JOVES (Journal of Vocational Education Studies)
VOL 8, No. 1, 2025, pp. 90-108
pISSN: 2614-7483 pISSN: 2614-7475 https://doi.org/10.12928/joves.v8i1.11574

Development of Video-Based Learning Model Through "Seesaw" Application to Improve Process Skills Reviewed from the Motivation and Initial Understanding of Vocational High School Students

[1]Tatag Prahestiningtyas, [2]Dwi Sulisworo*

Universitas Ahmad Dahlan, Indonesia

Email : [1]grafertata@gmail.com, [2]dwi.sulisworo@uad.ac.id*

* Correspondence author

ARTICLE INFO

Article history
Received Sep 15, 2024
Revised Feb 19, 2025
Accepted Feb 20, 2025

Keywords
"Seesaw" Application
Process Skills
Video-Based Learning
Vocational Education

ABSTRACT

Knowing how much learning has improved in students after using Physics learning media based on Video-Based Learning through the "Seesaw" application. This study employed a One-Group Pre-test Post-test Design. 34 SMK Bhakti Mulia Blora 10th-grade students served as the study's samples. The Simple Random Sampling technique was used to sample the sample members. Pre-experiment tests and questionnaires provided the data, which were then analyzed using paired t-tests. By using the "Seesaw" program to create instructional films, teachers can cut down on the amount of time they spend teaching and standardize the way that lesson materials are delivered. Additionally, because they are able to take in and comprehend the instructional information more thoroughly, kids become more engaged in the learning process, which makes learning more exciting overall. Teachers may easily plan and construct learning activities, assessments, and records of student work by using the "Seesaw" program. Students performed better in the post-test than they did in the pre-test. Additionally, student performance has improved from cycle to cycle. When utilizing the "Seesaw" program for video-based learning in Physics, students' process abilities have improved as opposed to manual learning.

Introduction

The COVID-19 epidemic has altered a lot of aspects of society, including education. Online learning is used for instruction in the red and orange zones. The aforementioned declaration is in accordance with the Decree on the implementation of free education for the 2020–2021 academic year that was issued by the Ministers of Education and Culture, Health, Religion, and Home Affairs (Ramanta, 2020). Increased graduation rates, shorter degree completion times, lower educational expenses, and increased accessibility for students who are not typical are the goals of online learning (Nguyen, 2015). Online learning focuses on ease of access, connection, flexibility, and the ability to create various interactions with the internet network. In addition, learning via the internet has become a primary need for educational institutions in the 21st century (He & Kruck, 2014).

Online education is also very important in the age of the Industrial Revolution 4.0. This era offers support for further growth, whether in the areas of business, education, and other fields. In the age of disruption and the "industry 4.0 revolution," the two sides of the coin may present challenges but also opportunities. According to Duryat (2020), if you don't want to be affected by changes and pressures, you can't claim to be in a pleasant place.

Students also worry about the transition from a typical classroom to a home learning environment. For students without access to a private, physical online learning environment, distractions such as noise can be an issue (Baticulon et al., 2021; Bringula et al., 2021). Moreover, during the COVID-19 pandemic, communities, institutions, people, and technology all provide difficulties to online learning (Baticulon et al., 2021; Fabito et al., 2021).

Binti Abd Aziz et al. (2020) claims that daring education can lead to effective daring education practices based on recent research. Threats to the bold education program include attitudes, disruptions, private tyranny, and technology tyranny. People's opinions on daring education are a reflection of their attitudes toward it. According to the data analysis, attitudes in relation to technology and technological indifference is the main component of daring education.

SMK (Sekolah Menengah Kejuaruan) is classified as a Vocational High School with an emphasis on preparing pupils for the workforce under Government Regulation of Indonesia Number 29 of 1990 (Indonesian Government, 1990). Meanwhile, a new phase known as Industrial Revolution 4.0 has been introduced to the industrial sector. The remarkable advancements in robotics, machine learning, artificial intelligence (AI), 3D printing, and the internet of things are collectively referred to as "industry 4.0." These discoveries have led to the expansion of automation, information technology, and electronics. This era places a strong emphasis on connectedness, transparency, and teamwork in order to facilitate communication not just between humans but also between robots (Duryat, 2020).

Physics as one of the subjects as the main supporter of technological development plays an important role. Therefore, studying physics and instilling concepts in vocational school students is very necessary. In order for the direction of scientific and technological growth to go in the right direction, this extremely rapid technological progress must be in accordance with raising the caliber of human resources (Mulyadi, 2021).

Over the past ten years, the physics education community has come to understand how important it is to take into account students' conceptions of what physics knowledge and learning actually entails (Madsen, McKagan, & Sayre, 2015). Over the past 20 years, physics education has made significant research in the domain of students' epistemic perspectives on physics learning. Physics as a science that studies matter or substances including physical properties, composition, changes, and the energy it produces. So it is expected that the maturity of understanding concepts through instilling students' initial understanding is very important. However, this is constrained by the lack of learning processes and virtual laboratories.

Physics learning should be done by seeing, observing, or conducting experiments related to the processes of natural phenomena. But it is often found that learning physics only studies many formulas, so that students tend to only memorize formulas rather than understand the concept. Physics learning should contain types with verbal descriptions, pictures or diagrams, graphs, mathematics. The verbal method can define a concept. Pictures or diagrams are methods that can visualize something that is still abstract (Coleman, 2020). Similar to this, promoting the use, creation, and viewing of videos helps educators and students make better use of these tools for fostering shared knowledge growth and collaborative learning (Sablić et al., 2021).

