

Development of Learning Videos on Petroleum Materials Using Dora Toon Web Apps for Class XI High School Students

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Abstract. Many students have difficulty understanding chemistry concepts due to limited learning resources such as textbooks and traditional lectures. This research proposes making videos using Dora Toon, an audiovisual web platform specifically for petroleum materials. This project aims to assess video quality through evaluation by research subjects (material experts, media, chemistry educators, and 10 class XI high school students). With a research and development approach, the model used is 4D (define, design, development, disseminate) with a focus on the disseminate stage. The definition stage includes analysis of the front-end, students, concepts, tasks, and learning objectives. The design stages include selecting media & format, collecting references, creating initial designs, and making instruments. The development stage includes video production, validation tests on research subjects. Sampling used purposive sampling technique, data collection used a validation questionnaire, and analyzed descriptively in percentages. At the disseminate stage, the product can be distributed to the wider community. However, this stage was not carried out due to time constraints. This results in HD resolution that is easy to use. It produces HD (1280x720p) resolution MP4 videos that are easy to use and contain petroleum ingredients. The evaluation results were very positive. The material expert gave a score of 95% (very good), the media expert gave a score of 95% (very good), the chemistry teacher gave a score of 86.06% (very good), and the students answered positively 100%. These findings indicate that animated videos can be an alternative learning tool for teaching petroleum chemistry in the classroom.

Keywords: Learning videos, dora toon, petroleum.

Introduction

Technological advancements have revolutionized education, with online learning resources readily available (Setiawan, 2017). Despite this potential, research by Widyawati (2019) highlights the underutilization of technology for educational improvement. Therefore, Kaad (2018) suggests leveraging technology to develop engaging learning media. Effective learning media can positively impact students' psychological development, fostering active participation and preventing boredom (Supriyono, 2018; Ayu, 2019). This aligns with Magdalena's (2021) perspective that media integration enhances learning effectiveness.

Research by Wahyuni & Yokhebed (2019) identifies PowerPoint as the most prevalent learning media in classrooms. While PowerPoint can boost student interest (Nurwidayanti & Mukminan, 2018), its current use often lacks engaging elements like images, animations, or audio. Nomleni & Manu (2018) highlights the benefits of audio in learning materials for

better comprehension. To address this gap and enhance material presentation, Nurseto (2011) emphasize the need for developing learning media that incorporates video and audio elements.

Videos offer valuable tools for educators (Febriani, 2017). Among video creation applications, Dora toon stands out for its reliability (Fauziah & Ninawati, 2022). Research supports the effectiveness of animation in learning. A study by Latifah (2020) found Powtoon-based media for the periodic table to be a useful and effective learning tool based on student feedback. Similarly, Apriliana & Rochmawati (2023) reported positive student responses and a "practical" category rating for PowToon video learning materials. While Dora toon-based animated videos for chemistry are less explored, research suggests its potential. Latif & Dewi (2022) found that Dora toon animation in civics lessons increased student interest and understanding due to its engaging and humorous style. Additionally, Umar et al. (2020) reported positive student comments about the effectiveness of Dora toon learning media in Indonesian Language and Literature.

Dora Toon-based audio-visual media offers the advantage of expanding the scope of using learning media, making it more effective, practical and efficient (Awalia et al., 2019). Other benefits include being able to broadcast it, making learning more effective and allowing students to re-watch content until they fully understand. This media can also be used to convey knowledge in accordance with learning and to develop the instructor's ability to transfer knowledge, make teaching and learning activities more entertaining and prevent students from becoming bored with these activities (Bina et al., 2022). It is also easy to use, especially for educators, and has unique features.

Petroleum is a chemistry subject in class XI high school (Lendeng et al., 2021). Students have difficulty learning this material because of memorization and recounting many theories in the form of paragraphs in the book. The memorization method and lecture approach are often used to teach petroleum material. This will be difficult for students to remember, especially if the lesson is not easy to remember (Sakhia et al., 2021). Many people will feel more interested in reading if the content is unique and good. Therefore, a media is needed to overcome the problem and prevent these misconceptions (Astuti et al., 2021; Nurjanah et al., 2017). Based on observation data with chemistry educators at SMA Negeri 1 Bambanglipuro, the learning media used in learning petroleum is student worksheet media. This media is considered less successful because the material in the student worksheets tends to be boring so that it makes students bored quickly.

