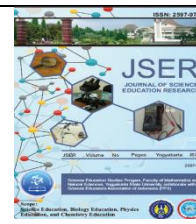




Journal of Science Education Research

Journal homepage: <https://journal.uny.ac.id/index.php/jsr/index>

ISSN: 2597-9701



Implementation of the Problem Based Learning Model Using Interactive Learning Videos to Improve Students' Understanding of Concepts and Learning Interest in The Acid-Base Material of Grade XI

M. Amelia^{1*}, R. Linda², D. Futra³

¹ Master of Chemistry Education Study Program, Faculty of Teacher Training and Education, Riau University

² Chemistry Education Study Program, Faculty of Teacher Training and Education, Riau University

³ Chemistry Education Study Program, Faculty of Teacher Training and Education, Riau University

*Corresponding Author. Email: misdariantiamelia24@gmail.com

Abstract

Conceptual understanding and learning interest are important factors in learning, but they are still not evenly distributed among students. This study aims to analyze the improvement in conceptual understanding and learning interest of students after implementing the Problem-Based Learning (PBL) learning model using interactive learning videos compared to the scientific method. The method used is descriptive quantitative. The subjects of the study were grade XI students at MAN 1 Kampar and MAN 4 Kampar in the 2024/2025 academic year. The sample was selected using a purposive sampling technique. The research instruments were conceptual understanding questions and a learning interest questionnaire. The results showed that the Problem-Based Learning (PBL) learning model using interactive learning videos compared to the scientific method. Students' conceptual understanding in classes using the Problem-Based Learning (PBL) model using interactive learning videos achieved results of 80.57% (high category) at MAN 1 Kampar and 74.1% (high category) at MAN 4 Kampar, while scientific methods increased by 75.1% (high category) at MAN 1 Kampar and 68.3% (high category) at MAN 4 Kampar. Meanwhile, student learning interest in classes using the Problem-Based Learning (PBL) model using interactive learning videos was 87.5% (very high) at MAN 1 Kampar and 76.5% (high category) at MAN 4 Kampar. Meanwhile, scientific method learning increased by 76.3% (high category) at MAN 1 Kampar and 72% (high category) at MAN 4 Kampar. These findings indicate that the Problem-Based Learning (PBL) approach using interactive learning videos creates a more engaging learning experience, increases student engagement, and helps them understand concepts more deeply. In conclusion, the Problem-Based Learning (PBL) model using interactive learning videos is more effective than the scientific method in improving students' conceptual understanding and learning interest. Thus, this approach can be an effective alternative for promoting student engagement and deeper conceptual understanding.

Keywords:

Problem-Based Learning (PBL), interactive learning video, conceptual understanding, learning interest.

History

Received:
April 29,
2026

Revised:
August 31,
2026

Accepted:
September 1,
2026

How to cite:

M. Amelia, R. Linda, D. Futra, (2026). Implementation of the Problem Based Learning Model Using Interactive Learning Videos to Improve Students' Understanding of Concepts and Learning Interest in The Acid-Base Material of Grade XI. *Journal of Science Education Research*, 10(2), 275-287. doi: [10.21831/j.sc.edu.research.v10i2.97485](https://doi.org/10.21831/j.sc.edu.research.v10i2.97485).

This open access article is distributed under a (CC-BY SA 4.0 License) 

1. INTRODUCTION

A new paradigm in education designed to address the increasingly complex and dynamic challenges of the times is known as 21st-century education. Education itself is essentially a process of human development through learning, guidance, and role modeling, enabling optimal human development across cognitive, affective, and psychomotor aspects (Lenggono, 2021). 21st-century education offers breakthroughs so that students not only master knowledge but also equip them with critical, collaborative, communicative, and creative thinking skills to solve future problems. One of the skills emphasized is problem-solving skills by integrating mathematical and scientific knowledge relevant to real life.

In the context of 21st-century learning, teachers are required to design, select, and implement effective learning models, methods, and strategies. This is crucial for enhancing students' conceptual understanding and fostering their interest in learning. 21st-century learning also emphasizes the importance of active collaboration and communication skills among students, making learning activities more meaningful and less focused on memorization. However, the reality on the ground shows that there are still many educators who have not fully used learning models that are in accordance with the demands of the curriculum, so that learning objectives have not been achieved optimally.

The results of pre-research interviews in two schools, namely MAN 1 Kampar and MAN 4 Kampar, confirm this fact. At MAN 1 Kampar, teachers still tend to focus on calculation material, especially on acid-base material, without giving adequate emphasis to conceptual understanding. In fact, acid-base material requires a deep conceptual understanding so that students do not get caught in misconceptions. On the other hand, at MAN 4 Kampar, learning still uses minimal interactive media. Teachers tend to use simple lecture and group discussion methods, while the application of acid-base in everyday life is limited to examples listed in textbooks. This approach makes students passive and afraid to ask questions, which ultimately leads to conceptual misunderstandings Dwi, et al. (2023) This condition has an impact on low student interest in learning, because learning tends to be monotonous and less interesting for students.

These issues demonstrate that conceptual understanding and learning interest are crucial aspects that must be developed in learning, particularly in acid-base material. Learning interest is a key determinant of student learning success. Learning interest can arise from within the student (an internal factor) or be influenced by external factors such as the teacher's teaching strategy, learning media, and the learning environment. If student learning interest is low, conceptual understanding will not be optimal. Therefore, a learning model is needed that can simultaneously enhance both aspects.

