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# The Effect of Student Worksheet With Creative Problem Solving Based On Students Problem Solving Ability

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***Abstract***

The purpose of this research is to ascertain the impact of employing student worksheets based on creative problem solving on students' problem-solving abilities and mastery of concepts. This study was carried out at a high school employing a nonequivalent control group design and a quasi-experimental methodology. Purposive sampling was used to do the sampling. Two classes of senior high school students made up the study's sample, with the control class having 30 individuals. The written test, which included up to 15 essay questions, was used to collect the data. The findings indicated that the use of creative problem-solving student worksheets did not affect problem-solving abilities but did affect mastery of the concept of the circulatory system.
**Keywords:** Student Worksheets, Creative Problem Solving, Problem Solving Ability, Mastery of Concepts.

**Abstrak**

Tujuan penelitian ini adalah untuk mengetahui pengaruh penggunaan lembar kerja siswa berbasis creative problem solving terhadap kemampuan pemecahan masalah dan penguasaan konsep siswa. Penelitian ini dilakukan di sekolah menengah menggunakan desain kelompok kontrol nonequivalent dan metodologi kuasi-eksperimental. Purposive sampling digunakan untuk melakukan pengambilan sampel. Sampel penelitian terdiri dari dua kelas siswa sekolah menengah atas, dengan kelas kontrol berjumlah 30 orang. Tes tertulis, yang mencakup hingga 15 soal esai, digunakan untuk mengumpulkan data. Hasil temuan menunjukkan bahwa penggunaan lembar kerja siswa creative problem tidak mempengaruhi kemampuan pemecahan masalah tetapi berpengaruh terhadap penguasaan konsep sistem peredaran darah..
**Kata Kunci:** Lembar Kerja Siswa, Creative Problem Solving, Kemampuan Pemecahan Masalah, Penguasaan Konsep.



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## INTRODUCTION

Education is the key to the success of developing an advanced civilization. Through the educational process, humans will continue to develop their abilities. Humans will be difficult to develop, even if they are underdeveloped, without education. The goal of education must be to create morally upright, competitive individuals with high moral standards. Organizing the teaching and learning process is one of the educational activities. The most fundamental activities of the entire educational process in schools are learning activities. This indicates that students' perceptions of the learning process as learners have a significant impact on whether educational goals are met or not (Afcariono, 2008).

In general, the learning process provided by educators only takes the form of monotonous teaching materials. Any resources that are organized systematically, show a full picture of the competencies that students will master, and are employed in the learning process are considered teaching materials, including information, tools, and text. Therefore, it is essential to have cutting-edge teaching resources so that learning is more active and student-centered. The student worksheet is one of the instructional tools that may be utilized for learning. LKS, which stands for Learning Knowledge and Skills, is printed teaching material in the form of sheets of paper that contains information, summaries, and directions for carrying out learning tasks that must be completed by students. If students do not have books or other resources relating to the assignment subject, they will not complete activity sheets adequately. LKS emphasizes in advance a phenomenon that is concrete, simple, and related to the concept to be studied. LKS contains things that students must do, including doing, observing, and analyzing. LKS also helps students apply and integrate various predetermined concepts. LKS is helpful for reinforcing the lessons that the teacher has taught. In order for the learning process to be student-centered and consistent with the 2013 curriculum's goals (Greiff et al., 2013).

According to the findings of an interview with a high school biology instructor, worksheets for the students with assessment questions were typically used as teaching materials in discussion lessons. With this teaching material, the average score in several chapters is still relatively low or below the KKM, especially in the chapter on the circulatory system. There has been no development of LKS teaching materials provided by biology teachers in Senior High School. From these problems, the researchers developed student worksheets based on creative problem solving. Combined with CPS because the learning phases align with the 2013 Curriculum's aims, which call for students to participate more actively in class and reduce the teacher's role to that of a facilitator.

With this teaching material, learning becomes interactive, where students can find knowledge not only from educators but can gain knowledge from anyone and anywhere. Students will be asked to identify problems, gather information, and then develop their ideas. From the ideas that have been developed, students will draw conclusions, and from these conclusions, it will be decided which one is the right application (Kadir, 2010). The creative problem-solving learning model was first coined by Alex Osborn. Osborn created a unique definition of creative problem solving as the creator of the Creative Education Foundation. The CPS learning model keeps evolving until it is referred to as Creative Problem Solving Models. The creative aspect is needed in CPS learning to look for various ideas and choose the optimal and best solution. At each stage of the employed problem-solving process, the CPS emphasizes the significance of identifying various alternative ideas and looking for various potential actions (Mahrani et al., 2023).

