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Enhancing Learning Outcomes: The Impact of Contextual Learning with E-LKPD Liveworksheets on Colligative Properties

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Abstrak

This study aims to determine the effect of contextual learning model assisted by E-LKPD Liveworksheets on student learning outcomes on the material of colligative properties of solutions. This research was conducted in one of the public high schools in South Tangerang using quasi experiment method and non-equivalent control group design. Sampling using purposive sampling technique consisting of 40 students of class XII MIPA 2 (control class) and 40 students of class XII MIPA 3 (experimental class). Data collection using a multiple choice test of 30 questions. The results of hypothesis testing of learning outcomes data using the t-test (Paired Sample Test) with a significance level of 5% obtained an Asymp.Sig (2-tailed) value of 0.00 <0.05 so that H0 is rejected and H1 is accepted. This shows that there is an effect of contextual learning model assisted by E-LKPD Liveworksheets on student learning outcomes on the material of colligative properties of solutions.

1. Introduction

Student learning outcomes are an indicator of success or as a measure to measure the extent to which learning applied by teachers can optimize student abilities (Rahman and Nasyrah, 2019). This means that student learning outcomes are inseparable from the learning applied by the teacher that is experienced by students

in the classroom.

experienced by students in the classroom. Based on previous research, it is known that students' chemistry learning outcomes on the material of the colligative properties of solutions are still relatively low, as indicated by the scores that do not reach learning completeness. In Winiawati and Hernani's research (2023) found that student learning outcomes on the material of the colligative properties of solutions were still relatively low because of 36 students there were 63% or 23 students who had scores below the predetermined KKM. Haryanto's research (2020) also found that the average student learning outcomes on the colligative properties of solutions were 40.83 and only 3 students were complete out of 15 students. Then Iswara, et al. (2021) found that only 36 (27.70%) were complete and 94 students (72.30%) were not complete out of a total of 130 students. These low learning outcomes indicate that students still have difficulty learning the material on the colligative properties of solutions.

One indicator of learning difficulties in students is indicated by low learning outcomes where the average score is below the predetermined KKM (Parnawi, 2019). The difficulties experienced by students in learning the colligative properties of solutions are supported by the research of Susmiasih, et al. (2021) which states that the average difficulty experienced by students in understanding the concept of colligative properties of solutions is 66.23% and is included in the high difficulty category. In addition, students' difficulties in analyzing the phenomenon of colligative properties of solutions in everyday life fall into a fairly high category caused by students' low ability to remember examples of the phenomenon of colligative properties of solutions in everyday life (Iswara, et al., 2021).

Students' difficulties in learning the colligative properties material are related to chemistry learning activities that tend to be teacher-centered. Student activities only listen to explanations of material from the teacher, do practice questions, and are less actively involved in the learning process. The use of less than optimal learning methods is a factor that causes students to find it difficult to learn chemistry (Priliyanti, et al.. 2021). Monotonous teaching methods such as lectures can cause students to feel sleepy and less focused because it feels boring so that students find it difficult to understand chemistry lessons that have been taught by teachers (Prayunisa, 2022). In addition, based on observations, it was also found that chemistry learning only focuses on calculating formulas in books and memorization, without

linking the theory taught to the context of everyday life. Learning that does not connect with daily life experiences makes students feel difficult in learning chemistry which affects students' low learning outcomes (Timilsena, Maharjan and Devkota, 2022).

Based on Basic Competency 3.1 of class XII in Curriculum 2013, namely "analyzing the phenomenon of colligative properties of solutions" and Basic Competency 4.1, "presenting the results of information search on the use of the principle of colligative properties of solutions in everyday life", the colligative properties of solutions are known to be related to everyday life. Therefore, a learning model is needed that can link the phenomenon of the colligative properties of solutions with real life so that it can encourage students to be actively involved which will have an impact on student learning outcomes.

One learning model that provides learning experiences by connecting subject matter with students' real-life situations is the Contextual Teaching and Learning (CTL) model. The CTL model can also encourage students to link the knowledge they learn with its use in their lives as individuals in families, communities, and the world of work in the future (Sudarmanto et al., 2021). The Contextual Teaching and Learning (CTL) learning model makes students actively build their knowledge related to everyday life and discover new learning concepts so that the knowledge they gain is more meaningful and can last a long time (Afiana, et al., 2019). This learning model can improve student learning outcomes in line with the research of Syaifuddin, et al. (2021) that the use of the CTL model can improve student learning outcomes with a percentage increase of 7.08% in the second cycle. Muliaman, et al. (2022) found that learning with the Contextual Teaching and Learning (CTL) model affected students' cognitive learning outcomes where the average score of student learning outcomes using the CTL model was higher than students using the conventional model. Research by Artini, et al. (2019) also shows that there is a significant effect of contextual learning models on student chemistry learning outcomes on the subject of hydrocarbons.