Several synectic learning models applied with creativity processes based on Video-Based Learning through the Seesaw application are expected to improve process skills in terms of motivation and initial understanding of vocational high school students. According to Chaubey's (2015) research, using video-based learning for instructional purposes opens up new and creative ways to teach. This affirms that the development of cognitive, emotional, and psychomotor skills serves as a basis for pupils' first knowledge formation. Seesaw, on the other hand, is a learning platform that lets every student keep a learning diary in an online classroom. The arrival of Seesaw has caused a shift in the way educators approach creating authentic online exams. Instructors can use this app to tell parents about what their children are doing in class (Hindasah, 2020). Seesaw is different from other online platforms in that it doesn't require a username or password, is free, and has an intuitive UI. Students can collaborate with family, friends, and the larger community using the site and publish their portfolios (Moorhouse, 2019).

Several indicators of academic achievement and perseverance in science classrooms have been discovered in recent years. Individual studies have found that a wide range of characteristics are predictive, including support for work-study, involvement in learning communities, motivation, personality traits, college entrance exams, and prior knowledge relevant to the subject (Van Riesen et al., 2018).

It is commonly recognized that student motivation has a major influence on learning results in educational settings (Jiao et al., 2022; Kaya et al., 2022). Consequently, motivating students to increase their motivation has long been a top priority for administrators, practitioners, and educators (Deci & Ryan, 2016; Ryan & Deci, 2020). When students participate in classroom activities to earn incentives from instructors and parents, this is referred to as extrinsic motivation. Therefore, intrinsic motivation—which comes from a sense of fulfillment on its own—or extrinsic motivation—which comes from the possibility of rewards from outside sources—may be used to drive students' academic success in the classroom (Cao, 2022). Students' excitement to learn is highly connected with academic engagement (Wang, 2022; Yin & Wang, 2016), academic achievement (Datu & Yang, 2021; Joe et al., 2017), and academic success (Peng & Fu, 2021; Wu, 2019).

One of the challenges that online physics education still faces is that high school and vocational school students still struggle with solving problems, particularly when it comes to the subject of rigid body equilibrium and rotational dynamics. The first survey was done by research. The pre-research survey results indicated that students' initial understanding and enthusiasm to learn were still low in Rotational Dynamics and Equilibrium of Rigid Objects material. The average student engagement in Meeting 1 of Cycle I was 2.19. The subjects that were questioned about caused the biggest disparity in student comprehension.

In addition to using Seesaw as a learning technology that facilitates interactive activities, teaching and learning activities at SMK Bhakti Mulia Blora demonstrate that vocational students will develop their process skills by utilizing the Personal Sientak learning model, which is based on video-based learning. Students will become more motivated and interested in learning through more engaging and productive methods as a result. Furthermore, it is anticipated that vocational students' process abilities will be enhanced by their instruction in comprehending, applying scientific problem-solving techniques, and interpreting data in relation to their primary needs.

In the meantime, this study aims to ascertain how well the Seesaw application of the Video-

Based Learning model applies to the ideas of Rigid Body Equilibrium and Rotational Dynamics in order to enhance the process skills of the students in vocational high school with respect to motivation and foundational knowledge.

Method

Research Context

The research design was One-Group Pre-test Post-test Design. Fifty 10th-grade students at SMK Bhakti Mulia Blora, Jawa Tengah, Indonesia served as the study's sample. The Probability Sampling - Simple Random Sampling technique was used to sample the sample members. Only 34 students completed the learning activities. This study was based on specific methodological and practical considerations. This study focused on obtaining in-depth insights into student engagement and learning improvements within a controlled environment. Additionally, the number of participants was influenced by class size limitations and the availability of students who met the study's criteria. In vocational education settings, where class sizes can vary significantly, this sample was considered representative of typical student groups in similar learning environments

This study employs a pre-test and post-test design to measure the effectiveness of video-based learning through Seesaw. The students had no prior experience using Seesaw. To ensure the internal validity of the study, a learning session was conducted until the respondents became proficient in using the platform. The data on learning performance was collected only after they were familiar with Seesaw, ensuring that the results reflect the effectiveness of the learning method rather than prior familiarity with the platform.

The study period runs from July 2023 to December 2024 of the academic year 2023–2024. Preparing learning aids, assembling test questions, surveys, and observation forms, testing research instruments for validity, and evaluating test results are all part of the Pre-Research phase. deciding on the pretest and posttest questions in accordance with the designated categories. As part of the research step, pretest questions are given to students to gauge their starting proficiency, use the Seesaw app to implement learning via a video-based learning paradigm; interacting with kids via the Seesaw app and holding Q&A sessions; supplying post-test questions to gauge students' academic progress and surveys to gauge students' drive to study. In the post-research phase, test results, questionnaires, and observation sheets are analyzed, and a research report is put together.

Research Instruments and Analysis Techniques

Pre-experiment tests and questionnaires using a single group pretest-posttest design provided the data. Validation sheets, exam questions for rigid body equilibrium and rotational dynamics, and student response questionnaires served as the study's instruments. Media expert and material validation sheets are examples of validation sheets. Both descriptive and inferential analysis was done on the gathered data.

