The Effects of Collaborative Learning Oriented Project Based Learning (PjBL) and Learning Cycle Models using Animation Video on Students Problem Solving

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Abstract. The purpose of this study is to examine the problem-solving skills of students who are taught Thermochemical Materials using a collaborative Learning Oriented Project Based Learning (PjBL) and Learning Cycle Model with animated video. This is a quantitative study using the Pre-Experimental Design approach of experimental research, with a focus on thermochemical material-centered collaborative learning utilizing animated video. The instrument is a designed test of problem-solving ability that fulfills the requirements for content validity and reliability with a high degree of dependability. The findings produced from the average value of the Normalized gain for both used learning models were inside the high categories. Based on the results of the hypothesis test analysis (one sample t-test), t_{count} surpassed t_{table}. It is said that the problem-solving abilities of students taught using the project-based learning (pjbl) learning model and collaborative learning cycle with animated video media on the subject of chemistry meet the high standard of N-gain.

Keywords: Project-Based Learning (PjBL); learning cycle; Collaborative Learning ; Animated Video ; Students' Problem Solving Ability

1 Introduction

A person who is experiencing life transitions is through the learning process. In addition to changes in speech, skin temperature, comprehension, and knowledge, the process has a range of other positive effects. the capability and motivation to do a certain activity as well as associated activities that vary for learners (Trianto, 2010).

In accordance with the problem-solving process criteria, it is anticipated that a student will be able to solve a problem by grasping the problem, solving it, and moving on (Saryantono, 2013). One of the chemical substances that are still producing problems in the classroom is thermochemical substance.Thermochemistry is a branch of chemistry concerned with the changes in energy (heat) that follow a chemical reaction, denoted as heat of reaction, where the change in heat (heat) of a substance involves both chemical and physical processes.

Project-Based Learning (PjBL) is one of the learning methodologies that may help students build problem-solving skills and alter their perspectives. The project-based learning (pjbl) model or project-based learning is an innovative paradigm that is more student-centered

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(Student-Centered) and the teacher is just a facilitator and motivator; in this case, students have the choice to work independently to generate learning experiences (Surya, 2018).

The advantages of this project-based learning (pjbl) strategy include enhanced student performance, greater cooperation and collaboration, enhanced resource management, attractive learning environments, and enhanced student attitudes toward the learning process (Sumarni, 2015).

In addition to the project based learning (pjbl) paradigm, lesson study observation sheets are used to facilitate collaborative learning in this study. Collaborative Learning or collaborative learning is the presence of two or more individuals learning together to achieve a common goal (Haqqi , 2017).

The objective of Collaborative Learning is to build and enhance student knowledge so that students are adept in articulating what is in their thoughts and increase their mental capacities so that students are more engaged in working in groups to create a student-centered teaching and learning environment (Pertiwi, 2017).

Lesson study is a methodology for increasing the quality of classroom learning via collaborative and sustainable learning based on the notion of cooperation among a group of instructors to form a learning community (DN Purba, 2021). Information designed to increase student engagement with the learning process.

Learning media, like science and technology, are essential to the learning process because they motivate and engage pupils. As a conduit for imparting knowledge to students, the media may be exploited. The media may provide unique and novel content, such as photographs and videos, which can reduce the complexity of a subject that must be taught to students. The definition of animated video media is media that incorporates the movement of an image or object that may alter its location.

Animated media is now undergoing education. Implementing collaborative learning inside the project-based learning (pjbl) paradigm aids researchers in assembling, instructing, and leading researchers in collaborative learning activities. Children are trained to listen, ask questions, and seek information throughout the learning process.

2 Methods of Research

This study was carried out in SMA Negeri 2 Kabanjahe, Kab. Karo, North Sumatra. Pre-Experimental research is employed.

Pretets (O1) (initial test) O2 denotes a posttest (final test)

X = Project Based Learning Learning (pjbl) Animated Video Media for Oriented Collaborative Learning.

The steps of this study began with the selection of a sample class from the population of SMA Negeri 2 Kabanjahe. Following the selection of the sample class, students were given a pretest (O1) to see how students' existing knowledge was addressed using a collaborative learning-oriented project based learning (pjbl) learning model using animated video media. Then, using the collaborative learning observation sheet, go over the learning process.