Building on prior research by Dimyati et al. (2023) and Rowindi (2022) who found positive student and teacher responses to Dora toon animation in learning, this project aims to develop interactive and thought-provoking Dora toon-based animated learning materials on petroleum for high school juniors (Grade 11). This innovative approach addresses the lack of existing Dora toon resources on this topic. The resulting audio-visual media can serve multiple purposes for educators: reducing content density, enhancing information clarity and visual appeal during presentations, and ultimately boosting student learning enthusiasm.

Methods

This research uses research and development (R&D) methodology, especially the 4D model (define, design, development, and disseminate) as proposed by (Thiagarajan et al., 1974). However, this research only focused on the dissemination stage. The 4D model was chosen because of its nature which can be used to develop various types of learning media (Riani et al., 2023). Now we will learn the specific steps involved in this model:

The first stage is define. This stage helps in determining and explaining needs and gathering information related to things that will be developed in the product which will be made. Activities include front-end analysis, student analysis, concept analysis, task analysis, and learning objective specification (Aceto et al., 2014). The second stage is design. This stage carries out activities for preparing materials, designing products, and preparing evaluation tools (Bonk & Graham, 2012). The third stage, namely development, aims to obtain product quality assessment data from material expert, media expert, high school chemistry teachers, and student responses. This stage includes video production activities, then validation tests are carried out on various parties who are competent in the fields of materials, media, educators, and tested on a limited scale by 10 students. The fourth stage is disseminate, at this stage the product can be distributed and introduced to the wider community beyond the scope of development itself. However, this stage was not carried out due to time constraints. Then activities were carried out to analyze the results obtained at the product trial stage on research subjects to see whether the objectives were achieved or not, by concluding and looking at the results of the questionnaire that had been distributed to experts and students. In this way, researchers can find out the success of the learning video media developed.

The evaluation of the Dora toon video involved a group of subject matter experts: 1 material expert, 1 media expert, and 3 high school chemistry teachers. Additionally, 10 class XI students participated in a product trial. Data was collected through questionnaires and interviews. Questionnaires were used to gather feedback from all participants. To analyse the data, two main techniques were employed: 1) qualitative descriptive analysis: This method examined written comments and suggestions from the experts and students. By analysing these responses, researchers could identify recurring themes and use them to refine the video; 2) quantitative descriptive analysis: This method focused on numerical data, such as scores from the feasibility assessment questionnaires. These scores were converted into percentages to provide a clear picture of the video's overall effectiveness (Rachma et al., 2023).

Qualitative feedback from product testers, such as comments and suggestions, is transformed into quantitative data for analysis. This conversion is achieved using a Likert scale, as presented in Table 1 (Viandhy & Ratnasari, 2015). The Likert scale assigns numerical values to different response options, allowing researchers to measure the overall sentiment and categorize the feedback.

Table 1. Scoring rules

Description	Score
VG (Very Good)	5
G (Good)	4
E (Enough)	3
L (Less)	2
VL (Very Less)	1

To determine the overall validation score, a specific formula will be used, as described by Ridwan (2007):

$$\bar{X} = \frac{\sum x}{n} \quad (1)$$

Description:

$\bar{X}$ = Average score
 $\sum X$ = Total score of each rater
 n = Number of raters

The next step involves translating the raw scores from the individual aspects into a four-point scale. The conversion criteria for this process are detailed in Table 2 (Setiawan, 2020).