Logical and empirical validity are the types of validity employed in this investigation. Testing for logical validity is done with the assistance of experts. The learning syllabus, learning implementation plan (or lesson plan), observation sheets, and pretest/posttest questions are among the tools that experts have examined.

The tools assessed include questions, reliability, discrimination power, and degree of difficulty in addition to validity tests. One way to assess the reliability was used the Alpha-Cronbach correlation coefficient. a suitable question type if the query is neither overly simple nor very complex. The difficulty index is a numerical value that can be used to determine how simple or tough a question is. The degree to which a question separates students' aptitude levels is gauged by the item discrimination index. The range of the item discrimination index is −1.00 to +1.00. A question's capacity to distinguish between high- and low-ability pupils is indicated by its D value.

To create a picture of the data's status in the form of statistics and visuals, the obtained data is descriptively examined. It is displayed as tables, graphs, and diagrams to make the data easier to read and comprehend. With IBM SPSS's assistance, a paired t-test will be used to examine the pre-test and post-test data to evaluate the hypothesis. One technique for testing hypotheses when data are not freely available is the paired t-test (Nuhanisa et al. 2019). One person (the research object) receiving two distinct treatments is the feature most frequently observed in paired cases. The researcher collects two sets of sample data, one from the first treatment (before learning) and one from the second treatment (after learning), even though the same individual is employed.

Result and Discussion

In this study, 34 10th-grade students participated in the experiment. The instruments used to assess the candidates' knowledge of rotational dynamics and equilibrium of rigid objects consisted of pretest and posttest questions. Since content validity is the validity test employed in this study, a validator is required to determine whether each question that has been compiled matches the created question grid. The validator's checklist sheet is used in this validity test.

Based on Table 1, it was determined that the research instrument, which took the form of a six-question descriptive exam, had been deemed legitimate by both validators. All of the questions can therefore be used to gauge the process skills of vocational high school pupils in terms of their motivation and starting abilities.

Table 1. The results of the content validity test

Validator	Test Items					
	1	2	3	4	5	6
Validator 1	Very Valid	Valid	Very Valid	Very Valid	Valid	Valid
Validator 2	Very Valid	Valid	Very Valid	Very Valid	Valid	Valid

The test instrument needs to be tested even after it has been deemed valid. The purpose of the trial step is to determine whether the developed instrument satisfies a number of requirements, including discriminating power and question complexity.

As stated by Hanifah (2017), the question discrimination index gauges how well a question separates students' ability levels. The discrimination index is favorable if more pupils in the high group than in the low group are able to correctly answer the question. The question has no discriminating power if both students in the high and low groups can accurately answer it. The question has negative discriminating power if more pupils from the low group than the high group can correctly answer it.

The range of values for the question discrimination index is -1.00 to +1.00. A question's capacity to distinguish between high- and low-ability pupils is indicated by its D value. The D value (discrimination: question discrimination) needs to be 0.33 or higher to be considered acceptable. While 0.75 and above must be considered really satisfactory. Table 2 displays the findings of the test item discrimination power calculation.

Table 2. The discrimination power of test items

Number of Tests	Discrimination power	Criteria
1	0.71	Very Good
2	0.32	Good
3	0.72	Very Good
4	0.46	Good
5	0.44	Good
6	0.75	Very Good

We may determine whether the results of the question discrimination power study indicate that every question has good or very good discriminating data by looking at Table 2. for every question to be utilized in the process of gathering data.

When a question is neither too easy nor too complex, it falls into a good category. The difficulty index is a numerical value that represents a question's level of ease or complexity. The difficulty value index (P), which can be categorized using the current categorization, can be used to interpret the difficulty index. Table 3 displays the test of the questions' degree of difficulty. There is just one question in the challenging section. The categories "too easy" and "too difficult" contain no questions. Therefore, you can use any query.

Table 3. The difficulty level of the questions

Number	Difficulty Level	Interpretation
1	0.56	Medium
2	0.49	Medium
3	0.41	Medium
4	0.42	Medium
5	0.37	Medium
6	0.20	Difficult

In order to assess students' comprehension of rigid body equilibrium prior to instruction using the Seesaw application's Video-Based Learning approach, this preliminary data analysis step is performed. Figure 1 displays the results of the pre-test.

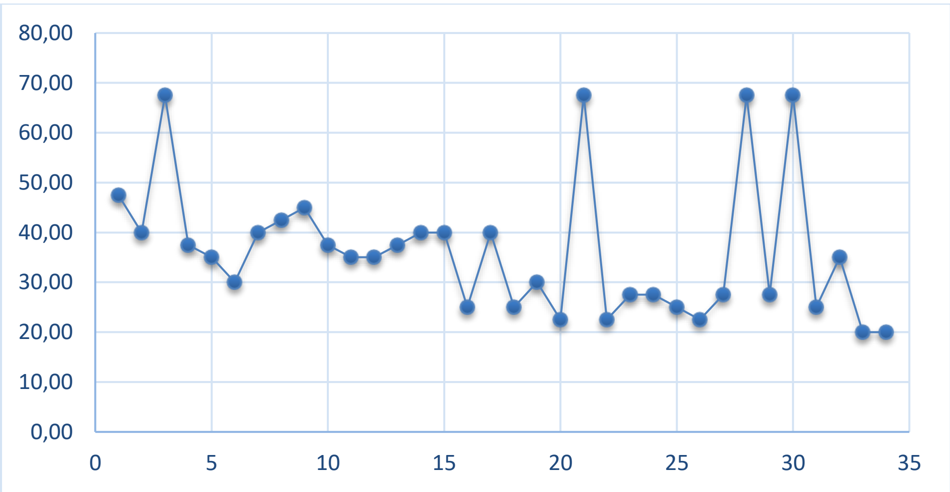

Fig 1: Pre-Test Scores

It is clear from Figure 1 that there is a wide range in the pre-test results of the pupils. This indicates that the initial understanding of the Rotational Dynamics and Equilibrium of Rigid Objects material by the students is lacking. There are four pupils that have a sufficient understanding of the subject. Most students, nevertheless, haven't grasped it.