Student worksheets based on creative problem solving are used because, based on KI 4, effective and innovative behavior are expected of pupils. Creative problem solving is included under the CPS Learning and Skills Standard, which include problem clarification, idea expression,

evaluation and selection, and implementation (Wahdiniawati et al., 2023). Student worksheets (LKS) based on creative problem solving contain elements of creative problem solving, namely problem clarification, idea expression, evaluation and selection, and implementation. Moreover, Core Competence Number 3 emphasizes that in order to be able to solve problems, students must be able to study precisely in accordance with their interests and talents. The fact that the Programmers for International Student Assessment (PISA) survey included problem solving skills for the first time in 2003 is proof of the value of these skills. The awareness that problem solving is a crucial cross-curricular talent with significant real-world relevance was the driving force behind expanding the range of abilities tested (Widayati et al., 2013).

The learning process using student worksheets based on creative problem solving contains stages that are almost the same as indicators of problem-solving ability (Ni'mah et al., 2018). So that by training students to work on CPS worksheets, they can solve questions that contain problem solving. Students are expected to be able to master the topics being studied in addition to being able to solve issues. Conceptual mastery is contained in KI 3, which also includes factual, conceptual, procedural, and metacognitive knowledge. Students are required to be able to comprehend, use, and analyze scientific concepts based on their scientific curiosity in order to apply that knowledge to certain fields of study in accordance with their skills and interests to solve problems.

Problem solving is divided into two forms: simple problem solving and complex problem solving. Solving simple problems requires simple thinking processes, and solving complex problems requires more complex thinking processes (Mutmainnah et al., 2023). The capacity to master several concepts and principles underpins one's ability to solve problems (Purwanto et al., 2020). The fact that problem-solving skills were included in the Programmers for International Student Assessment (PISA) survey for the first time in 2003 demonstrates the significance of this problem-solving ability. "The understanding that problem-solving is an important cross-curricular talent with high real-world relevance was the reason behind expanding the spectrum of abilities examined," according to the study. Problem solving is a strategy that encourages students to monitor the steps used in solving a problem. Students play an active role in solving problems with their groups; they examine several alternative approaches to problem-solving and consider the merits of diverse modes of thought. Problem resolution starts with analysis through certain steps, and the teacher can learn more about the pupils' problem-solving abilities after that. Problem solving needs to be studied by students not only by memorizing the concepts being studied but by understanding the concepts as a whole.

## METHOD

This study was carried out utilizing a quasi-experimental approach. The study's non-equivalent control group design was used (Sugiono, 2013). The research was conducted during the second semester of the academic year 2021–2022. The study was carried out in October 2022. The researcher started the research by giving an initial test (pretest) to both groups. After that, the

experimental group received treatment in the form of learning using a creative problem-solving LKS, whereas the control group received treatment in the form of learning using a traditional LKS. This study was then ended by administering a final test (posttest). Researchers used the purposive sampling method in taking samples. The sample classes taken were two classes XI IPA 2 (totaling 30 people) and XI IPA 3 (totaling 30 people), wherein one class served as the control class and another served as the experimental class. The data for this study were gathered using a variety of methods, including learner observations, concept mastery assessments, and measures of problem-solving skills. The normalcy test, homogeneity test, and hypothesis testing are data analysis procedures utilized.

## RESULT AND DISCUSSION

According to statistical statistics, the experimental class's average problem-solving ability score was 0.95 points lower than the control class's, on average. The experimental class's problem-solving score has a wider range of scores than the control classes. As many as 12 people (40.00%) got scores above the average and 18 people (60.00%) got scores below the average in the experimental class. And as many as 15 people (50.00%) got scores below the average, 15 persons (50.00%) received scores that were higher than the control class average. With a 2.58 point gap, the control class outperformed the experimental class in terms of concept mastery. Also, compared to the control class, the experimental class's concept mastery score shows a wider range of results. As many as 14 people (46.67%) got scores above the average, and 16 people (53.33%) got scores below the average in the experimental class. And as many as 14 people (46.67%) got scores below the average, 16 persons (53.33%) received scores that were higher than the control class average. Based on these data, the experimental class has an average problem-solving ability score that is 3.50 points greater than the control class. Also, the experimental class's problem-solving skill score has a wider range of scores than the control classes. As many as 17 people (56.67%) got scores above the average, and 13 people (43.33%) got scores below the average in the experimental class. And as many as 16 people (53.33%) got scores below the average, 14 persons (46.67%) received scores that were higher than the control group's average. Concept mastery scores in the experimental class outperformed those in the control class, with a score difference of 5.92. The concept mastery score for the experimental class also has a shorter range of scores than the control class. As many as 13 people (43.33%) got scores above the average, and 17 people (56.67%) got scores below the average in the experimental class. And as many as 15 people (50.00%) got scores below the average, and 15 people (50.00%) surpassed the control class's average in test scores.

