ORBITA: Jurnal Pendidikan dan Ilmu Fisika
ISSN : 2460-9587 (print) | ISSN : 2614-7017 (elektronik)
Volume 10, No. 1, May 2024, pp. 52-61

The effect of using contextual-based motion dynamics learning videos on Higher Order Thinking Skills (HOTS)

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Received: 06 February 2024 | Accepted: 25 April 2024 | Published Online: 04 May 2024

Abstract

21st century education requires students to master Higher Order Thinking Skills (HOTS). Based on a survey at SMAN 13 Padang, it is known that students' HOTS is still relatively low. One of the reasons is that the use of learning media has not facilitated students' HOTS. HOTS can be improved by using contextual-based learning videos and reinforced with problem-based learning models. This study aims to see the effect of using contextual-based motion dynamics learning videos on students' HOTS. This research is a pseudo-experimental research, posttest-only control design. The population of this research is the entire class XI Phase F SMAN 13 Padang in the 2023/2024 academic year studying physics. The sampling was done using purposive sampling technique. This study used class XI F3 as the experimental class and class XI F7 as the control class. The data in this study is HOTS data. The research instrument is a written test in the form of an essay totaling 6 questions. The results showed that the average HOTS in the experimental class was higher than the control class. The results of the hypothesis test in the form of a t test with a 5% level obtained t_count = 4,72 and dan t_table=1,997,, meaning that the price of t_count is in the H_o rejection area so that H_I is accepted at a real level of 0.05. Thus, it shows that there is an effect of using contextual-based motion dynamics learning videos on HOTS of SMA Negeri 13 Padang students.

Keywords: Higher Order Thinking Skills (HOTS); contextual based learning videos; problem based learning model

How to Cite: Utami, N. R., Desnita, Akmam, & Emiliannur. (20242). The effect of using contextual-based motion dynamics learning videos on Higher Order Thinking Skills (HOTS). *ORBITA: Jurnal Pendidikan dan Ilmu Fisika, 10*(1), 52-61. https://doi.org/10.31764/orbita.v10i1.21953

INTRODUCTION

The 21st century is named as the era of the industrial revolution 4.0 which is characterized by the rapid development of science and technology. Technological advances are expected to strengthen human labor, so that a limited number of workers can complete more work. The consequence of technological advances is the demand for adjustments to the competence of Human Resources (HR). Policy change is one way to adjust HR competencies with technological advances. P21 (Patnership for 21st Century Learning) determines the skills needed in the 21st century, namely creativity, critical thinking, communication and collaboration (4C). 4C skills are needed to deal with problems that arise so that a harmonious order is formed in society (Soulé and Warrick 2015). Critical thinking and creative

thinking skills can be classified as Higher Order Thinking Skills (HOTS) (Conklin 2011). HOTS includes critical, reflective logical, metacognitive and creative thinking skills (Sani 2019). So students who have the ability to think critically and think creatively, then the students have reached HOTS.

Based on the HOTS test results of students in class XI Phase F semester 1 at SMAN 13 Padang in the 2023/2024 school year obtained from students' answers to questions on fluid material totaling 5 questions. The percentage of students' HOTS indicators obtained is in the analyzing indicator (C4) of 32% in the low category, 14% in the very low category, the evaluating indicator (C5) of 24% in the low category, 47% in the very low category, the creating indicator (C6) of 37% in the low category, 36% in the very low category.

The low HOTS of students can be due to the fact that students are not familiar with HOTS questions and the media and teaching materials used by teachers have not been able to trigger students to think at a higher level (Mayasari, Wandika, and Fitri 2023). Based on interviews conducted at SMAN 13 Padang with physics teachers, it was found that physics teachers have utilized learning media in the form of Power Point and Youtube videos. Video media is used when illustrating the application of physics concepts in everyday life, which comes from the Youtube application. The most commonly used media is Power Point media which contains points/summaries of subject matter. However, these media have not been able to train HOTS because they are not designed to be interactive and are one-way. Power point media cannot fulfill the learning needs of students because learning is one-way so that students cannot learn independently (Afifah, Murniati, and Susilawati 2013). One-way learning is a transfer of knowledge that focuses on mastering the material and has not led to life skills oriented, this is evident from the ability of students who only remember facts in a short time interval (Fatonah, Ashadi, and Haryono 2016).