3 Results and Discussion

Table 1 displays the pretest and posttest experimental class data of PjBL applied

Table 1 pretest-posttest and N-Gain results of experimental class data

Problem-solving ability	Score\ Average	Typical Deviation	Variant
Pretest	24,5714	3,987	15,899
Posttest	80,8571	6,198	38,420
N-Gain	0,747	0,077	0,006

T-testing hypotheses manually using Microsoft Excel 2007. Table 3 displays the outcomes of testing hypotheses (one sample t-test). The result of tcount > ttable shows that Ho is rejected and Ha is accepted, showing that the problem-solving ability of students taught using the Project-Based Learning (PjBL) paradigm is oriented.

Collaboravite Learning thermochemical content with the use of animated video media may meet the requisite high standard of 70. According to the findings of the data analysis, posttest scores of 80.85 and n-gains of 0.747%(74.7%) were indicative of student learning outcomes. According to research (Suyanti, 2017), project-based learning (pjbl) has significant advantages for students' problem-solving abilities.

As a result of completing problem-solving assignments, students enhance their critical and creative reasoning as well as their spatial ability. This is shown by an increase in the average value of the treatment delivered by the researcher through the provided models and learning materials. Data processing and hypothesis testing data analysis were conducted based on the findings.

The following table illustrates the design of the research:

Design of a pre-and-post-test

O_1 X O_2

Information:
O_1: Pre-testing (initial test) O2: Follow-up test (final test)
X: Collaborative Learning focused Learning Cycle and PjBl aided by animated video-e module

The flow or phases of this study might begin with the selection of a sample class from the population of SMA Negeri 15 Medan. Then, utilizing e-modules, administer the pre-assessment (O1) to evaluate students' essential abilities prior to implementing a collaborative learning-focused learning cycle model. Using the observation sheet for collaborative learning, I am monitoring the learning process.

The researcher administered X treatment (Learning with a collaborative learning-oriented learning cycle model supported by e-modules. At the end of the learning and treatment process,

students will be given a post-test to measure student learning achievement after receiving treatment on the response speed material.

3.1 Discussion of the Findings

The experimental class's pretest-posttest data is as follows:

Table 2. pretest-posttest and N-Gain results of experimental class data of Learning Cycle applied

Problem-solving ability	Score\ Average	Typical Deviation	Variant
Pretest	24,389	3,879	15,044
Posttest	80,556	5,709	32,597
N-Gain	0,744	0,069	0,005

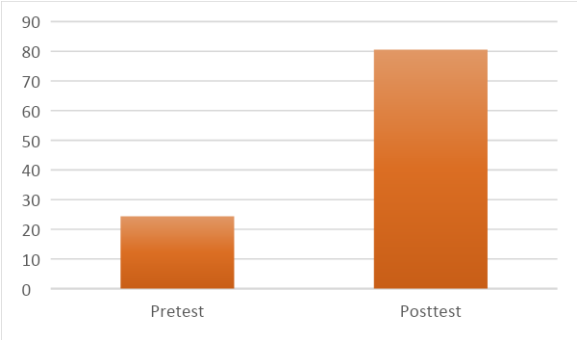

Fig 1: Pre- and post-test data

The t-test was used to test hypotheses using the Microsoft Excel 2010 manual application. The following table shows the outcomes of hypothesis testing:

Table 3 Analysis of Hypothesis Results PjBL applied

percent N-Gain	t *count*	t *table*	description
$\underline{X}$ = 80,55556 S = 5,7094 $\underline{\mu_0 = 75}$ n = 36	5,838325	1,699	Reject H0 And accept Ha

Table 4 Analysis of question problem solving

Amount of Question	Under stand the issue	Completion of Planning	Impleme nting the Finishing Plan	Check once more
1	80%	80%	72%	64%
2	86%	79%	74%	74%
3	81%	82%	79%	70%
4	97%	83%	83%	79%
5	94%	89%	87%	84%
Average	88%	83%	79%	74%

The hypothesis testing yielded a t count of 5.838. This signifies that the outcomes of problem-solving abilities taught using a collaborative learning-oriented learning cycle model aided by e-Modul media exceed the Minimum Completeness Criteria (KKM) that have been established. Based on the learning outcomes data, the average posttest score of students is 80.556, which is higher than the KKM score of 75.

5 Conclusion

Based on the analysis of the data, the researcher can conclude that the reaction rate of students' problem-solving abilities who are taught using the PjBL model and collaborative learning-oriented learning cycle supported by e-modules exceeds the standard value of the Minimum Completeness Criteria (KKM), which is 75.

Comprehension of the challenge posed by students taught using a project-based learning (pjbl) learning paradigm with an emphasis on collaborative learning using animated video media.

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