Figure 2 shows that while the students' post-test scores vary widely, they do so within a narrower range than their pre-test results. This indicates that after acquiring Video-Based Learning through the Seesaw Application, a greater knowledge of the Rotational Dynamics and Equilibrium of Rigid Objects material was attained.

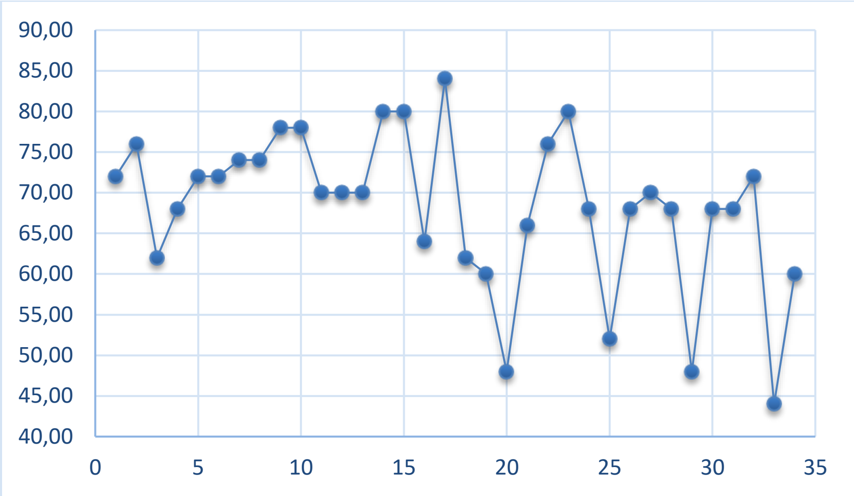

Fig 2: Post-Test Scores

As demonstrated by Figure 3, there are variations in the pre-test and post-test scores' lowest, maximum, and average values. The post-test value is 40, and the minimum pre-test value is 20. The post-test value is 84, and the greatest pre-test value is 67.5. On average, the post-test score is 68.29 while the pre-test score is 36.32. When students have used the Seesaw application for video-based learning, their understanding of the Rotational Dynamics and Equilibrium of Rigid Objects material has improved, as evidenced by the minimum, maximum, and average post-test scores that are higher than the pre-test scores.

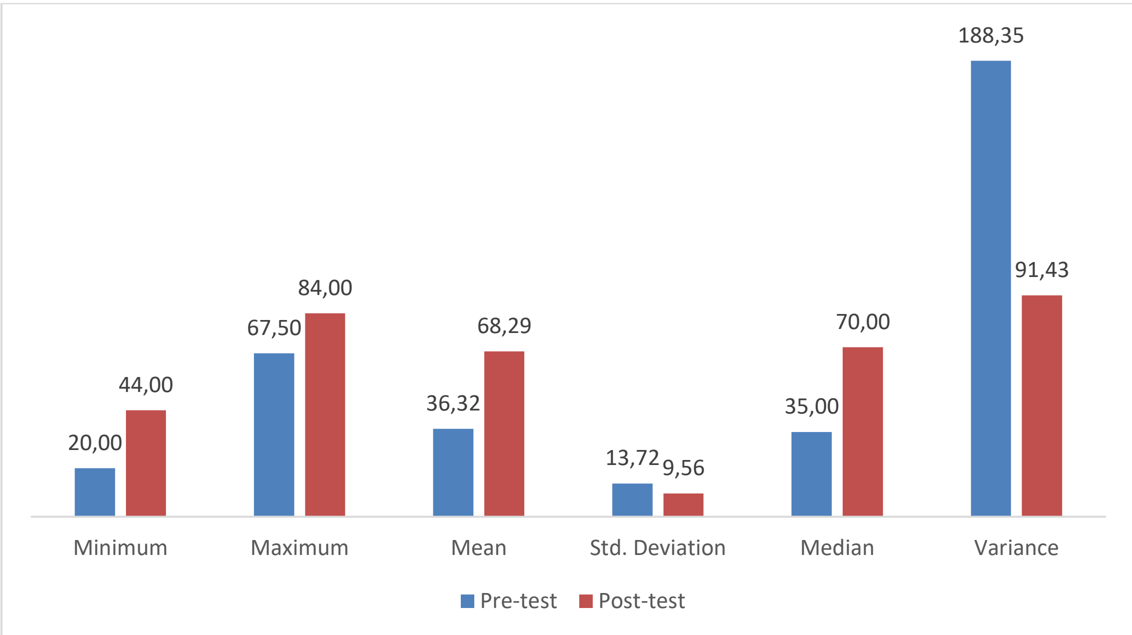

Fig 3: Statistic Descriptive of Pre-test and Post-test

The findings of the descriptive analysis of the pre-test, post-test, and difference between the two scores are displayed in Table 4. By deducting the pre-test score from the post-test score, the difference between the two scores is found. On the lowest value, maximum value, and average value, negative findings were found. The pre-test score is lower than the post-test score, according to these results. These outcomes also line up with Figure 3. This indicates that after completing Physics lessons using video-based learning via the Seesaw app, students' comprehension has increased.