Indonesia's education system is currently directing students to increase HOTS through curriculum changes. The change in question is the change from the 2013 curriculum to the independent curriculum that has been implemented in 2022. According to the National Education Standards Agency (BSNP), the independent learning curriculum is a curriculum that refers to the talent and interest approach of students. The independent curriculum is designed to be more flexible and flexible, focusing on essential material and improving the character and skills of students (Rahayu et al. 2022). In the independent curriculum, learning activities are carried out based on the student centered method, this method is learning centered on developing and strengthening students in improving their critical thinking skills (Heriyati 2022). Learning is carried out by providing opportunities to apply material to real problems or contexts, encouraging interaction and active participation of students, optimizing the use of resources available in the Education Unit environment and / or in the community, using information and communication technology devices (Kemendikbud 2022).

In order for learning to be carried out effectively and efficiently, teachers need to pay attention to supporting factors including learning media. Learning media is a tool that supports the learning process, so that the meaning of the message is conveyed more clearly and learning is carried out effectively and efficiently (Nurrita 2018). The accuracy and variety of media can activate students, so that it has an impact on learning outcomes (Istiqomah, Werdhiana, and Wahyono 2017). Learning media can develop critical thinking, skills and attitudes of students, resulting in creativity and innovative work (Hasan et al. 2021).

To find out the results of the learning process, the teacher as a facilitator certainly needs an assessment system. Assessment is the process of collecting and processing information to determine the learning needs and developmental achievements or learning outcomes of students (kemendikbud 2022). Assessment of learning outcomes is more focused on HOTS (Kemendikbud 2017). HOTS

assessment focuses on developing students' skills in critical thinking, creative thinking, and innovation and being able to solve more complex problems (Ahmad 2019). HOTS assessment has characteristics including measuring HOTS, based on contextual problems, not routine, and using various forms of questions (Fanani 2018). HOTS questions measure the cognitive domains of analyzing (C4), evaluating (C5), and creating (C6) (Widana 2017).

Physics studies all inanimate and living objects related to nature (Astuti 2016). Physics has an abstract nature, making it difficult for students to understand physics concepts (Musliman and Kasman 2022). Physics learning does not escape from understanding concepts, applying them in solving physics problems, and scientific activities (Hudha, Aji, and Rismawati 2017). In physics learning, students are trained to conduct simple research on natural phenomena, so that students can have scientific reasoning, critical thinking skills and problem solving skills (Badan Standar, Kurikulum 2022). Most of the characters of physics material are abstract concepts or cannot be seen directly by the eye (Musliman and Kasman 2022).

In physics learning it is difficult to be able to present or display physics phenomena directly, because it is constrained by several circumstances including: objects / phenomena are too small, such as coulomb law and magnetic fields. Human ability now cannot present directly charge or electric field in the classroom in an isolated state (Priyono, Hardyanto, and Akhlis 2018). Physics objects are too large, for example, such as the solar system which is difficult to present directly in the classroom (Handhita et al. 2016). Physics phenomena require long observation, such as the collision of two galaxies or short-lived phenomena, for example the nature of wave-particle dualism in electrons (Sinaga 2011). Some physics concepts are dangerous when experimented directly, for example radioactivity which has a very high level of danger if students are too close to radioactive elements (Rachma et al. 2019).

The physics research team of FMIPA UNP chaired by Prof. Dr. Desnita, M.Si in 2019 has developed a contextual-based motion dynamics learning video. The contextual-based motion dynamics learning video that will be used has been tested for validity, practicality and effectiveness. So that the contextual-based motion dynamics learning video is suitable for use in physics learning. In contextual-based learning videos, students are presented with video events related to motion dynamics material, accompanied by an explanation of basic competencies, learning indicators, learning objectives, and learning instructions. Learning activities are carried out by centering on students (student centered) which begins with opening insights with video shows, continued with discussions in groups, at this stage students will be directed to analyze and find problems in video shows, which will stimulate students to ask questions related to information that is not understood. So as to find a solution, students will reason about the relationship between previously acquired knowledge and existing problems.

CTL videos are able to display complex physics phenomena, hone students' HOTS in solving problems, and analyze physics phenomena in everyday life with the material studied so that meaningful learning is carried out (Novisya* and Desnita 2020). According to Sudirman, N. (1992) contextual-based video media causes the implementation of activities to respond to the teacher's questions about the phenomena shown, ask questions and conclude the material (Istiqomah, Werdhiana, and Wahyono 2017). Contextual-based learning videos can make it easier for students to remember, stimulate thinking to understand problems, and increase learning activities (Suantiani and Wiarta 2022). To strengthen the role of media in improving and training students' HOTS, this contextual-based learning video needs to be strengthened with the Problem Based Learning (PBL) learning model.