One approach believed to be able to address this problem approach is called Problem-Based Learning (PBL). PBL is a student-centered learning model that actively engages students in solving authentic problems. Through this process, students not only gain knowledge but also develop critical thinking skills, communication skills, and independence in learning. PBL also aligns with constructivist learning theory, which emphasizes that students construct their own knowledge through experience, assimilation, and accommodation. By continuously facing new problems, students will continually adapt their existing knowledge, developing a deeper understanding and cognitive balance.

The application of PBL in chemistry learning, particularly in acid-base chemistry, is highly relevant. Acid-base chemistry encompasses not only pH calculations but also closely relates to everyday life phenomena. Using PBL, students are encouraged to analyze problems, formulate alternative solutions, implement strategies, and conduct evaluations. The teacher acts as a facilitator, guiding students' thinking processes (Hidayah, 2022). Thus, PBL has great potential to enhance conceptual understanding and student learning interest in acid-base chemistry.

Several previous studies also support the effectiveness of PBL. Oktaviani Rampi's (2021) study, "Application of the PBL Model to Acid-Base Material for Grade XI Science Students at SMA Negeri 1 Telaga," showed that PBL can improve student activity and learning outcomes. Furthermore, Febi Ramadan's (2019) study, "Improving Students' Critical Thinking Skills in Acid-Base Material with the Application of the PBL Model," also demonstrated that PBL can develop critical thinking skills. Thus, PBL can be said to be effective in improving the quality of chemistry learning, especially in materials that require in-depth conceptual understanding.

In addition to implementing PBL, the use of learning media is also crucial for capturing students' attention and increasing their interest in learning. One medium that aligns with the characteristics of today's students is interactive learning videos. Digital generation students are accustomed to audio-visual media such as television, computers, laptops, and smartphones. Learning videos provide a more immersive learning

experience because students can directly see illustrations, animations, and simulations of the concepts being studied. This can increase students' motivation, interest, and curiosity (Dewi Handayani et al., 2021).

However, the use of conventional learning videos alone may not be sufficient to address the learning problems faced by students. Conventional videos generally position students as passive viewers who only watch and listen to the presented material without being directly involved in the learning process. This condition may reduce students' attention and opportunities to actively construct their understanding, particularly when learning abstract chemistry concepts such as acid-base concepts. Therefore, interactive learning videos are needed to provide a more active and engaging learning experience. Interactive learning videos allow students to interact with learning content through features such as questions, feedback, navigation, illustrations, animations, simulations, and other activities that require students to respond to the material. Such features can encourage students to pay closer attention, process information actively, and evaluate their understanding throughout the learning process.

The urgency of integrating interactive learning videos with Problem-Based Learning (PBL) lies in the complementary characteristics of both approaches. PBL provides students with opportunities to investigate authentic problems, discuss possible solutions, and construct knowledge through problem-solving activities, while interactive videos can provide visual and contextual representations that help students understand abstract concepts and phenomena. In acid-base learning, this combination is particularly important because students need to connect microscopic concepts, symbolic representations, calculations, and macroscopic phenomena encountered in everyday life. Interactive videos can present these phenomena through animations, demonstrations, and simulations that may be difficult to observe directly in the classroom. Furthermore, interactive features can maintain students' attention and encourage their active participation while working through the problems presented in the PBL stages. Thus, the integration of PBL and interactive learning videos is expected not only to improve students' conceptual understanding but also to increase their learning interest.

Although previous studies have demonstrated the effectiveness of PBL in improving learning outcomes and critical thinking skills, studies specifically examining the integration of PBL with interactive learning videos to simultaneously improve students' conceptual understanding and learning interest in acid-base chemistry remain limited. This indicates a research gap that needs to be addressed. The present study therefore focuses on implementing the PBL learning model supported by interactive learning videos and comparing its effectiveness with the scientific method. This approach is expected to provide a more meaningful, interactive, and contextual learning experience and to offer an alternative learning strategy for addressing students' difficulties in understanding acid-base concepts and their relatively low interest in learning.

2. RESEARCH METHOD

The method used in this study was quasi-experimental research. A pretest-posttest control group design was used to analyze student learning interest and a posttest-only control group design to measure student conceptual understanding.

This study employs a pretest-posttest control group design to analyze students' learning interest and a posttest-only control group design to measure their conceptual understanding. The formulas for the pretest-posttest control group design and the posttest-only control group design are presented in Tables 3.1 and 3.2.

Table 3.1 Pretest-posttest control group design

O ₁	X	O ₂
O ₃	-	O ₄

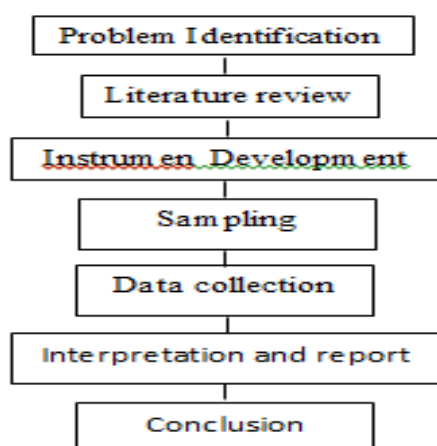
Table 3.1 presents a pretest-posttest control group research design used to measure students' learning interest in the control and experimental classes.