Table 2. Rating Scales

No.	Quantitative score range (i)	Value	Qualitative Categories
1.	$X \geq \bar{X}_i + 1.SBx$	A	VG (Very Good)
2.	$\bar{X} + 1.SBx > X \geq \bar{X}_i$	B	G (Good)
3.	$\bar{X}_i > X \geq \bar{X}_i - 1.SBx$	C	L (Less)
4.	$X < \bar{X}_i - 1.SBx$	D	VL (Very Less)

Description:

X = Score achieved

$\bar{X}_i$ = Average ideal score = $\frac{1}{2}$ (ideal max score + ideal min score)

SBx = Ideal standard deviation = $\frac{1}{6}$ (ideal max score - ideal min score)

Ideal maximum score = criteria item $\times$ highest score

Ideal minimum score = criteria item $\times$ lowest score

Student responses, which were initially in the form of qualitative data (comments, opinions), underwent a conversion process into quantitative data (scores). This conversion uses the Guttman scale Sugiyono (2013), which represents assessment in the form of a positive statement score, where "Yes" is denoted as 1 (if the statement indicates good) and "No" as 0 (if the statement indicates not good). Meanwhile, the assessment is in the form of a negative statement score, where "Yes" is denoted as 1 (if the statement indicates it is not good) and "No" as 0 (if the statement indicates it is good).

To determine the overall effectiveness of the product and the effectiveness of each individual aspect, percentage scores were calculated using a formula outlined by Rohman & Mutmainah (2015).

$$\text{Percentage of Ideal} = \frac{\text{Achieved Score}}{\text{Maximum Ideal Score}} \times 100\% \quad (2)$$

The assessment data has been converted into percentages, then analyzed descriptively using Table 5 (Arikunto, 2010).

Table 5. Percentage descriptive analysis criteria

Achievement level (%)	Category
81-100	Very good
61-80	Good
41-60	Enough
21-40	Less
<20	Very less

Results and Discussion

The research introduces a learning video crafted through the Dora Toon web app. Dora Toon was specifically selected for its user-friendly features and extensive array of templates, facilitating effortless video creation (Yanti et al., 2023). Videos, as a medium, amalgamate auditory and visual elements, inherently captivating audiences with their ability to convey information, elucidate processes, and demystify intricate concepts (Kemuda & Yasa, 2024). The appeal of videos lies in their amalgamation of audio, visual, textual, and animated components, rendering them highly engaging (Candra & Negara, 2021; Maulida, 2019; Sumarni et al., 2020). Animated videos, in particular, are deemed captivating due to their capacity to attract attention, enhance aesthetic appeal, streamline learning, facilitate comprehension, and elucidate challenging topics (Ayuningsih, 2017; Candra & Negara, 2021; Kasih, 2017). Previous studies attest to the efficacy of animated videos in aiding both educators and learners, ultimately enhancing learning outcomes (Candra & Negara, 2021; Dewi et al., 2021; Siddiq et al., 2020). Notably, the research adopts the 4D model as its procedural framework, a decision based on its suitability for instructional design. Here's the explanation:

Define stage

In the 4D model, the first stage is definition which aims to determine and define development needs. The requirement in question is something that is able to demonstrate the basic need for why learning video media needs to be developed. This requires 5 different analyzes to find the main problem. At this stage the researcher analyzes the problem which includes front end analysis, student analysis, concept analysis, task analysis, and specification of learning objectives.

Front end analysis was carried out by interviewing high school chemistry teachers and the results obtained were that teachers had never used video learning media, the only media used were print media such as printed images and PowerPoint. Teachers also find it difficult to make their own learning videos (Bruggeman et al., 2022). They admit that they are not yet proficient in the techniques of making interesting videos. In addition, the use of textbooks can cause students to misunderstand when studying independently. This can happen because the discussion in textbooks is still too difficult to understand (Afifah & Isnawati, 2023). PowerPoint has difficulty presenting the microscopic aspects of petroleum effectively due to its limitations in detailed explanations. The interviews also highlighted that current learning media promote approaches that involve teachers. To make learning more interesting and interactive, researchers suggest including multimedia elements such as audio, video, text, images and animation. This approach, as shown by NurLatifah & Suprihatiningrum (2023), can significantly improve understanding of complex theories such as those found in petroleum studies.

Student analysis was carried out by conducting interviews with several class XI high school Bantul Regency students and accompanied by teachers. Based on the results of interviews, it is known that students quickly feel bored when following the learning process if they do not use a variety of learning media, students have the characteristics of being enthusiastic and happy about new things and have a great curiosity, and students participate more often in learning by take notes, do assignments and listen to the teacher's explanation.