The use of contextual-based learning videos and PBL models can significantly improve students' critical thinking (Sari 2022; Yulaisa 2022). Context-based learning videos reinforced with PBL models can

improve students' creative thinking skills (Jaully 2022). Learning using contextual-based learning videos with PBL models can significantly improve cognitive abilities than conventional learning (Andriani, Subiki, and Supriadi 2021). The application of the PBL model assisted by contextual videos can stimulate students' curiosity about physics concepts which results in students participating more actively in discussions so as to improve students' cognitive (Perwithasari, Sutrio, and Harjono 2023).

Based on the background that has been stated above, this research was conducted to find out whether there is an effect of using contextual-based learning videos on students' Higher Order Thinking Skills (HOTS).

METHODS

This research is a type of quasi-experimental research (pseudo research). This study used the Posttest-Only Control Design. This study has two sample classes, namely experimental and control classes. In the experimental class, learning activities were carried out using contextual-based learning video media while the control group of learning activities used Power Point media. In both sample classes both used a problem-based learning model. This research design can be seen in Table 1.

Table 1. Posttest-Only Control Design

Group	Treatment	Posttest
Experiment	X_1	O
Control	X_2	O

Where X_1 = The use of contextual-based learning videos, X_2 = Use of Power Point media, and O = Final test (Posttest) of experimental group and control group

Sampling this study using purposive sample technique. purposive sample is sampling with certain considerations. This research sampling is based on a normally distributed population class that also has a homogeneous variance, and has almost the same initial ability. In general, the research procedure is divided into 3 stages, namely the preparation, implementation, and completion stages.

RESULTS AND DISCUSSION

Results

From the research that has been carried out, the Higher Order Thinking Skills (HOTS) value of students is obtained. The experimental class was given treatment, namely the use of media in the form of contextual-based learning videos and the control class was not given treatment, but used media in the form of presentation media, namely Power Point. After measuring HOTS in both sample groups, the results were obtained as illustrated in Figure 1.

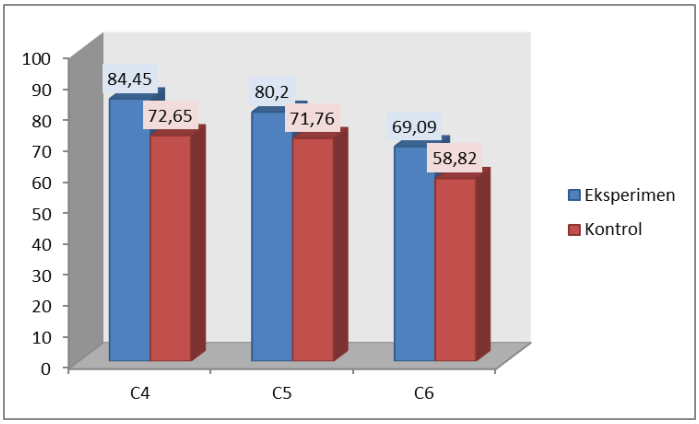

Figure 1. Higher Order Thingking Skills (HOTS) score of students

Based on the data in Figure 1, it can be seen that the experimental class in each HOTS indicator has a higher average value when compared to the value in the control class. In the experimental class, the indicators of analyzing (C4) and evaluating (C5) were at a high level. Meanwhile, the indicator of creating (C6) was at a medium level. Meanwhile, in the control class, the indicators of analyzing (C4), evaluating (C5), and creating (C6) were at a moderate level.

1. Normality Test

The results of the normality test for the two groups of data from the research sample are presented in Table 2.

Table 2. Normality test

Class	N	α	L_t	L_h	keterangan
Experiment	33	0,05	0,154233	0,093592	Normal
Control	34		0,1519	0,10553294	Normal

Based on Table 2, it can be seen that $L_t > L_c$ at the real level of 0.05 for both sample classes. This indicates that the data in each sample class is normally distributed.

2. Homogeneity test

The results of the homogeneity test on the two sample group data can be seen in Table 3.

Table 3. Homogeneity test

Class	N	$\bar{X}$	S	S^2	F_h	F_t	dk	Ket
Experiment	33	80,10	7,84	61,45	1,506	1,793	32	homogeneous
Control	34	69,90	9,62	92,58			33	

Based on Table 3, it can be seen that $F_c < F_t$ for both sample classes. This indicates that the sample classes have homogeneous variances.