In addition to choosing the right learning model, the use of teaching materials such as E-LKPD can also improve student learning outcomes. This is supported by research by Annida, et al. (2022) that there is a significant effect of E-LKPD based on Liveworksheets on students' cognitive learning outcomes. One of the websites used to create E-LKPD is Liveworksheets. Based on interviews with

chemistry teachers, information was obtained that in learning chemistry has never used E-LKPD either based on Liveworksheets or other websites. The use of E-LKPD Liveworksheets can increase the effectiveness of learning because it involves active participation of students in contrast to conventional LKPD which tends to make students more passive and only receive information from the teacher (Annida, et al. 2022). Khastini, et al. (2023) showed that the use of LKPD Liveworksheets was effective in improving learning outcomes where the average score of the class using LKPD Liveworksheets was higher than the class that did not use LKPD Liveworksheets.

From this description, it is known that to support student learning outcomes on the material of the colligative properties of solutions can use a contextual learning model assisted by E-LKPD (Electronic-Learners' Worksheet). Teachers can make E-LKPD with a variety of displays and support components in contextual learning so that students are interested in studying chemistry, thus affecting their learning outcomes for the better. Therefore, researchers are interested in examining "The Effect of Contextual Learning Model Assisted by E-LKPD Liveworksheets on Student Learning Outcomes on the Material of Colligative Properties of Solutions".

2. Research Methodology

The research method used was a quasi-experimental quantitative research method. To ensure that the groups are similar, a pretest is given to both groups to determine whether there are pre-existing differences between the groups in terms of ability or other characteristics (Lodico, Spaulding, and Voegtle, 2010). The Non Equivalent Pretest-Posttest Control Group research design is used because basically this design uses an experimental group and a control group that is not randomly selected and both groups are given a pretest and posttest (Creswell, 2009). The experimental group will be treated using a contextual learning model assisted by E-LKPD Liveworksheets while the control class uses conventional learning.

The population in this study were XII MIPA students in one of the public high schools in South Tangerang, which amounted to 4 classes with a total of 164 students. The samples in this study were XII MIPA 2 as the control group and XII MIPA 3 class as the experimental group, each class consisting of 40 students. The

sampling technique used was Purposive Sampling, which is a sampling technique based on certain considerations (Abdullah, et al.. 2021).

The pretest and posttest scores become learning outcome data obtained from the learning outcome test instrument on the colligative properties of the solution in the form of multiple choice of 30 questions. The learning outcome test instrument was first carried out a validity test, reliability test, level of difficulty and differentiator to meet the requirements of the feasibility of the instrument as a data collector. The content validity test was carried out with 3 expert lecturers then an instrument trial was carried out for empirical validation given to 30 samples using the Pearson Product Moment formula. Then the reliability test was carried out using Cronbach's Alpha method. Validity and reliability testing was assisted by SPSS v.22 software with a significance level of 5%. In addition, the test of the level of difficulty of the questions and the differentiating power of the questions was also carried out. Data analysis techniques in this study are descriptive and inferential analysis. Descriptive analysis includes mean value, maximum value, minimum value and standard deviation. For inferential analysis, namely the analysis prerequisite test (normality test, homogeneity test) and hypothesis testing.

3. Result and Discussion

The pretest questions were given to students before learning with the aim of knowing the initial abilities of students and determining the experimental and control class groups. The pretest question data from both the experimental and control classes were analyzed using descriptive analysis techniques, as in Table 1.

Table 1. Pretest Data of Experimental Class and Control Class

Data	***Prettest***	
	Eksperiment Class	**Control Class**
N	40	40
Minimum Value	16,67	13,33
Maximum Value	46,67	53,33
Mean Value	26.25	29,08
Standard Deviation	8,10	9,33

Based on the data in Table 1, the average pretest scores obtained in the experimental and control classes are 26.25 and 29.08. The minimum value obtained in the experimental class is 16.67 and the maximum value is 46.67. The minimum value

obtained in the control class is 13.33, and the maximum value is 53.33. For the results, of the standard deviation obtained in the experimental class, is 8.10, while in the control class is 9.33.

Posttest questions are given after learning is carried out to see student learning outcomes after treatment. Posttest data from both experimental and control classes were analyzed using descriptive analysis techniques, as in Table 2.

Table 2. Posttest Data of Experimental Class and Control Class

Data	***Posttest***	
	Eksperiment Class	**Control Class**
N	40	40
Minimum Value	60	56,57
Maximum Value	96,67	93,33
Mean Value	81,50	77,25
Standard Deviation	10,01	11,46

Based on the data in Table 2, it shows that after being given different treatments, the average posttest score of students in the experimental class is higher than the control class, namely 81.50 in the experimental class and 77.25 in the control class. This happens because the contextual learning model is better able to make the learning atmosphere more active and invite students to think critically so that students' confidence in participating in learning and when doing assignments is higher, rather than conventional learning, which is more teacher-centred which makes students tend to be passive and pessimistic (Muliaman et al., 2022). The application of contextual learning models makes students actively build their own knowledge related to everyday life and find new learning concepts so that the knowledge they gain is more meaningful and can last a long time (Afiana, et al., 2019). Anggraini and Ulfa's research (2022) found that the contextual learning model made students activities excited and enthusiastic to participate in learning and included in the good category with a percentage value of 90.9%. The active participation of students during learning can give them a deep meaning of what has been learned so that the material will be easily remembered and the learning outcomes obtained will increase (Afiana, et al., 2019).