Concept analysis is carried out by analyzing core competencies (CC) and basic competencies (BC) followed by analysis of learning resources. CC and BC analysis was carried out with the aim of determining the limits of the material to be presented, namely petroleum material which requires a strong understanding of concepts. The final result in

the petroleum learning process is that students are able to explain the process of petroleum formation, processing techniques, and the use of processing results.

Task analysis is carried out by translating core competencies and basic competencies into learning indicators. The basic competencies used in the media being developed are: basic competencies (BC) 3.2: explain the process of forming petroleum fractions, separation techniques and their uses. The indicators in the learning video assisted by the Doratoon web app are: (1) explaining the process of forming petroleum, (2) explaining petroleum processing techniques, and (3) explaining the use of fractions resulting from petroleum processing.

Specification of learning objectives is carried out by developing learning objectives based on the core competencies and basic competencies in the 2013 curriculum which are then translated into indicators and learning objectives. At this stage, the final objectives of the learning media developed are formulated as follows: (1) students are able to explain the process of petroleum formation, (2) students are able to explain petroleum processing techniques, and (3) students are able to explain the uses of fractions resulting from petroleum processing.

Design Stage

The next stage is design. At this stage there are 5 steps which include media selection, format selection, reference collection, initial design creation, and instrument creation. Media selection, the media used in this research is Dora Toon. Next, format selection and display design are created using features already available in Dora Toon. A collection of references, the material that will be created in this media is petroleum which consists of several sub-materials, namely: the process of forming petroleum, processing techniques, and the use of processing results. Next, create an initial design. The software used in this research includes the Capcut and YouTube applications. Capcut is used to edit videos, where this application can combine videos, cut videos, adjust video composition, be able to add audio or music and can add emoji stickers according to editing needs (Deriyan, 2022). YouTube is used to upload videos, watch various videos, and also share videos where the videos can be seen by everyone (Nur, 2021). The supporting websites used in developing this video are www.remove.bg to remove image backgrounds, www.pinterest.com to search and download GIFs or images, and www.unscreen.com to remove GIF backgrounds. After the animated video was created, a research instrument was created. The instruments that have been created are first consulted with the supervisor, then validated. Research instruments include validation, product quality assessment, and student responses. The product quality assessment instrument includes aspects of language, format, material, learning quality and benefits. Meanwhile, the student response instrument includes aspects of media design, material content, and benefits. The instruments that have been created have been validated by instrument expert.

Development Stage

At the development stage, the plans and designs that have been prepared at the design stage are realized into a product, then the product goes through a validation process by experts (media, materials, high school chemistry teachers) and is responded to by several class XI high school students. The activity carried out at this stage is making a product in the form of a Dora Toon learning video. Following are the stages of making it. The first stage is to prepare the appearance of the Dora Toon web app on the internet and the petroleum material that will be presented in the video. The second stage, editing uses the Dora Toon web app which can be seen in Figure 1.

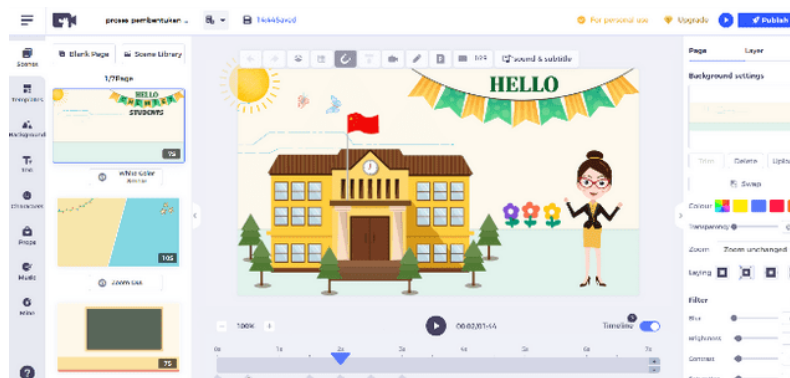


Figure 1. The process of making videos on Dora Toon

This stage is carried out by selecting and creating a background aimed at creating a cheerful atmosphere in the animated video being developed (Warmi et al., 2024), adding appropriate animation, cutting processes, speeding up and slowing down the video speed, providing transition effects, subtitles, selecting fonts. and color, as well as adjusting the video contrast brightness.