3. Hypothesis testing

The results of the two means equality test on the two groups of data from the sample can be seen in Table 4.

Table 4. Hypothesis test

Kelas	N	$\bar{X}$	S	S^2	t_h	t_t
Eksperimen	33	80,10	7,83	61,45	4,72	1,997
Control	34	69,90	9,62	92,58		

Based on the results of hypothesis testing in Table 4, it can be seen that the $t_c > t_t$ value, so the research hypothesis is accepted at the real level of 0.05. So it is concluded that there is a significant effect on the use of contextual-based motion dynamics learning videos on Higher Order Thinking Skills (HOTS) of class XI students of SMA Negeri 13 Padang.

Discussion

This study has two sample classes, namely the experimental class and the control class. In both classes, the learning process uses the problem-based learning (PBL) model. What distinguishes the learning process of the two sample classes is the use of learning media. The experimental class used contextual-based physics learning video media, while the control class used power point media. Based on the results of the research data analysis, it was found that the HOTS of students as a whole and each indicator in the experimental class was better than the control class. So it is concluded that there is a significant effect of using contextual-based videos on Higher Order Thinking Skills (HOTS).

The increase in students' HOTS is influenced by the use of contextual-based learning videos that are able to stimulate students' critical thinking skills and increase curiosity which directs students to formulate problems, ask questions, conduct investigations so that they can determine solutions that are in accordance with the problem. Contextual-based learning video media can create a more lively learning atmosphere with positive interactions between students, namely by discussing groups and also a pleasant classroom atmosphere (Afifah, Murniati, and Susilawati 2013). Contextual-based learning video is one of the media that can increase students' curiosity, minimize boredom, and train critical thinking skills so that they can solve problems (Perwithasari, Sutrio, and Harjono 2023). Contextual videos can increase students' interest and understanding (Rofiah and Mundilarto 2021).

The characteristics of video as learning media Kristanto (2016) are first, video is able to accurately visualize processes that can be repeated. Video is able to visualize the components of a process and procedure in detail, so that students can easily observe the steps of a procedure/process (Utami and Julianto 2013). Secondly, videos are able to show phenomena that are dangerous if observed directly. Showing objects that match the original is able to provide a real experience to learners because it can bring events that cannot be observed directly into the classroom (Indarwati, Musyadad, and Utami 2021). Real new experiences are felt to be able to increase students' interest in learning (Neni Isnaeni and Dewi Hildayah 2020). Third, it overcomes distance and time limitations. Video media is able to present material well, and is able to overcome the limitations of space and time so that learning can take place anytime and anywhere (Maslikhah, Janah, and ... 2021).

Fourth, videos can be played repeatedly if necessary to increase clarity. Video shows that can be watched repeatedly can make it easier for students to understand the material well (Fedistia and Musdi 2020; Hamid and Effendi 2019). According to Cheppy Riyana (2007) video media makes it easier for students to understand learning information more meaningfully and information can be received completely so that it can be stored in long-term memory and is retention (Oktaviani 2019). Fifth, the information delivered is fast and easy to remember. Sixth, develop learners' thoughts and opinions.

Eighth, develop learners' imagination. Learners with high imagination are able to develop their thinking and reasoning power without being held back by everyday reality (Syahidah 2015). Ninth, clarify abstract things and provide more real visuals. Video can turn abstract concepts into concrete because videos are able to show motion that is accelerated or slowed down, showing something in detail making it easier for students to observe (Hafizah 2020).

According to Suprihatiningrum, the PBL model is a learning model at the beginning of learning students are faced with a problem, then directed to gather information that is student centered (Prihatin 2019). The PBL learning model is able to hone and develop problem-solving skills that focus on authentic problems in the real world, thus stimulating students to think at a high level (Amaliyah, Fatimah, and Abustang 2019). Problem-based learning is able to improve lifelong learning skills in an open, reflective, critical mindset and active learning (Rusman 2012).