Table 3.2 Posttest Only Control Group Design

X	O ₂
-	O ₄

Table 3.2 presents a posttest-only control group research design used to measure students' conceptual understanding in the control and experimental classes.

This research was conducted in the Chemistry Education Master's Program, Faculty of Teacher Training and Education, University of Riau, and the implementation phase was conducted at MAN 1 Kampar and MAN 4 Kampar. The research procedure is presented in figure 1.



The population in this study were all students of class XI MAN 1 and XI MAN 4 Kampar. The research sample is part of the population taken as a data source and can represent the entire population, so from the existing population two classes were taken, namely the experimental class and the control class. Sampling was carried out using a purposive sampling technique, namely taking based on the provisions and needs of the researcher. The data collection instruments used were tests of conceptual understanding and learning interest.

A significance test is not required for the descriptive analysis comparing the average post-test results between the experimental and control groups; this aligns with Sugiyono (2018), who states that comparing two or more means does not necessitate significance testing. Technically, this implies that descriptive statistics involve neither significance tests nor error levels, as the researcher does not intend to make generalizations—and thus, there is no risk of generalization error.

Descriptive statistics are used to analyze data by describing or illustrating the collected data exactly as it is, without the intention of drawing conclusions applicable to a broader population or making generalizations (Sugiyono, 2018). Consequently, this study employs descriptive analysis—specifically frequencies, means, performance metrics, and bar charts—to obtain an overview of the students' conceptual understanding and learning interest across the experimental and control groups.

The concept understanding test is in the form of multiple choices which are arranged based on concept understanding indicators. as presented in Table 1.

Table 1: Indicators of concept understanding

No	Indicators	Number of Items per Indicator	Item Number
1	Interpreting	4	1,13,16,18
2	Giving examples	3	2,11, 29
3	Classingfyng	6	3,8,15,19,23,26
4	Summarizing	3	4,24,25
5	Drawing inferences	7	5,9,10,12,14,21,30
6	Comparing	2	6,17
7	Ecpaining	4	7, 20,22, 27

The data obtained from this study are conceptual understanding test scores. The scores are calculated using the following formula. Theassessment method uses the following formula:

$$X = \frac{\text{Jumlah skor pemahaman konsep}}{\text{total skor}} \times 100\% \dots \dots \dots (1)$$

The interpretation of understanding is as follows:

Table2: Interpretation of Concept Understanding

Mark	Information
95,00-100,00	Special
80,00 - < 95, 00	Very good

65,00 - < 80,00	Good
55,00 - < 65,00	Enough
40,00 - < 55,00	Not enough
00,00 - < 40,00	Very less

(Sri dan Zulirfan, 2023)

Meanwhile, the learning interest questionnaire was compiled based on four main indicators, The learning interest test is in the form of statements compiled based on learning interest indicators as presented in Table 3.

Table 3: Indicators of interest in learning

Indicators	Number of Items per Indicator	Item Number
Feelings of joy	8	1,2,3,4,5,6,7,8
Student engagement	5	9,10,11,12,13
Student interest	5	14,15,16,17,18
Student attention	2	19,20

The student learning interest questionnaire consists of positive and negative questions accompanied by four answer choices, namely SA (strongly agree), A (agree), D (disagree), and SD (strongly disagree). The student learning interest questionnaire will be distributed to students. The scoring guidelines for the learning interest questionnaire are based on a Likert scale as in Table 4.

Table 4. Scoring Guidelines for the Learning Interest Questionnaire

Alternative Answers	Statement Score
SA (strongly agree)	4
A (agree)	3
D (disagree)	2
SD (strongly disagree)	1

How to calculate the percentage of the questionnaire as follows:

$$P = \frac{K}{l \times m} \times 100\% \dots \dots \dots (2)$$

Description:

P = percentage score of the questionnaire results

K = overall score obtained by students

l = number of students

m = maximum score

To group the average student scores into scientific attitude category levels, the provisions listed in Table 4 are used.

Table 5: Learning Interest Categories

Average learning interest	Score category
85,26 – 100	Very high
62,51 - 85,25	High
43,76 – 62,50	Low
≤ 43,75	Very low

(Hidayat, dkk, 2023)

3. RESULT AND DISCUSSION

This research was a quasi-experimental study. The purpose of this study was to determine the effect of implementing a problem-based learning (PBL) model using interactive videos on improving students' conceptual understanding and learning interest in acids and bases in grade XI science. This research was conducted at MAN 1 Kampar and MAN 4 Kampar.

The first stage of this study was determining the sample to be used as the research sample and grouping them into two research classes: an experimental class and a control class. In the next stage, the experimental group was given treatment in learning using the problem-based learning (PBL) model using

interactive learning videos, while the control class used a scientific approach. Before receiving the treatment, students in the experimental and control classes had to have similar initial abilities to ensure there were no significant differences in student initial abilities. Therefore, both classes underwent normality tests and a test for the equality of two variances, known as the homogeneity test. In the initial stage, a pre-test was administered to assess learning interest. In the final stage, the sample was given a post-test to measure students' conceptual understanding and learning interest using a test technique.