Table 4. Statistic Descriptive of Pre-test and Post-test

Test Type	Statistic Descriptive					
	Min.	Max.	Mean	Std. Deviation	Median	Variance
Pre-test	20.00	67.50	36.32	13.72	35.00	188.35
Post-test	44.00	84.00	68.29	9.56	70.00	91.43
Pre-test - Post-test	-24.00	-16.50	-31.97	4.16	-35.00	96.92

In essence, physics is a science about natural phenomena that is poured into facts, concepts, principles and laws that have been tested for truth and through a series of activities in the scientific method. Physics is also a branch of science that provides quantitative experience about the nature, behavior and mathematical analysis. So physics is developed using mathematical auxiliary sciences, meaning that to understand the natural phenomena found around us, physicists compile mathematical models as their presentation. Mathematical models can help explain abstract concepts. However, students in the learning process need concrete evidence in understanding the abstract concepts. So there needs to be a learning media that can present abstract concepts to be more real so that they are easy for students to understand. it is considered necessary to develop an educational product in the form of video learning media that can be easily accessed anywhere, and allows for two-way communication. So the Video-Based Learning media was developed through the Seesaw application. Sablić et al. (2021) explained the similar finding about the use of Video-Based Learning.

With the help of the learning platform Seesaw, each student can keep a learning notebook in an online classroom. With the release of Seesaw, educators will no longer approach the creation of online authentic assessments in the same way. Teachers can use this application to tell parents about what their pupils are doing in class. Student activities during the learning process can be viewed in a variety of ways, from those that are simple to watch to those that are more complex. Reading, listening, writing, exhibiting, and measuring are among the tasks that can be seen being performed.

Present research evaluates the method in addition to the outcomes. Learner motivation is one of the process evaluations. Making observations as the lesson is being taught and learned is one method of performing process assessment. The first step in performing observations is watching instructional activities utilizing the Seesaw app and the video-based learning approach. At this point, prepared observations are conducted, and the prepared observation and evaluation format is used to conduct an assessment of the action's outcomes.

It is evident from Table 5 above that each meeting has witnessed an increase in the outcomes of the student learning activities. The average student involvement in meeting 1 of cycle I was 2.19. It then rose to 2.33 at meeting two. Then it changed to 2.50 at meeting 3. Up until the conclusion of the lesson at each meeting, preparation tasks for this teaching and learning activity include setting up the necessary media and stationery. Instruction begins with material delivery and ends with student quizzes. Pupils are asked to organize into groups. Following the quiz, students in each group have a discussion with their classmates about the content that was just covered thet shown on table 5.

Table 5. Result of Observation

Aspects Observed	**Average Score Meeting No.**			**Mean**	**Percentage**
	1	**2**	**3**		
Observation, Classification, Interpretation	2.33	2.44	2.80	2.51	63%
Prediction, Asking questions, Hypothesis	2.20	2.28	2.40	2.25	56%
Planning experiments, Using tools/ materials	2.20	2.33	2.33	2.27	57%
Applying concepts, Communicating	2.20	2.28	2.50	2.31	58%
Mean	2.19	2.33	2.50	2.34	58%
Percentage	55%	58%	62%	58 %	58%

Among the observed elements, the one with the lowest score is applying concepts, communicating, and planning experiments, as well as making predictions, posing questions, and utilizing equipment and materials. This demonstrates how students still frequently struggle with developing hypotheses, carrying out experiments, and applying concepts during the first meeting.

Students nevertheless frequently struggled with developing hypotheses and applying concepts in the observed aspects, which were the meeting of the two aspects with the lowest scores. Students once more encountered difficulties carrying out experiments at the third meeting. Analyzing the average score reveals that the tasks requiring students to make predictions, pose questions, or develop hypotheses proved to be the most challenging for them throughout the procedure.

It is clear from the previous description that each meeting results in an improvement in the motivation and preliminary comprehension of the students. The rising observation scores at every meeting demonstrate this. These findings demonstrate how utilizing the Seesaw app's video-based

Email : joves@mpv.uad.ac.id
Website : http://journal2.uad.ac.id/index.php/joves

learning for Physics instruction can boost students' interest and comprehension at the outset.

Statistical testing is required to verify whether the hypothesis is true. The paired t-test is the statistical analysis that is employed. The purpose of this study is to determine whether there are any differences between the pre- and post-test scores. Table 6 displays the findings of the paired t-test analysis.

Table 6 indicates that 0.000 is the significant value based on the data. The alpha value is greater than this value. Consequently, it can be said that Ha is accepted while Ho is rejected. This indicates that the pre- and post-test findings differ from one another. The difference in average scores can be used to determine if student understanding has increased. It is evident that there is a -31.97059 difference in the mean score between the pre- and post-tests. The average pre-test score is less than the average post-test score, as indicated by this negative number. Thus, it can be said that students' comprehension of rigid body equilibrium and rotational dynamics has increased. Following their completion of the Seesaw application's video-based learning process for Physics, pupils' comprehension increased.