The Dora Toon that was created was then edited using Capcut to include the voice recording that had been made previously. The video content editing process is carried out by cutting, speeding up and slowing down the video speed, adding background sound while aligning it with the video content, and removing noise. This stage can be seen in Figure 2.

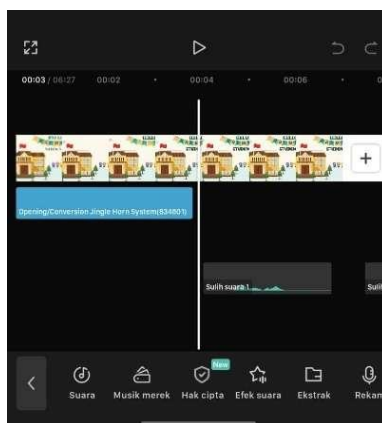


Figure 2. Editing process using the Capcut application

The final product produced is a Dora Toon learning video on petroleum materials. This video follows a clear structure with an opening, main body, and closing. The opening is crucial as it sets the stage and introduces the video content (Kountul & Wibowo, 2021). As illustrated in Figure 3, the opening typically includes a greeting, the video title, researcher identification, and the learning objectives.



Figure 3. The video's intro

The video content dives into petroleum through a relatable hook. This technique, called apperception, connects the learning to everyday experiences like moving vehicles (as seen in Figure 4). Research by Nuryadin & Husein (2021) suggests that apperception helps grab students' attention, provide context, and boost their motivation and understanding.



Figure 4. Visual representation of the connection to everyday life

The content of the video is an explanation of petroleum material which consists of: 1) the definition and components of petroleum; 2) the process of forming petroleum; 3) processing techniques; and 4) utilization of processing results. The contents of the video can be seen in Figure 5.



Figure 5. The main part of the video

The video concludes with a closing sequence expressing gratitude (see Figure 6).



Figure 6. The video's conclusion

The final stage in preparing this learning video is the video publication stage. The learning videos created are at high definition (HD) level with a resolution of 1280x720p in .mp4 format so that the animated videos can be seen clearly. The animated video is then uploaded to the YouTube platform for easy access.

Here the video has completed the validation process by a group of experts (material experts, media experts, high school chemistry teachers) as well as class XI high school student respondents. These validators and respondents rate the videos based on specific criteria outlined in the questionnaire. The validation process continues until the video is deemed appropriate and effective as a learning tool. The next section presents the assessment results of the test subjects.

Media expert, specifically lecturers from the chemistry education program at UIN Sunan Kalijaga Yogyakarta, evaluated the video's language and format. Their role was to

ensure the media itself is well-presented and functions effectively. Table 6 displays the results of this media feasibility test by media expert.

Table 6. Feedback from Media Expert on the Dora Toon Video

Assessment aspects	Σ Score	Σ Max Score Ideal	Percentage Ideal	Category
Language	20	20	100	Very Good
Format	18	20	90	Very Good
Total	38	40	95	Very Good

Table 6 shows the results of media expert evaluation of the Dora Toon learning video. From the results of data processing analysis, a total score of 38 out of 40 was obtained and an ideal percentage of 95 was obtained. Based on the percentage descriptive analysis assessment criteria table that has been explained in the method section, Table 7 shows the results of material expert evaluation of the Dora Toon learning video. From the results of data processing analysis, a total score of 19 out of 20 was obtained and an ideal percentage of 95 was obtained. Based on the percentage descriptive analysis assessment criteria table that has been explained in the method section, a percentage of 95 was obtained in the 'very good' category.

Similar to the media expert, material expert from the chemistry education program at UIN Sunan Kalijaga Yogyakarta evaluated the video's content. Their focus was on ensuring the accuracy and educational quality of the presented petroleum material. The results of their assessment using a specific evaluation tool can be found in Table 7.

Table 7. Feedback from Material Expert on the Dora Toon Video

Assessment aspects	Σ Score	Σ Max Score Ideal	Percentage Ideal	Category
Material	9	10	90	Very Good
Quality of learning	10	10	100	Very Good
Total	19	20	95	Very Good

Table 7 shows the results of material expert evaluation of the Dora Toon learning video. From the results of data processing analysis, a total score of 19 out of 20 was obtained and an ideal percentage of 95 was obtained. Based on the percentage descriptive analysis assessment criteria table that has been explained in the method section, a percentage of 95 was obtained in the 'very good' category.