The results of data analysis showed that the experimental and control classes experienced a significant increase. This increase is assumed due to the use of the PBL model in both sample classes. However, there is a significant difference, this is due to the character of the video media and PBL model in the experimental class. In the experimental class, the indicators of analyzing (C4) and evaluating (C5) were at a high level, while the indicator of creating (C6) was at a medium level. The two HOTS indicators in the experimental class were in the high category, but the indicator of creating (C6) was in the medium category. The indicator of creating (C6) is the highest level at the cognitive level of Bloom's revised taxonomy, it is not easy to achieve because the research only took place with 6 meetings on one material topic. So that to get better results requires longer time, better learning strategies, and more careful planning. The success of learning outcomes is determined by the learning strategies used and careful planning (Sutardi 2016).

CONCLUSION

Based on the research results that have been obtained, it can be concluded that there is an effect of using contextual-based motion dynamics learning videos on Higher Order Thinking Skills (HOTS) of class XI students of SMA Negeri 13 Padang.

REFERENCES

Afifah, N., N. Murniati, and Susilawati. 2013. “Penerapan Pendekatan Kontekstual Menggunakan Media Video Untuk Meningkatkan Hasil Belajar Fisika Pada Kelas XI RPL 1 SMK N 8 Semarang.” In *Seminar Nasional 2nd Lonttar Physics Forum*, 1–7.

Ahmad, Iqbal Faza. 2019. “Analisis Higher Order Thinking Skills (HOTS) Pada Soal Ujian Akhir Siwa Kelas 6 KMI Dalam Kelompok Mata Pelajaran Dirasah Islamiyah Di Pondok Modern Tazakka Batang.” *Jurnal Pendidikan Agama Islam* XVI(2).

Amaliyah, Nurhadifah, Waddi Fatimah, and Perawati Bte Abustang. 2019. *Model Pembelajaran Inovatif Abad 21*. DI Yogyakarta: Samudra Biru.

Andriani, Khantika, Subiki Subiki, and Bambang Supriadi. 2021. “Pengaruh Model Problem Based Learning (Pbl) Disertai Video Berbasis Kontekstual Terhadap Hasil Belajar Dan Keterampilan Proses Sains Dalam Pembelajaran Fisika Di Sma.” *Jurnal Pembelajaran Fisika* 10(1): 36.

Astuti, Irnin Agustina Dwi. 2016. “Pengembangan Alat Eksperimen Cepat Rambat Bunyi Dalam Medium Udara Dengan Menggunakan Metode Time of Flight (Tof) Dan Berbantuan Software Audacity.”

Unnes Physics Education Journal 5(3): 18–24. http://journal.unnes.ac.id/sju/index.php/upej.

Badan Standar, Kurikulum, dan Asesmen Pendidikan. 2022. "Capaian Pembelajaran Mata Pelajaran Fisika Fase E - Fase F Untuk SMA/MA/Program Paket C." *Kementrian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia*: 1–13.

Conklin, Wendy. 2011. *Higher-Order Thinking Skills to Develop 21st Century Learners*. Shell Education.

Fanani, Moh. Zainal. 2018. "Strategi Pengembangan Soal Hots Pada Kurikulum 2013." *Edudeena* 2(1): 57–76.

Fatonah, D S R, A Ashadi, and H Haryono. 2016. "Studi Komparasi Pembelajaran Kimia Menggunakan Model Inquiry Based Learning (IBL) Dan Problem Based Learning (PBL) Pada Materi Termokimia Kelas XI SMA N 1 Sukoharjo Dengan Memperhatikan Kemampuan Matematik Tahun Pelajaran 2015/2016." *Jurnal Pendidikan Kimia* 5(2): 36–43. https://jurnal.fkip.uns.ac.id/index.php/kimia/article/view/8338.

Fedistia, Ridia, and Edwin Musdi. 2020. "Efektivitas Perangkat Pembelajaran Berbasis Flipped Classroom Untuk Meningkatkan Kemampuan Penalaran Matematis Peserta Didik." *Jurnal Didaktik Matematika* 7(1): 45–59.

Hafizah, Syarifah. 2020. "Penggunaan Dan Pengembangan Video Dalam Pembelajaran Fisika." *Jurnal Pendidikan Fisika* 8(2): 225.

Hamid, Abdul, and Hansi Effendi. 2019. "Flipped Classroom Sebagai Alternatif Pembelajaran Pada Mata Pelajaran Dasar Listrik Dan Elektronika." *JTEV (Jurnal Teknik Elektro dan Vokasional)* 5(1.1): 81.

Handhita, Emye Tegar, Isa Akhlis, Putut Marwoto, and Info Artikel. 2016. "Pengembangan Media Pembelajaran Materi Astronomi Berbasis Visual Novel Ren'Py." *UPEJ Unnes Physics Education Journal* 5(2): 35–41. https://journal.unnes.ac.id/sju/index.php/upej/article/view/13617.