Table 6. Result of Paired t-test

Mean Difference	t-statistics	Degree of Freedom	Sig. (2-tailed)
-31.97059	-12.912	33	0.000

The study highlights the role of video-based learning through Seesaw in enhancing student motivation and understanding. Research suggests that interactive video-based learning enhances student engagement and comprehension compared to passive viewing (Guo, Kim, & Rubin, 2014; Fiorella & Mayer, 2018). To address this, the implementation of interactive features in Seesaw, such as embedded quizzes, discussion prompts, and reflective assignments, played a crucial role in reinforcing learning. Mayer’s (2021) cognitive theory of multimedia learning emphasizes that active engagement with instructional videos, such as answering questions and summarizing content, leads to better retention and understanding. Students were encouraged to engage with the video content by responding to embedded prompts and participating in discussions within the Seesaw platform, aligning with findings that active learning strategies significantly improve learning outcomes (Chi & Wylie, 2014; Hattie & Donoghue, 2016).

Additionally, teachers facilitated engagement by providing feedback and guiding students through follow-up activities that required them to apply concepts from the videos. Research shows that feedback plays a critical role in reinforcing learning and preventing students from becoming passive consumers of content (Hattie & Timperley, 2007; Wiliam, 2011). These strategies ensured that students actively processed and internalized the material rather than merely watching passively.

Further analysis could explore the extent to which these interactive components influenced learning outcomes. Future research could also examine students' engagement patterns, such as how often they revisited videos, paused for reflection, or interacted with embedded tasks. Prior studies indicate that video engagement analytics can provide insights into learning behaviors and optimize instructional design for digital learning (Schwan & Riempp, 2004; Zhang, Zhou, Briggs, & Nunamaker, 2006). Understanding these patterns would offer a more comprehensive perspective on how video-based learning supports deeper learning and retention.

The study's findings support those of Samad et al. (2023), who reported an increase in computer system activity and learning outcomes thanks to video media. This is demonstrated by the rising average student learning results and the increase in student participation toward the inquiry indication. According to the research findings, students' process abilities increased when they learned physics through the Seesaw program, which used video-based learning. The rise in observation scores in the following areas indicates a growth in process skills: observation, classification, interpretation; prediction, questioning, and hypothesis; planning experiments, utilizing materials and instruments; applying concepts, and communicating. The findings of this observation indicate that each meeting has seen a rise in the kids' motivation to learn.

The study’s findings indicate a positive impact of Seesaw-based learning; however, it is important to acknowledge external factors such as internet access and device availability, which could influence the effectiveness of online learning. These factors are particularly relevant in vocational education, where students may have varying levels of access to technology and stable internet connections (Selwyn, 2020).

Limited internet access can affect students’ ability to stream instructional videos, participate in discussions, and submit assignments on time. Digital divide issues have been widely documented, with students from lower-income backgrounds often facing challenges in accessing reliable internet and digital devices for learning (Van Dijk, 2020). Similarly, differences in device availability—whether students use smartphones, tablets, or computers—may impact their learning experience. Research suggests that students using larger screens and high-performance devices often have better engagement and comprehension in digital learning environments compared to those relying on small-screen smartphones (Kay et al., 2019; Sung, Chang, & Liu, 2016).

Additionally, device compatibility with educational platforms plays a significant role in user experience. Seesaw’s mobile-friendly design offers flexibility, but some interactive features may be more accessible on larger screens or require more advanced hardware (Henderson, Selwyn, & Aston, 2017). The role of digital literacy also cannot be ignored, as students with higher familiarity in navigating online learning tools tend to have better academic performance (Castañeda, Esteve-Mon, & Adell, 2018).

While this study primarily focused on instructional effectiveness within the Seesaw platform, future research should examine how these external factors influence learning outcomes. Surveys or interviews with students could provide insights into their technological access and potential barriers to engagement. Addressing these factors would help ensure that digital learning tools like Seesaw are implemented more equitably across different student populations (Warschauer & Matuchniak, 2010).

A broader discussion on how Seesaw differs from other online learning platforms in terms of usability, instructional features, student engagement, and learning outcomes would enhance the study's depth. Research suggests that digital learning tools vary significantly in their effectiveness depending on how they structure content delivery and interaction (Henderson, Selwyn, & Aston, 2017; Sung, Chang, & Liu, 2016). Additionally, an exploration of the strengths and limitations of Seesaw relative to other platforms could provide a more balanced perspective on its effectiveness (Castañeda, Esteve-Mon, & Adell, 2018; Warschauer & Matuchniak, 2010).

For instance, while Seesaw offers intuitive multimedia integration and interactive tools that encourage student creativity and engagement, platforms like Google Classroom provide a more structured approach to assignment management and collaboration, which may be more suitable for certain educational settings (Van Dijk, 2020; Wiliam, 2011). Research indicates that platform-specific features, such as interactive video tools, peer collaboration spaces, and real-time teacher feedback, play a crucial role in shaping student learning experiences (Kay, LeSage, & Knaack, 2019; Zhang, Zhou, Briggs, & Nunamaker, 2006).