The average proportion of problem-solving indicators in the experimental and control courses was calculated, and here are the results. Displays the proportion of each indicator's problem-solving capacity depending on the outcomes of the pretest and posttest. The experimental class outperforms the control class on average on indicators of problem-solving skill. There is a 3.64% difference in the average problem-solving ability between the experimental and control groups. This demonstrates that

both the experimental class and the control class had improved problem-solving skills. It rose to 64.86% in the experimental class while rising to 61.22% in the control group. Percentage of students in the experimental class and the control class who met each topic mastery indicator. The experimental class outperforms the control class on average in terms of indicators of concept mastery. The average percentage difference between the experimental and control groups is 3.41%. This demonstrates that both the experimental class and the control class have a greater understanding of the subject. It went up to 94.66% in the experimental group. In the control group, it went up to 91.25%.

There are discrepancies between the worksheets used in the experimental class and the control class. The control class, which used traditional learning methods, showed a rise in the average worksheet achievement at each meeting while the experimental class worked on worksheets based on creative problem solving. The table also demonstrates that the experimental class' LKS is lower than the control class' LKS. This shows that students understand more about conventional worksheets and are not familiar with worksheets based on creative problem solving.

The results of teacher observations in the experimental class, which were carried out during two meetings, showed that the teacher had carried out the model stages to the fullest in terms of the average percentage of each meeting that was achieved. Observations were also carried out on students in five stages. The results of observations of student activities showed that each stage experienced an achievement rate of more than fifty percent. The activeness of students in each meeting also always increases. The results of the observations were also carried out in the control class in two meetings, indicating that the teacher had carried out the learning stages to the fullest as seen from the average percentage of each meeting that was achieved. Observations were also made on students in the control class. The results of observations of student activities showed that all stages experienced more than fifty percent achievement. The activeness of students in each meeting also increased.

***Discussion***

The t-test is used to do tests to see if the usage of worksheets focused on creative problem-solving affects students' ability to solve problems and grasp concepts. The calculation of the t test for the students' problem-solving skills yielded findings that were statistically significant at a level larger than 0.05, according to the results. H1 is therefore rejected, whereas H0 is approved. Between the control class utilizing standard LKS and the experimental class using creative issue solving LKS, there is an average difference that is not statistically significant in the problem-solving ability data. H0 is rejected and H1 is approved based on the calculation of the concept mastery t test, which revealed that the significance level reached was less than 0.05. This indicates that there is a substantial average difference between the control group utilizing traditional LKS and the control class using creative problem-solving LKS in terms of the students' concept mastery data.

The components of problem solving and concept mastery performed better on the posttest as compared to the pretest, which indicated progress. The difference between the experimental class and the control class is not really noticeable when it comes to problem solving. The experimental class

outperformed the control class in terms of topic mastery. The experimental class scored 73.33 on the pretest, compared to 67.50 in the control group for formulating problems. In the experimental class, the posttest scores for developing issues were 76.67, compared to 75.83 in the control group. This demonstrates that students in the experimental class are more prepared to formulate questions correctly and to explore their ideas.

The component of making a hypothesis on the pretest in the control class obtained a result of 25.00, while in the experimental class it obtained a result of 53.75. The posttest results in the control class obtained 43.33 results, while those in the experimental class obtained 53.75 results. This shows that in the experimental class, students are used to making hypotheses using relevant primary and secondary sources to solve the problems that have been presented. The component of testing the hypotheses answers on the pretest in the control class obtained a result of 13.33, while the experimental class obtained a result of 12.22. The posttest results in the control class were 61.11, while those in the experimental class were 60.56. The outcomes of the control class are marginally superior to those of the experimental class in this component. This demonstrates that the comparison group is more inventive in their information-seeking. The process of testing answers helps students develop their investigative skills about what ideas are applicable and which are not applicable.