Hasan, Muhammad et al. 2021. Tahta Media Group *Media Pembelajaran*. Pertama. ed. Fatma Sukmawati.

Heriyati, Tri Setyo. 2022. "Adaptasi Kurikulum Merdeka Dengan Model Pembelajaran Berbasis Problem Solving Pada Pendidikan Agama Kristen." *Jurnal Ilmu-ilmu Sosial* 19(2): 713–20.

Hudha, Muhammad Nur, Sudi Aji, and Astri Rismawati. 2017. "Pengembangan Modul Pembelajaran Fisika Berbasis Problem Based Learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Fisika." *SEJ (Science Education Journal)* 1(1): 36–51.

Indarwati, Dwi, Faridl Musyadad, and Wahyu Murti Utami. 2021. "Urgensi Media Pembelajaran Audio Visual Pada Hasil Belajar Ilmu Pengetahuan Alam (IPA) Di Sekolah D Asar." *Dikdastika: Jurnal Ilmiah Pendidikan ke-SD-an* 7(1): 23–30.

Istiqomah, Puput, I Komang Werdhiana, and Unggul Wahyono. 2017. "Pengaruh Penggunaan Media Video Terhadap Peningkatan Pemahaman Konsep Suhu Dan Kalor Pada Siswa Kelas X Man 1 Palu." *JPFT (Jurnal Pendidikan Fisika Tadulako Online)* 5(3): 28.

Jaully, Almaretta. 2022. "Pengaruh Penggunaan Video Pembelajaran Fisika Berbasis Konteks Terhadap Kemampuan Berpikir Kreatif Siswa Kelas XI SMA Negeri 5 Solok Selatan." Universitas Negeri Padang.

kemendikbud. 2022. *Permendikbudristek RI Nomor 21 Tahun 2022 Tentang Standar Penilaian*.

Kemendikbud. 2017. *Modul Penyusunan Higher Order Thinking Skill (HOTS)*. Direktorat Jendral Pendidikan Dasar dan Menengah Departemen Pendidikan dan Kebudayaan.

———. 2022. *Permendikbudristek RI Nomor 16 Tahun 2022 Tentang Standar Proses*.

Kristanto, Andi. 2016. Bintang Sutabaya *Media Pembelajaran*. Surabaya: Bintang Sutabaya.

Maslikhah, M, M I Janah, and ... 2021. "Penerapan Audio Visual Berbasis Animasi Sebagai Penunjang

Pembelajaran Jarak Jauh Tingkat Sekolah Dasar." In *SEMAI: Seminar …*, , 519–30. http://proceeding.iainpekalongan.ac.id/index.php/semai/article/download/431/149.

Mayasari, Ade, Wandika Wandika, and Anisa Dwita Fitri. 2023. "Effect Size Analysis of the Problem Based Learning Model on Students' HOTS Ability and Conceptual Understanding." *Journal of Innovative Physics Teaching* 1(1): 40–49.

Musliman, Acep, and Usep Kasman. 2022. "Efektivitas Model Inkuiri Terbimbing Untuk Melatih Kemampuan Berpikir Kritis Siswa Pada Konsep Fisika Yang Bersifat Abstrak." *Jurnal Jendela Pendidikan* 2(01): 48–53.

Neni Isnaeni, and Dewi Hildayah. 2020. "Media Pembelajaran Dalam Pembentukan Interaksi Belajar Siswa." *Jurnal Syntax Transformation* 1(5): 148–56.

Novisya*, Dira, and Desnita Desnita. 2020. "Analisis Pengembangan Video Pembelajaran Fisika Berbasis CTL Pada Materi Fluida." *Jurnal IPA & Pembelajaran IPA* 4(2): 141–54.

Nurrita, Teni. 2018. "Pengembangan Media Pembelajaran Untuk Meningkatkan Hasil Belajar Siswa." *Jurnal Ilmu-Ilmu Al- Quran, Hadist dan Tarbiyah* 3(1): 171–87.

Oktaviani, Risqa Tri. 2019. "Pemanfaatan Video Sebagai Media Pembelajaran Dalam Pendidikan Dan Pelatihan (Diklat)." *MADIKA: Media Informasi dan Komunikasi Diklat Kepustakawanan* 5(1): 91–94. https://ejournal.perpusnas.go.id/md/article/view/728.