The study's results indicate an increase in students' motivation and understanding after using Seesaw for video-based learning. A follow-up assessment conducted weeks or months after the initial intervention could provide valuable insights into the long-term impact of the learning method. Future research could incorporate a delayed post-test or longitudinal study design to determine whether the observed gains in motivation and understanding persist beyond the immediate learning period.

Conclusion

There is an increase in process skills reviewed from the motivation and prior knowledge of vocational high school students after using Physics learning media based on Video-Based Learning through the Seesaw application compared to manual learning. Teachers need to focus more on developing students' process skills, especially in the context of motivation and prior knowledge. Teachers can use the Video-Based Learning approach in teaching, especially for complex subjects or topics, so that it can help improve students' understanding, especially for vocational high school students with prior knowledge that may be limited. Teachers can use the Seesaw application as a platform to send materials, assignments, and learning videos to students. With more dynamic and easily accessible interactions, students will be more motivated and involved in online learning.

Since vocational education emphasizes skill-based learning, Seesaw can be enhanced by incorporating video demonstrations, step-by-step tutorials, and interactive assignments that require students to apply practical skills. Teachers can design tasks where students upload videos showcasing their work, allowing for direct feedback and assessment. Seesaw's collaborative features should be maximized by encouraging peer feedback, discussions, and group projects. Research suggests that social interaction and collaborative learning enhance vocational students' engagement and knowledge retention. Features like shared journals, group workspaces, and live discussions could be further utilized to foster peer-to-peer learning. Vocational education covers diverse disciplines, from engineering to healthcare. Future implementations of Seesaw should consider customizing learning materials to align with specific vocational competencies. Teachers should be trained to create content that integrates industry-relevant skills, ensuring the platform meets the unique needs of vocational training.

Acknowledgments

This study was supported by Hibah Penelitian Tesis Mahasiswa (Thesis Writing Grants) from the Directorate of Research, technology, and Community Services, the Ministry of Education and Culture of the Indonesian Republic under contract number 0459/E5/PG.02.00/02024, 107/E5/PG.02.00.PL/2024, 0609.12/LL5-INT/AL.04/2024, and 038/PTM/LPPM-UAD/VI/2024.

References

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., Tiu, C. J. S., Clarion, C. A., & Reyes, J. C. B. (2021). Barriers to online learning in the time of COVID-19: A national survey of medical students in the Philippines. Medical Science Educator, 31, 615–626.

Binti Abd Aziz, N. A., Bin Musa, M. H., & Binti Abd Aziz, N. N. (2020). A study on barriers contributing to an efective online learning among undergraduates students. Open Journal of Science and Technology, 3(1), 17–23.

Bringula, R. P., Batalla, M. Y. C., & Borebor, M. T. F. (2021). Modeling computing students' perceived academic performance in an online learning environment [Paper presentation]. ACM-SIGITE'21, SnowBird, UT, USA. https://doi.org/10.1145/34503 29.3476856.

Cao, G. (2022). Towards the favorable consequences of academic motivation and L2 enjoyment for students' willingness to communicate in the second language (L2WTC). Frontiers in Psychology. https://doi.org/10.3389/fpsyg.2022.997566.

Castañeda, L., Esteve-Mon, F. M., & Adell, J. (2018). Teaching and learning in the digital age: The role of digital competence. Journal of New Approaches in Educational Research, 7(2), 79-87.

Chaubey, A. (2015). Learning Management System in Higher Education. Good Teaching Attributes in Engineering Education, V(3), 150-158.

Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. Educational Psychologist, 49(4), 219-243.

Coleman, J.M., etc. (2020). Elementary Teachers' of Graphical Representation in Science Teaching. Journal Science Teacher Education, 4(2), 1-31.

Datu, J. A. D., & Yang, W. (2021). Academic buoyancy, academic motivation, and academic achievement among Filipino high school students. Current Psychology, 40(8), 3958–3965. https://doi.org/10.1007/s12144-019-00358-y.

Deci, E. L., & Ryan, R. M. (2016). Optimizing students' motivation in the era of testing and pressure: A self-determination theory perspective. In W. Liu, J. Wang, & R. Ryan (Eds.), Building autonomous learners: Perspectives from research and practice using self-determination theory (pp. 9–29). Berlin: Springer. https://doi.org/10.1007/978-981-287-630-0_2.

Duryat, M. (2020). Opportunity Pendidikan: Transformasi Di Era Disrupsi dan Revolusi Industri 4.0. Jurnal Wahana Karya Ilmiah_Pascasarjana (S2) PAI Unsika, 4(2), 93-104.

Fabito, B. S., Trillanes, A. O., & Sarmiento, J. R. (2021). Barriers and challenges of computing students in an online learning environment: Insights from one private university in the Philippines. International Journal of Computing Sciences Research, 5(1), 441–458. https://doi.org/10.25147/ijcsr.2017.001.1.51.

Fiorella, L., & Mayer, R. E. (2018). What works and what doesn't work with instructional video. Computers in Human Behavior, 89, 465-470.

Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. Proceedings of the First ACM Conference on Learning@ Scale Conference, 41-50.

Hanifah, N. (2017). Perbandingan Tingkat Kesukaran, Daya Pembeda Butir Soal Dan Reliabilitas Tes Bentuk Pilihan Ganda Biasa dan Pilihan Ganda Asosiasi Mata Pelajaran Ekonomi. Sosio e-KONS, 6(1), 41-55.

Hattie, J., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. Review of Educational Research, 86(1), 47-87.