In this study, before applying the problem-based learning (PBL) model using interactive learning videos in the experimental and control classes with scientific learning, the learning tools developed consisted of Teaching Modules, Student Worksheets (LKPD) and Test Instruments that would be used were first tested for validity and limited trials to produce valid tools. The test instrument used was a concept understanding test instrument that was tested in a limited trial at MAN 1 Kampar to determine the validity and reliability of the questions used in the implementation of the study.

This study aims to analyze the conceptual understanding and learning interests of students who participated in PBL learning using interactive learning videos and those who received scientific learning. The study sample consisted of two experimental classes and two control classes from two schools. The implementation of the PBL model using interactive video in the experimental class is presented in [Figure 2](#).



Figure 2. Implementation of the PBL learning model using interactive video

According to [Figure 2](#), the learning process using the PBL model using interactive video was carried out in four meetings. After all meetings were completed, conceptual understanding questions and a learning interest questionnaire were distributed to students to measure their level of conceptual understanding and learning interest. The PBL model consists of FIVE syntaxes: orienting students to the problem, organizing students for learning, guiding investigations, developing and presenting results, and analyzing and evaluating the problem-solving process.

The first stage in implementing the Problem-Based Learning (PBL) model is problem orientation. This stage begins with the presentation of a problem related to the learning topic to stimulate students' curiosity. Next, students are divided into small groups to discuss and collaborate to understand the given problem. Previous research has shown significant improvements in student mathematics learning outcomes after implementing the PBL model with student worksheets (LKPD) and instructional videos ([Emasains, 2022](#)). With interactive video media, the problem-orientation process becomes more focused because students not only listen to the teacher's explanation but also gain visual experience.

The next stage involves organizing students for research by developing collaborative skills among students and facilitating them to investigate problems together. Through assignments and group investigations, students practice critical thinking while building responsibility for learning. Previous research has shown that PBL syntax, which emphasizes group work, can improve students' collaborative skills and understanding of the concepts being studied ([Junaidi et al., 2025](#)).

The next stage is a session to support independent and group investigations. In the independent and group investigation sessions, the teacher guides students in collecting data/information (knowledge, concepts, and theories) through various methods to find alternative solutions to problems. In the data collection stage, activities are carried out according to the instructions in the Student Worksheet (LKPD). Students work in groups to observe and analyze problems through interactive learning videos, thus obtaining relevant data. The resulting data is then used as evidence to support understanding of the concepts being studied. In line with this, research shows that the use of interactive video-assisted worksheets encourages students to observe videos, discuss in groups, and collect data through observation tables, which are then processed to strengthen conceptual understanding ([Bakri et al., 2020](#)).

The next stage is developing and presenting the work. This activity is very relevant to the research being conducted, because in the implementation of the Problem Based Learning model assisted by interactive learning videos, students are not only directed to discover the concept of acids and bases independently, but also produce a form of work or report that reflects their understanding of the material. Research shows that the use of interactive videos based on PBL not only increases students' motivation and critical thinking skills (Ulfaa et al., 2025). Thus, the activity of developing and presenting the work not only deepens conceptual understanding but also increases students' interest in learning through a meaningful and real problem-solving process.

The next stage is analyzing and evaluating the problem-solving process. At this stage, the teacher facilitates students' reflection on the steps taken to solve the problem and evaluates the accuracy of the solutions obtained. In the context of implementing the Problem-Based Learning model with the help of interactive learning videos on acid-base material, this reflection activity helps students reassess their conceptual understanding, identify deficiencies, and improve learning strategies. Research by (Dolmans et al., 2021) states that the evaluation stage in PBL encourages students to become independent learners through self-evaluation and peer feedback, thereby deepening conceptual understanding and increasing learning motivation. Thus, the analysis and evaluation stages not only strengthen conceptual mastery but also contribute to increasing student learning interest through more meaningful learning experiences.

Meanwhile, the control class was taught using the scientific method, as shown in Figure 3.



Figure 3. Implementation of the Scientific Learning Model

The learning process using the scientific model is carried out over four sessions. If the teacher teaches monotonously, the results will remain the same; students tend to feel bored and less motivated to learn the material (Huda & Ikhsan, 2024). The use of inappropriate teaching methods has a less than optimal impact on student learning outcomes (Ferawati, 2021). After all sessions were completed, a conceptual understanding test and a learning interest questionnaire were distributed to students to measure their conceptual understanding and learning interest. The implementation of this questionnaire is presented in Figure 4.



Figure 4. Completing the Conceptual Understanding Test Questions and the Learning Interest Questionnaire

Then, the data from the Conceptual Understanding Test Questions and the Learning Interest Questionnaire were analyzed descriptively to provide a general overview of the differences in conceptual understanding and learning interest levels between the two groups. The results of the analysis of students' conceptual understanding scores after implementing the two learning models are presented in Table 5.

Tabel 5. Result of descriptive analysis posttest conceptual understanding

Indicators	Posttest MAN 1 Kampar				Posttest MAN 4 Kampar			
	Experiment		Control		Experiment		Control	
	Average	Des	Average	Des	Average	Des	Average	Des
Interpreting	83%	VG	80%	VG	79%	G	75%	G
Giving examples	81%	VG	79%	G	82%	VG	68%	G
Classingfyng	73%	G	70%	G	74%	G	67%	G
Summarizing	78%	G	76%	G	71%	G	71%	G
Drawing inferences	87%	VG	75%	G	71%	G	68%	G
Comparing	79%	G	72%	G	69%	G	62%	F
Eclplaining	83%	VG	74%	G	73%	G	67%	G
Average	80,57%		75,1%		74,1%		68,3%	

Description: VG= Very good, G = good, F = fair

Based on [Table 5](#), it can be seen that the conceptual understanding ability of students in the experimental class is better than that of the control class, both at MAN 1 Kampar and MAN 4 Kampar.