The next component is drawing conclusions. The pretest results for the control class were 16.67, while those for the experimental class were 15.00. There was an increase in the conclusion component in both classes. The control class obtained a posttest result of 60.00, while the experimental class obtained a result of 62.50. These results show that the experimental class is more able to decide and make their own plans in relation to the problems presented. The last component of problem solving is applying conclusions. At this stage, students are asked to provide the best solution from the conclusions that have been drawn so that it can be applied to solve existing problems. In this component, the experimental class's pretest result was 26.78 while the control class's was 12.92. The experimental class's posttest score was 64.86 while the control class's was 61.22. These findings show that the experimental class did pretty well in selecting approaches to address the issues raised during the learning process.

It is clear that using worksheets based on creative problem-solving helped the experimental class's average performance on the problem-solving ability component. While a rise also took place in the control class, it did not surpass that of the experimental class. because the experimental class has been prepared to work on issues that have been studied in the CPS Learning System's problem-solving questions, which contains the stages in solving problems, The lowest posttest results in both classes were found in the indicator of the component's problem-solving ability to make a hypothesis. According to studies done by Dian Nurmala Wulansari. Research conducted related to student problem solving ability reveals that students' difficulties in making the right hypotheses are due to their not being used to using various information media such as books and the internet to find relevant information so that the hypotheses made lead to the right result. Another result tested in this study is

the component of concept mastery. Factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge are the four parts of conceptual mastery. Only three elements factual, conceptual, and procedural knowledge were used in this study. Three conceptual questions, two procedural questions, and six factual questions the experimental class's pretest result for the factual component was 52.22 while the control class's was 56.48. After learning, the posttest results in the control class were 90.74, while those in the experimental class were 94.63. These results indicate that the experimental class understands more about factual questions, so they can answer these questions better than the previous results.

The next component is conceptual knowledge. The experimental class's pretest score was 31.50 while the control class's was 33.17. Also, the experimental class scored 95.50 on the posttest, compared to the control class's 85.58 score. This is significantly better than the control class and demonstrates an increase in the experimental class. The procedural component is the final area of this conceptual knowledge that is tested. In this component, the questions given are to mention the steps in carrying out the practicum. The pretest result for the control class was 27.95, while that of the experimental class was 23.85. The pretest results for this component were smaller than the previous components because students did not fully understand the practicum steps. Then, after doing the practicum, the new students showed better results, namely, the experimental class's posttest score was 93.85 while the control class's was 97.44. Results in the control class outperformed those in the experimental class, indicating that they were more serious and knowledgeable about the practicum process.

Data from the t test results on the problem-solving component demonstrated that although there was a difference between the experimental class and the control class, it was not significant. The experimental class and the control class differ significantly in terms of the concept mastery component. A theory or set of assumptions that is supported by substantial evidence, accompanied by correct scientific steps, generally proves to be correct. However, after processing the data and calculating the hypothesis test using the t test, it was stated that the difference was not significant between the control class and the experimental class for the problem-solving component. A hypothesis that has not been proven does not mean the research failed. If the hypothesis is not proven, it can be caused by invalid instruments, poor sampling, inaccurate control of external variables, or an inaccurate theoretical basis.

The results of this discussion indicate that in the research process, there are still several factors that influence the course of the research, as can be shown through the evaluation of the outcomes of in-class observations. The experimental class participated in only 65% of group activities. Even though group discussion activities are the main activity in this research, which will determine whether students can work on student worksheets based on creative problem solving so that they can have an assessment on problem solving questions that is superior to the control class, However, in the assessment of concept mastery, as a result of the experimental class's greater

performance than the control class, student worksheets based on creative problem solving have an effect on students' factual, conceptual, and procedural knowledge, according to KI 3, where pupils can comprehend, use, and evaluate knowledge that is factual and conceptual. Also, procedural based on his aptitude for problem-solving and interest in science.

## CONCLUSION

Based on the findings of the study and analysis, it was determined that problem-solving abilities are not greatly impacted by the usage of creative problem-solving worksheets. This is because the CPS LKS is not being used to its full potential, and as a result, its connection to problem-solving skills is not made. The mastering of topics is positively impacted by the usage of inventive problem-solving worksheets. The posttest demonstrates that the experimental class's average value is higher than that of the control group. This proves that students still understand more about conceptual questions that do not use the stages of problem solving skills.

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