Hattie, J., & Timperley, H. (2007). The power of feedback. Review of Educational Research, 77(1), 81-112.

He, W., Xu, G., & Kruck, S. (2014). Online IS Education for the 21st Century. Journal of Information Systems Education, 25(2), 101-105.

Henderson, M., Selwyn, N., & Aston, R. (2017). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. Studies in Higher Education, 42(8), 1567-1579.

Hindasah. I, Maskur, M., Risnandah, Y., Halimah, E. T.(2020). Efektivitas Pemanfaatan Seesaw Untuk Meningkatkan Keaktifan Belajar. Edutech, 19(3), 263-278.

Indonesian Government (1990). Peraturan Pemerintah Nomor 29 Tahun. 1990. Jakarta: BPK RI.

Jiao, S., Jin, H., You, Z., & Wang, J. (2022). Motivation and its efect on language achievement: Sustainable development of Chinese middle school students' second language learning. Sustainability, 14(16), 9918. https://doi.org/10.3390/su14169918.

Joe, H. K., Hiver, P., & Al-Hoorie, A. H. (2017). Classroom social climate, self-determined motivation, willingness to communicate, and achievement: A study of structural relationships in instructed second language settings. Learning and Individual Diferences, 53, 133–144. https://doi.org/10.1016/j.lindif.2016.11.005.

Kay, R. H., LeSage, A., & Knaack, L. (2019). Exploring student perceptions of video-based learning: Implications for instructional design. The Internet and Higher Education, 42, 13-21.

Kaya, S., Eryilmaz, N., & Yuksel, D. (2022). The efects of motivational and metacognitive variables on immigrant and nonimmigrant students' reading achievement. International Journal of Educational Research, 112, 101944. https://doi.org/10.1016/j.ijer.2022.101944.

Madsen, A., McKagan, S. B., & Sayre, E. C. (2015). How physics instruction impacts students' beliefs about learning physics: A meta-analysis of 24 studies. Physical Review Special Topics - Physics Education Research, 11, 010115.

Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.

Moorhouse, B. L. (2019). Seesaw: https://web. seesaw. me. RELC Journal, 50(3), 493-496.

Mulyadi, D.E. (2020). Pembelajaran Daring Fisika Melalui Whatsapp, Google Form, dan Email dalam Capaian Presensi Aktif dan Hasil Belajar Peserta Didik. Ideguru: Jurnal Karya Ilmiah Guru, 5(1), 34-41.

Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. MERLOT Journal of online learning and teaching, 11(2), 309-319.

Nuhanisa, H., Pangesti, R. & Fajri, A. (2019). Metode Uji Independent T-Test, Dependent T-Test, dan Wilcoxon Signed T-Test. Universitas Gadjah Mada.

Peng, C. (2021). The academic motivation and engagement of students in English as a foreign language classes: Does teacher praise matter? Frontiers in Psychology, 12, 778174. https://doi.org/10.3389/fpsyg.2021.778174.

Ramanta, D., & Widayanti, F. D. (2020). Pembelajaran Daring di Sekolah Menengah Kejuruan Putra Indonesia Malang pada Masa Pandemi COVID-19. Prosiding Seminar Bimbingan dan Konseling, 9(4), 61-68.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Defnitions, theory, practices, and future directions. Contemporary Educational Psychology, 61, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860.

Sablić, M., Mirosavljević, A., & Škugor, A. (2021). Video-based learning (VBL)—past, present and future: An overview of the research published from 2008 to 2019. Technology, Knowledge and Learning, 26(4), 1061-1077.

Samad, S., & Setyabudhi, A. L. (2023). Application of Video-Based Learning Media with Applications to Improve Learning Activities of Vocational High School Students. Technical and Vocational Education International Journal (TAVEIJ), 3(1), 22-27.

Schwan, S., & Riempp, R. (2004). The cognitive benefits of interactive videos: Learning to tie nautical knots. Learning and Instruction, 14(3), 293-305.

Selwyn, N. (2020). Should robots replace teachers? AI and the future of education. Polity Press.

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. Computers & Education, 94, 252-275.

Van Dijk, J. (2020). The digital divide and digital skills: A review. Telematics and Informatics, 53, 101-109.

Van Riesen, S., Gijlers, H., Anjewierden, A., & de Jong, T. (2018). The influence of prior knowledge on experiment design guidance in a science inquiry context. International Journal of Science Education, 40, 1327 –1344. https://doi.org/10.1080/09500693.2018.1477263.

Wang, X. (2022). Enhancing Chinese EFL students' academic engagement: The impact of L2 enjoyment and academic motivation. Frontiers in Psychology, 13, 914682. https://doi.org/10.3389/fpsyg.2022.914682.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. Review of Research in Education, 34(1), 179-225.

Wiliam, D. (2011). Embedded formative assessment. Solution Tree Press.

Wu, Z. (2019). Academic motivation, engagement, and achievement among college students. College Student Journal, 53(1), 99–112.

Yin, H., & Wang, W. (2016). Undergraduate students' motivation and engagement in China: An exploratory study. Assessment & Evaluation in Higher Education, 41(4), 601–621. https://doi.org/10.1080/02602938.2015.1037240.

Zhang, D., Zhou, L., Briggs, R. O., & Nunamaker, J. F. (2006). Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness. Information & Management, 43(1), 15-27.