The Conceptual Understanding Indicators in this study consist of seven indicators. Overall, the seven indicators of conceptual understanding are explained as follows:

1. Interpreting

Interpreting is the ability to convert information from one form to another, such as translating images, illustrations, graphs, and tables into words or vice versa. In line with [Anderson & Krathwohl \(2015\)](#), interpreting is an indicator of conceptual understanding that aims to transform information from one form to another.

The results of the study obtained on the indicator interpreting the posttest score of the experimental class of MAN 1 Kampar were 83% and 79% in MAN 4 Kampar, while the score in the control class at MAN 1 Kampar was 80% and the score was 75% in MAN 4 Kampar. This score was obtained from an analysis of students' answers to questions that measure interpreting abilities, which indicates that the application of the Problem Based Learning learning model assisted by interactive videos is able to improve students' skills in converting information into other forms of representation. These findings align with research by [Gkitzia et al. \(2020\)](#), which demonstrates that the ability to translate information across representations is crucial for understanding chemical concepts. This skill requires students to extract information from one representation and subsequently link it to others at the macroscopic, submicroscopic, and symbolic levels. The study also indicates that the ability to translate between representations depends on students' conceptual understanding. Furthermore, [Erlina et al. \(2023\)](#) found that the use of videos based on multiple representations can significantly enhance the understanding of chemical concepts, as students acquire information through various representational forms that facilitate the integration of abstract chemical concepts. These findings are reinforced by research conducted by Datul and Ardhana, which shows that implementing the Problem-Based Learning model with Grade 11 students—specifically regarding the topic of acids and bases—is linked to their ability to utilize various chemical representations. In the context of acids and bases, interpretive skills are also essential when students read and connect information presented in graphs, tables, images, symbols, and chemical phenomena. Thus, the use of interactive learning videos within the Problem-Based Learning framework offers students the opportunity to engage with diverse representations and connect that information to the problems at hand. This approach can help students build conceptual understanding while simultaneously improving their interpretive skills—a key indicator of conceptual comprehension.

2. Providing Examples

Providing examples is an indicator that requires students to provide examples of a general concept or principle. Research results show that the posttest scores for the experimental class at MAN 1 Kampar (providing examples) were 81% and 82% for MAN 4 Kampar, while the scores for the control class at MAN 1 Kampar were 79% and 68% for MAN 4 Kampar.

The results of the study indicate that students are guided to observe and understand the experimental examples presented in problem-based learning using interactive learning videos. Furthermore, students are given conceptual understanding questions with the indicator of providing examples. For example, after watching the video, students are asked to name examples of acids and bases commonly encountered in everyday life. Students can list oranges as an example of an acid because they contain citric acid, which gives them a tangy

taste. Acids and bath soap are examples of bases because they contain sodium hydroxide, which creates a slippery feeling. Through this activity, students are not only able to cite examples but also understand why a substance is classified as an acid or base based on its properties and pH value. Students' ability to add new, relevant examples demonstrates that they not only remember the examples given by the teacher but also understand the acid-base concept more deeply. This aligns with [Holme et al.'s \(2015\)](#) assertion that students are said to understand a concept if they can provide other examples that align with the concept.

3. Classifying

Classifying is an indicator that expects students to be able to group something into a specific category (concept). The research results show that the conceptual understanding score for the experimental class post-test at MAN 1 Kampar was 73% and 74% for MAN 4 Kampar. Meanwhile, the research results show that the conceptual understanding score for the control class post-test at MAN 1 Kampar was 70% and 67% for MAN 4 Kampar.

The results of research on problem-based learning using interactive learning videos on acid-base material include student activities to group a concept. This activity is guided through questions and problems so that by answering these questions students continue to be trained to classify. For example, after watching a video, students are asked to group several solutions around them, such as orange juice, vinegar, soap, and lime water. Students classify orange juice and vinegar into the acid group because they have a sour taste and a pH <7 , while soap and lime water are grouped as bases because they feel slippery and have a pH >7 . With this exercise, students are able to distinguish and group substances according to their acid or base properties. The ability to correctly classify examples that fall into certain categories can help train students' conceptual understanding ([Holme, et al., 2015](#)).

4. Summarizing

Summarizing is a method of rewriting or simplifying information that has been explained. The summary contains key points related to the information or knowledge. Research findings indicate that the summarizing indicator achieved conceptual understanding scores for the experimental class at MAN 1 Kampar and 71% for MAN 4 Kampar. Meanwhile, the classification indicator achieved conceptual understanding scores for the control class at MAN 1 Kampar and 76% for MAN 4 Kampar.

The results indicate that in problem-based learning using interactive learning videos, students are trained to summarize concepts through a combination of visuals and audio from the experiments presented. Students are asked to observe illustrations, listen to explanations, and then summarize the core concepts learned. Therefore, summarizing is not limited to reading the material but also encompasses the process of understanding through direct observation and listening. Each student produces a different summary based on their perspective and the details they capture. The more detailed the summary, the more information they gain, thus improving students' conceptual understanding ([Yulisa et al., 2020](#)).