The pretest score data was hypothesized using the Independent Sample t-Test test to determine the initial state in both sample groups and test the feasibility of the sample. The t-test for independent samples is used to determine whether at a selected probability level, there is a significant difference between the means of two

independent samples (Gay, Mills and Airasian, 2009). If there is a pre-existing difference, then it cannot be concluded that the difference recorded at the end of the study is due to the treatment applied (Lodico, Spaulding and Voegtle, 2010). The data from the Independent Sample t-Test test with the help of SPSS v.22 software at a significance level of 5% or 0.05 can be seen in the following table.

Table 3. Hasil Uji *Independent Sample t-Test*

Data Statistik		**Kesimpulan**
α	***Sig.2-tailed***	***Sig.(2-tailed) > α***
0,05	**0,151**	**H0 diterima**

Based on Table 3, the Sig. The value obtained is 0.151, where the sig. The value obtained is greater than 0.05. This shows that H0 is accepted, which means that there is no significant average difference between the pretest of the experimental class and the control class and it can be said that both classes have the same initial understanding.

Then data analysis was carried out using hypothesis testing with Paired Sample t-test to determine whether there was an effect of the Contextual Teaching and Learning (CTL) learning model assisted by E-LKPD Liveworksheets on student learning outcomes on the material of colligative properties of solutions. The following data are the results of the Paired Sample t-test test for the experimental class and control class with the help of SPSS v.22 software at a significance level of 5% or 0.05 which can be seen in the following Table 4.

Table 4. Hasil Uji *Paired Sample t-Test*

Data Statistik		**Kesimpulan**
α	***Sig.2-tailed***	***Sig.(2-tailed) < α***
0,05	**0,000**	**H1 diterima**

Based on the results of the hypothesis test using the Paired Sample t-Test, it is found that there is a significant difference between the average value of the experimental class and the control class as indicated by the sig. 0,000. This means that the sig. obtained <0.05 where H0 is rejected and H1 is accepted. It can be said that there is an effect of contextual learning model assisted by E-LKPD Liveworksheets on student learning outcomes on the material of colligative properties of solutions. This is in line with research conducted by Artini, et al. (2019) which shows that there is an effect of contextual learning models on chemical learning outcomes on the subject of hydrocarbons. In addition, it is also supported

by Khastini, et al. (2023) that the use of E-LKPD Liveworksheets is effective in improving learning outcomes where the average score of classes using E-LKPD Liveworksheets is higher than classes that do not use E-LKPD Liveworksheets.

These results are related to learning during the experimental class, students can build the concept of colligative solution material based on the results of their own experiences and findings. Students who learn independently in solving the experiences and challenges faced will naturally improve their abilities (Syaifuddin, et al. 2023). Contextual learning models can improve student learning outcomes because in the process students work and experience, not just transfer knowledge from teacher to student (Addaini, et al., 2023). In line with Aliyyah's research, et al. (2020), the score of student learning outcomes has increased from the pre-cycle to the second cycle with a contextual learning model.

The learning outcomes obtained in the experimental class were also influenced by the use of E-LKPD Liveworksheets used during learning activities. Based on research by Rusdan, et al. (2023) shows that there is an effect of E-LKPD based on Liveworksheets on the learning outcomes of grade XI students in Civics subjects at SMA N Cimanggung. E-LKPD Liveworksheets provides a new experience for students because they have never used E-LKPD before where learning is only through tasks given by the teacher. This experience makes students feel that learning chemistry becomes more fun so that it can optimize student chemistry learning outcomes.

While in the control class that uses conventional learning, learning does not involve students because it tends to be monotonous and teacher-centered. This kind of learning makes it difficult for students to understand the material which can affect student learning outcomes later. In the experimental class, students are fully involved in the learning process, so they can build their own knowledge based on their learning experiences and affect their learning outcomes. This is supported by the results of research by Muliaman, et al. (2022) that learning with the Contextual Teaching and Learning (CTL) model affects the cognitive learning outcomes of students where the average score of student learning outcomes using the Contextual Teaching and Learning model is higher than students using conventional models. Furthermore, Suryandari and Yuanta's research (2023) also shows that there is an effect of the CTL learning model on student learning outcomes, where the average score of students using the CTL learning model is greater than the average student in a class that does not use the CTL model.

5. Conclusion

Based on the results of the research and data analysis that has been carried out, it can be concluded that the contextual learning model assisted by E-LKPD Liveworksheets can influence student learning outcomes on the material of colligative properties of solutions. This is based on the results of the hypothesis testing of student data using the Paired Sample Test t-test which shows that the Sig (2-tailed) value is 0.000. The resulting significance value of 0.000 <0.05, then H0 is rejected and H1 is accepted, which means that there is a difference in the average value between classes that use contextual learning models and classes that use conventional learning. The CTL learning model allows students to build their own knowledge because in its activities students are encouraged to actively participate in finding the material being studied.

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