Perwithasari, Ni Made Nitha, Sutrio, and Ahmad Harjono. 2023. "The Effect of Problem-Based Learning Model Assisted by PhET Simulations on Students' Physics Problem-Solving Abilities." *Jurnal Pendidikan Fisika dan Teknologi* 9(2): 262–67.

Prihatin, Yulianah. 2019. Model Pembelajaran Inovatif Teori dan Aplikasi Pembelajaran Bahasa dan Sastra Indonesia *Model Pembelajaran Inovatif Teori Dan Aplikasi Pembelajaran Bahasa Dan Sastra Indonesia*.

Priyono, Agus, Wahyu Hardyanto, and Isa Akhlis. 2018. "Pengembangan Media Pembelajaran BARy (Board's Augmented Reality) Pada Pokok Bahasan Elektrostatika." *UPEJ Unnes Physics Education Journal* 7(3): 66–74.

Rachma, Anggi Julvian, Delia Achadina Putri, Maria Ulfah, and Dandan Luhur Saraswati. 2019. "Determining the Half Time and Analogy Constants of Radioactive Decay on the Illustration Board of Radioactive Decay with the Capacitor Filling and Discharging Method." *Jurnal Pendidikan Fisika* 7(3): 306–16.

Rahayu, Restu et al. 2022. "Implementation of Independent Curriculum in Driving School." *Jurnal Basicedu* 6(4): 6313–19.

Rofiah, Nor Muflihatur, and Mundilarto. 2021. "Pengembangan Video Pembelajaran Fisika Berbasis Kontekstual Untuk Meningkatkan Minat Belajar Dan Pemahaman Konsep Development of Contextual-Based Physics Learning Videos to Improve Learning Interest and Concept Understanding." *Jurnal Pendidikan Fisika* 8(4): 1–6.

Rusman. 2012. *Model-Model Pembelajaran: Mengembangkan Profesionalisme Guru*. Depok: PT Raja Grafindo Persada.

Sani, Ridwan Abdullah. 2019. *Pembelajaran Berbasis HOTS (Higher Order Thinking Skill)*. 1st ed. Tanggerang: Tira Smart.

Sari, Rezza Septia. 2022. "Pengaruh Penggunaan Video Pembelajaran Fisika Berbasis Konteks Terhadap Kemampuan Berpikir Kritis Siswa Kelas XI SMA." Universitas Negeri Padang.

Sinaga, P. 2011. "Penerapan Simulasi Dan Interactive Virtual Laboratory Pada Pembelajaran Fisika Modern Untuk Meningkatkan Pemahaman Konsep Radioaktivitas Inti, Reaksi Inti Dan Aplikasinya."

Prosiding Seminar Nasional Sains dan Teknologi Nuklir: 351–56.

Soulé, Helen, and Tatyana Warrick. 2015. "Defining 21st Century Readiness for All Students: What We Know and How to Get There." *Psychology of Aesthetics, Creativity, and the Arts* 9(2): 178–86.

Suantiani, Ni Made Ayu, and I Wayan Wiarta. 2022. "Video Pembelajaran Berbasis Pendekatan Kontekstual Pada Muatan Matematika." *Jurnal Penelitian dan Pengembangan Pendidikan* 6(1): 64–71.

Sutardi. 2016. *Solusi Mahir Fisika*. Yogyakarta: Deepublish.

Syahidah, Nuris. 2015. "Metode Mind Map Sebagai Upaya Mengembangkan Kreativitas Siswa Dalam Pelajaran Ekonomi." In *Profesionalisme Pendidik Dalam Dinamika Kurikulum Pendidikan Di Indonesia Pada Era MEA*, Prosiding Seminar Nasional, 108–17.

Utami, Khurnia, and Julianto. 2013. "Penggunaan Media Audio Visual Untuk Meningkatkan Pemahaman Konsep Siswa Di Sekolah Dasar." *Jpgsd* 01(02): 0–216.

Widana, I Wayan. 2017. *Modul Penyusunan Soal Higher Order Thinking Skill (HOTS)*. Jakarta: Direktorat Pembinaan SMA.

Yulaisa, Gusni. 2022. "Pengaruh Penggunaan Video Pembelajaran Fisika Berbasis Konteks Terhadap Kemampuan Berpikir Kritis Siswa Kelas XI SMA Negeri 5 Solok Selatan." Universitas Negeri Padang.