5. Drawing Inferences

The inferring indicator expects students to be able to draw their own conclusions from the material presented concisely. Research findings indicate that the inferring indicator resulted in a post-test conceptual understanding score for the experimental class at MAN 1 Kampar and 71% for MAN 4 Kampar. Meanwhile, the classification indicator resulted in a post-test conceptual understanding score for the control class at MAN 1 Kampar and 68% for MAN 4 Kampar.

The results of the problem-based learning experiment using interactive learning videos involved students engaging in a series of analysis and evaluation activities during the problem-based learning process, resulting in a solution that could be used as a conclusion. Through these stages, students become accustomed to drawing conclusions about the acid-base concepts they are learning, resulting in a deeper and more structured understanding of the concepts.

6. Comparing

Comparing is the ability to recognize the differences and similarities between two or more objects, concepts, problems, and events. The results of the study showed that the post-test conceptual understanding scores for the experimental class at MAN 1 Kampar were 79% and 69% for MAN 4 Kampar. Meanwhile, the post-test conceptual understanding scores for the control class at MAN 1 Kampar were 72% and 62% for MAN 4 Kampar.

The results showed that the use of problem-based learning supported by interactive learning videos provided a richer learning experience through a virtual laboratory. The experiments featured various animations and interactive illustrations that allowed students to directly observe changes. Furthermore, in the conceptual understanding questions, students were also presented with questions that required the ability to compare two

objects or situations. Thus, students became accustomed to identifying similarities and differences, which is an important foundation for a deeper understanding of the characteristics of acidic, basic, and neutral solutions.

7. Explaining

Explaining is an indicator that expects students to be able to establish causal relationships from concepts or material that has been explained. Research results show that the explaining indicator resulted in a post-test conceptual understanding score for the experimental class at MAN 1 Kampar of 83% and 73% for MAN 4 Kampar. Meanwhile, the classification indicator resulted in a post-test conceptual understanding score for the control class at MAN 1 Kampar of 74% and 67% for MAN 4 Kampar.

The results show that in problem-based learning using interactive learning videos, students are asked to explain a definition through animation. This animation presentation facilitates student understanding of concepts because they not only memorize or recall definitions but also grasp the meaning of the visualizations shown. Thus, students are better trained in building a deep conceptual understanding. This aligns with [Anderson & Krathwohl's \(2015\)](#) opinion, which states that conceptual understanding is the ability to grasp meaning, not simply memorize. This view is reinforced by [Nahdi et al. \(2018\)](#), who emphasize that conceptual understanding is students' ability to grasp the meaning of the subject matter being studied.

Based on these results, there is a difference in conceptual understanding between the average experimental class and the control class due to the different treatments given to each class, where the experimental class uses a problem-based learning (PBL) model using interactive learning videos while the control class uses a scientific approach. The results of the study show that in problem-based learning using interactive learning videos, students are asked to explain a definition through the animation displayed. This animation presentation makes it easier for students to understand the concept, because they not only memorize or remember the definition, but also capture the meaning of the visualization shown. Thus, students are more trained in building a deep understanding of the concept. This is in line with the opinion of [Anderson & Krathwohl \(2015\)](#) who stated that conceptual understanding is the ability to capture meaning, not just memorizing. This view is reinforced by [Nahdi, et al. \(2018\)](#) who emphasized that conceptual understanding is the ability of students to understand the meaning of the subject matter being studied.

Meanwhile, the posttest results of students' learning interest were carried out with the aim of obtaining sample scores for the experimental group and the control group after being given treatment. The test format used in this posttest was a questionnaire for testing students' learning interest. This consisted of four indicators: feelings of pleasure, student involvement, student interest, and student attention. The posttest results of students' learning interest in the experimental group and the control group at MAN 1 Kampar and MAN 4 Kampar can be seen in [Table 6](#).

Table 6 Posttest Results of Students' Learning Interest

Indicators	Posttest MAN 1 Kampar				Posttest MAN 4 Kampar			
	Experiment		Control		Experiment		Control	
	A	D	A	D	A	D	A	D
Feelings of enjoyment	82%	H	73%	H	75%	H	70%	H
Student engagement	80%	H	70%	H	72%	H	73%	H
Student interest	92%	VH	76%	H	79%	H	72%	H
Student attention	96%	VH	86%	VH	80%	H	73%	H
	87,5%	VH	76,3%	H	76,5%	H	72%	H

Description : VH = Very High, H = High, L = Low

Based on the posttest results shown in Table 6, student learning interest at both MAN 1 Kampar and MAN 4 Kampar remained in the high to very high category. The experimental class achieved relatively higher scores than the control class, although the differences were not significant.

Thus, it can be concluded that in MAN 1 Kampar, the highest indicator of learning interest in the experimental class is student attention, which is influenced by curiosity and response to tasks. The video-assisted Problem-Based Learning (PBL) model is able to improve this indicator because the video presents a real context, triggers curiosity, and supports problem orientation that is relevant to students' lives. The lowest indicator in the experimental class is student engagement, while in the control class the highest indicator is also interest, with the lowest indicator being feelings of pleasure. Meanwhile, in MAN 4 Kampar, the highest

indicator in the experimental class is student attention, while in the control class, the highest indicator remains student engagement, while the lowest indicator is feelings of pleasure.

