Sugiyono, 2016) purposive sampling is a technique for determining samples with certain considerations that are considered suitable for the characteristics of the sample that is determined to

be used as a sample. The sample characteristics that the researcher considers suitable for this research are; He has studied physics subjects with material on uniform straight motion and non-uniform straight motion and is currently in Class XI with the 2013 curriculum.

The data in this study was collected using test instruments. Test techniques are used to measure the level of students' cognitive abilities, namely understanding concepts. The test consists of pretest questions and posttest questions. The test instrument used to measure students' conceptual understanding of uniform straight motion material is in the form of a multiple-choice test. The number of questions on the instrument is 15 questions. The test questions are created according to indicators of conceptual understanding and have been validated by experts. The indicators for the questions that will be given are arranged based on aspects of understanding the concept according to (Suryani, 2019) namely interpreting, giving examples, classifying, drawing inferences, comparing and explaining. The following is the grid of the concept understanding test instrument from the results of small group trials from previous researchers, it shows that the students' response to E LKPD was very good. From these results, researchers are interested in conducting further research at the field trial/large group stage. The further research that will be carried out by researchers is entitled "Implementation of an interactive e-student worksheets integrated by STEM on uniform straight motion and non-uniform straight motion material towards student concept understanding".

Before use, the instrument was validated by a validator using an expert validation sheet adapted from Nertasari (2020). After this instrument is validated by the validator, the data obtained is analyzed using a Likert scale to determine the assessment contained in the expert validation questionnaire sheet. The formula for calculating the percentage of score acquisition is as follows.

Analysis of the data obtained is then interpreted into a conclusion regarding the test instrument for students' understanding of the concept of uniform straight motion material which is then grouped into categories of very good, good, quite good, not good, or very bad.

The data analysis technique used is inferential statistics with non-parametric statistical data analysis in hypothesis testing in the form of the Wilcoxon signed rank test. The data processing process in this research is assisted by IBM SPSS Statistics 25 software. The final step is to conclude the research results based on the problem

formulation and research objectives.

## Result and Discussion

This research was conducted at SMA N 2 Sungai Banyak with a sample of class Data was obtained directly from learning activities on the material of uniform straight motion and uniform straight motion which was carried out in 4 meetings. Then the data obtained will be analyzed with the help of IBM SPSS 25 with hypothesis testing in the form of a non-parametric test, namely the Wilcoxon signed rank test. This research uses quantitative methods and this research includes pre-experimental research with a one group pretest posttest design.

In analyzing the results of this research, before testing the hypothesis, it is necessary to carry out what is called a prerequisite test. The prerequisite tests carried out are the normality test and homogeneity test. The normality test is used to evaluate whether the data analyzed has a normal distribution or not. In this research, a normality test was carried out to ensure that the data obtained from students' conceptual understanding had a distribution that was in accordance with the assumptions of parametric statistics, namely that the data was normally distributed.

The results of the normality test are presented in tabular form and use the Shapiro-Wilk normality test type because the data totals  $>50$ . Furthermore, if the significance value (Sig.) of the normality test is more than 0.05, it can be concluded that the data has a normal distribution. However, if the Sig. less than 0.05, it can be assumed that the data does not have a normal distribution. Based on table 4.1, it can be seen that the normality test results obtained a Sig value. amounting to 0.018 for the pre-test variable and 0.005 for the posttest variable. The data from these two variables is smaller than 0.05, therefore it can be concluded that the data is not normally distributed.

After the results of the normality test are obtained, proceed with hypothesis testing to differentiate the pretest data and posttest data that have been obtained. Because the data normality assumption test was not met, data analysis for the homogeneity stage and paired sample t-test hypothesis testing could not be continued. Then according to (Puspita et al., 2022) who say that if the results of the normality test are not normally distributed (do not meet the assumption of normality) then the test equipment used as a substitute for the paired sample t-test can use the Wilcoxon signed ranks test as a non-test.

parametric.

The Wilcoxon signed ranks test is used to compare differences between two different conditions or times in one group of subjects. The Wilcoxon test is a non parametric test. In this study, the Wilcoxon test was used to test whether there was a significant difference in students' conceptual understanding before and after implementing the interactive E-LKPD integrated with STEM GLB and GLBB material. It is known that the average score for students' pre-test scores is 9.25 and the average score for students' post-test scores is 11.94. The results of the Wilcoxon test will produce a value (Asymp. Sig. 2-tailed). If the value of Asymp. Sig. 2- tailed is less than the significance level of 0.05, so there is sufficient evidence to reject  $H_0$  and accept  $H_1$ , which means that STEM integrated interactive E-LKPD can increase students' understanding of learning concepts in GLB and GLBB material. However, if the value of Asymp. Sig. 2-tailed is greater than the significance level, then there is not sufficient evidence to reject  $H_0$ , which means there is no significant difference in students' conceptual understanding.

Based on table 4.2, it is known that the value of the Wilcoxon test results obtained is the Asymp value. Sig. 2-tailed of 0.000 for pre-test and posttest. The results of the hypothesis test in this study are smaller than 0.05, therefore it can be concluded that  $H_1$  is accepted. From the research that the researchers conducted in class

## Conclusion

Based on the results of the data analysis and discussion described in the previous chapters, it can be concluded that the interactive E-LKPD integrated with STEM GLB and GLBB material can improve students Sungai Full in physics subjects. This can be seen from the difference in the average student score on the posttest of 11.94. Based on the results of the data hypothesis test carried out, namely the Wilcoxon sign test, the Asymp, value was obtained. Sig. 2-tailed of 0.000 for pre-test and posttest. The results of the hypothesis test in this study are smaller than 0.05, therefore it can be concluded that  $H_1$  is accepted so it can be concluded that the understanding of the concepts of class GLB and GLBB.

## Conclusion

Thank you to related parties who have provided criticism and suggestions in this research.

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