Each indicator is explained below:

a. feelings of joy

Student interest can be demonstrated by a sense of enjoyment and liking for something or an activity, resulting in enthusiasm and eagerness to participate in chemistry lessons. This sense of enjoyment enables students to engage effectively in learning, enabling the teacher to effectively convey the material taught. The results of the learning interest research focused on the enjoyment indicator, which consists of two questions. Interactive video media engages students in learning due to its animations, simulations, and engaging colors. Furthermore, it is based on a problem-based learning model, which significantly contributes to the student interest indicator. During the problem-oriented stage, students experience a sense of enjoyment because they feel challenged by the problems presented, which naturally fosters interest in learning.

Meanwhile, in the control class, learning activities did not use the problem-based learning model, using interactive learning videos. Students were encouraged to demonstrate, thus fostering a sense of enjoyment in learning. Due to the different treatment given to the two classes, there was a difference in average learning interest between the two classes. Learning videos work well combined with the problem-based learning model, which aligns with previous research. The combination of the Problem-Based Learning (PBL) model and the use of learning videos has been shown to improve the quality of student learning processes and outcomes. Ulfah, Lisdiana, and [Saptono \(2025\)](#) stated that interactive PBL-based videos can significantly increase students' motivation and critical thinking skills. Similar research by [Anggela et al. \(2023\)](#) also showed that the use of integrated videos with PBL has a positive effect on improving students' critical thinking skills.

b. Student Engagement

Student engagement or participation in an object results in students enjoying and being interested in participating in or completing activities related to that object. Research on learning interest, based on the student engagement indicator, showed that student learning interest in the experimental class at MAN 1 Kampar (80%) and MAN 4 Kampar (72%) was categorized as strong. In the control class at MAN 1 Kampar (70%) and MAN 4 Kampar (73%), student interest was also categorized as strong.

During group discussions, students also develop their ability to express opinions or ask questions. This activity trains students to respect opinions, be independent, take responsibility, and collaborate with others to solve problems ([Stefania et al., 2023](#)).

c. Student Interest

Student interest is closely related to the intrinsic drive to engage in an activity. Interest can be defined as a student's liking or special attention to a particular object. Affectively, interest emerges as a response triggered by the activity being undertaken. If students feel drawn to an object, they will feel happy and motivated to engage in activities related to that object. During the learning process, student interest will foster a growing curiosity. In fact, when students do not understand the material explained by the teacher, they tend to be bold enough to ask questions without hesitation.

The results of the study of learning interest, based on the student interest indicator, showed that 92% of the experimental class at MAN 1 Kampar and 79% of the MAN 4 Kampar students' interest was categorized as high. In the control class at MAN 1 Kampar, 76% and 72% of the MAN 4 Kampar students' interest was categorized as high. The use of interactive learning videos provides opportunities for students to gain more meaningful learning experiences. Through the interactive features presented, students can explore the material independently or in groups according to learning objectives.

Student learning interest can be increased through the use of appropriate learning media. [Setiawan \(2020\)](#) stated that visual media helps clarify abstract concepts, thereby capturing students' attention and facilitating understanding. This aligns with [Ardia Cahyaning Heryanti's \(2021\)](#) findings that learning strategies that involve student engagement can foster enthusiasm and interest in learning activities. The Problem-Based Learning (PBL) model supports this by emphasizing students' active role in finding solutions to given problems.

d. Student Attention

Students' attention to the subject matter is an important factor that can foster a diligent attitude and increase the intensity in studying the material presented by the teacher. This condition encourages students to be more active in discussion activities and during the learning process, so that learning objectives can be achieved optimally. The results of the study of learning interest in the student attention indicator in the experimental class at MAN 1 Kampar obtained a percentage of 96% and 80% in MAN 4 Kampar, student

learning interest was stated in the very high category and in the control class at MAN 1 Kampar obtained a percentage of 86% and 73% of student learning interest was also in the high category.

The use of interactive learning videos has been proven to provide an enjoyable learning experience for students. Engaging visuals and interactive features foster enthusiasm for learning and encourage students to be more active in participating in learning activities. In line with this, the implementation of the Problem-Based Learning (PBL) model contributes to increasing student attention through student-centered learning stages, starting with problem orientation, organizing learning activities, guiding investigations, developing and presenting work, and analyzing and evaluating the problem-solving process.

Students, who have been formed into groups, collaborate and actively discuss formulating or drawing conclusions. Several studies have shown that the implementation of Problem-Based Learning (PBL) supported by interactive videos can improve student learning outcomes, interest, and attention.

4. CONCLUSION

Based on the analysis and findings, the problem-based learning (PBL) model using interactive learning videos proved to be more effective in improving students' conceptual understanding and learning interest compared to the scientific model. Conceptual understanding in classes implementing PBL using interactive learning videos increased by 80,57% in category good, while classes using the scientific model only increased by 74,1% in category good. Meanwhile, student learning interest in classes implementing PBL using interactive learning videos increased by 87,5% in category very good, while classes using the scientific model only increased by 76,5% in category high. This indicates that the use of PBL with interactive learning videos provides a more engaging learning experience, increases student engagement, and helps them understand concepts.

REFERENCES

- Anderson, L.W. & Krathwohl, D.R. (2010). *Kerangka Landasan untuk Pembelajaran, Pengajaran, dan Asesmen*. Yogyakarta: Pustaka Pelajar.
- Anggela, R., Eviliyanto, & Rina. (2021). Pengaruh penggunaan video terintegrasi model pembelajaran *Problem Based Learning* (PBL) terhadap kemampuan berpikir kritis mahasiswa pendidikan geografi mata kuliah geografi regional dunia. *Sosial Horizon: Jurnal Pendidikan Sosial*, 8(1), 45–56. 10.31571/sosial.v8i1.2260.
- Bakri, F., Permana, H., Wulandari, S., & Mulyati, D. (2020). Student worksheet with AR videos: Physics learning media in laboratory for Senior High School students. *Journal of Technology and Science Education (JOTSE)*. <https://doi.org/10.3926/jotse.891>
- Dwi Wulandari, dkk. (2023). Identifikasi Pemahaman Konsep dan Kemampuan Berargumentasi Peserta Didik Pada Pembelajaran Fisika. *Jurnal Pendidikan MIPA*. 13(1).<https://doi.org/10.37630/jpm.v13i1.817>
- J., Dolmans, D., & van Merriënboer, J. (2021). Student, direct thyself! Facilitating self-directed learning skills and motivation with an electronic development portfolio. *Journal of Research on Technology in Education*.<https://doi.org/10.1080/15391523.2021.1906363>
- Emasains. (2022). Penerapan Problem-Based Learning berbantuan LKPD dan video pembelajaran interaktif dalam upaya meningkatkan hasil belajar siswa kelas X.D SMA Negeri 2 Mengwi. *E-Masains: Jurnal Edukasi Matematika dan Sains*, 11(2), 156–163.<https://doi.org/10.59672/emasains.v13i1.3622>
- Ferawati Jafar, A. (2021). Penerapan Metode Pembelajaran Konvensional Terhadap Hasil Belajar Fisika Peserta Didik. Al Asma: *Journal OF Islamic Education*, 3(2). <https://doi.org/10.24252/asma.v3i2.23748>
- Handayani, D., dkk. (2021). Pengembangan video asam basa berbasis lingkungan untuk meningkatkan pemahaman siswa kelas XI. *Jurnal Teknodik*, 25(2), 95–106. <https://doi.org/10.32550/teknodik.v25i2.620>
- Hidayah, F. N. (2022). Pengembangan E-LKPD berbantuan PhET Simulation berbasis Problem Based Learning pada materi pemanasan global untuk menumbuhkan keterampilan berpikir kritis peserta didik SMA [Skripsi, Universitas Negeri Surabaya]. *Repositori UNESA*.
- Huda, N., & Ikhsan, J. (2024). Menggugat Metode Ceramah Dalam Pendidikan Meluruskan Fitnah, Mengusulkan Paradigma Baru. CV. Jejak.
- Holme, T. A, dkk. Defining Conceptual Understanding in General Chemistry. *Journal of Chemical Education*. Vol 92. 10.1021/acs.jchemed.5b00218
- Junaidi, Pu'adi, Rohaniyah, J., Isminingsih, E., & Zainal, R. (2025). Penerapan model pembelajaran Problem-Based Learning (PBL) dalam meningkatkan keterampilan kolaborasi siswa kelas X-3 SMAN 1 Pademawu. <https://doi.org/10.47134/ptk.v2i4.1751>

- Lenggono, Budi dan Yuzarion. (2021). Motivasi Berprestasi Pada Siswa SMA Dalam Perspektif Islam. *Jurnal Psikologi Terapan dan Pendidikan*, vol. 2. <https://doi.org/10.26555/jptp.v2i1.17056>
- Nahdi, D.S, dkk. (2018). Upaya Meningkatkan Pemahaman Konsep Siswa Melalui Penerapan Metode Demonstrasi pada Mata Pelajaran IPA. *Jurnal Cakrawala Pendas*, Vol. 4 No (2).DOI: 10.31949/jcp.v4i2.1050
- Sri dan Zulirfan, (2023) .Identifikasi Pemahaman. Konsep Dan Kemampuan Berargumentasi Peserta Didik Pada Pembelajaran Fisika. *Jurnal Pendidikan Mipa*, 13(1). 10.37630/jpm.v13i1.817.
- Stefani, W. N. O. (2023). Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbasis Simulasi Phet Terhadap Minat Belajar dan Pemahaman Konsep Peserta Didik Pada Materi Gerak Harmonik. *Jurnal Inovasi Pembelajaran Fisika UNWIRA (1)*. <https://doi.org/10.30822/magneton.v1i1.2056>
- Ulfaa, A., Wuryanto, W., & Fajriyah, K. (2025). Effectiveness of interactive learning videos based on problem-based learning to increase student motivation and critical thinking skills. *Unnes Journal of Mathematics Education Research*, 14(1), 45–52. DOI:10.15294/usej.v14i1.19693
- Yulisa, Y, dkk. (2020). Pengaruh Video Pembelajaran Fisika Terhadap Pemahaman Konsep Siswa SMP. *Journal Luminous*.Vol 1. DOI: 10.31851/luminous.v1i1.3445