Both material and media expert evaluations (as shown in Tables 6 and 7) indicate 'very good' results. This means the Dora toon learning video meets high standards for educational quality, media presentation, and alignment with student needs. However, valuable feedback from the experts suggests areas for improvement. Material expert recommend incorporating information on chemical compound structures, while media expert suggest adjusting font colours in certain sections. By addressing these suggestions, the video can be further refined and reach its full potential.

After incorporating feedback from experts and revisions, the Dora toon video underwent a practicality test with high school chemistry teachers in Bantul Regency. These teachers evaluated the video's effectiveness in learning, clarity of language, and overall benefits for students. Table 8, 9, 10 presents the results of this teacher assessment.

Table 8. Review of the Dora Toon Video by Chemistry Teachers 1

Assessment aspects	Σ Score	Σ Max Score Ideal
Learning	23	25
Language	14	15
Benefit	13	15
Total	50	55
Percentage Ideal	90	
Category	Very Good	

Table 8 shows the results of the chemistry teacher's evaluation at the first school of the Dora Toon learning video. From the results of the data processing analysis, a total score of 50 out of 55 was obtained and an ideal percentage of 90 was obtained. Based on the percentage descriptive analysis assessment criteria table explained in the method section, a percentage of 90 was obtained in the 'very good' category.

Table 9. Review of the Dora Toon Video by Chemistry Teachers 2

Assessment aspects	Σ Score	Σ Max Score Ideal
Learning	17	25
Language	12	15
Benefit	12	15
Total	45	55
Percentage Ideal	81	
Category	Very Good	

Table 9 shows the results of the chemistry teacher's evaluation at the second school of the Dora Toon learning video. From the results of the data processing analysis, a total score of 45 out of 55 was obtained and an ideal percentage of 81 was obtained. Based on the percentage descriptive analysis assessment criteria table explained in the method section, a percentage of 81 was obtained in the 'very good' category.

Table 10. Review of the Dora Toon Video by Chemistry Teachers 3

Assessment aspects	Σ Score	Σ Max Score Ideal
Learning	20	25
Language	12	15
Benefit	15	15
Total	47	55
Percentage Ideal	85	
Category	Very Good	

Table 10 shows the results of the chemistry teacher's evaluation at the third school of the Dora Toon learning video. From the results of the data processing analysis, a total score of 47 out of 55 was obtained and an ideal percentage of 85 was obtained. Based on the percentage descriptive analysis assessment criteria table explained in the method section, a percentage of 85 was obtained in the 'Very Good' category.

Experts across various fields (media, content, and high school chemistry teachers) all responded very positively to the Dora toon animated video's ability to teach petroleum material. This aligns with research by Nurfadhillah et al. (2021), who found that such media is highly suitable for learning. Animated videos can spark students' interest, stimulate their thinking and emotions, ultimately leading to better learning outcomes. As highlighted by Alfiani et al. (2018), effective learning media can enhance learning effectiveness and

efficiency, boost student enthusiasm and motivation, promote direct interaction with the material, cater to diverse learning styles, facilitate communication, and ultimately improve the overall learning experience.

The validation process and feedback from experts confirm that learning media serves several key purposes. First and foremost, it captures students' attention and boosts their motivation to learn. Additionally, learning media can make the learning experience richer and more engaging, which can be a challenge with traditional methods like textbooks that rely heavily on abstract concepts.

Then at this stage a limited trial was carried out on 10 students. Student responses serve to assess the media in terms of aspects of media design, material content and benefits. Student responses were carried out by 10 students from two high schools in Bantul Regency. Data on student responses to learning videos using the Dora Toon web app can be seen in Table 11.

Table 11. Response Results from Class XI High School Students

Assessment Aspects	Σ indicator	Σ score	Σ score Max Ideal	Percentage of Ideality
Media Design Aspects	9	20	20	100
Material	9	20	20	100
Benefits	9	50	50	100
Total	9	90	90	100

The effectiveness of the Dora toon learning video is supported by various assessments. Experts in media and content validated the video, chemistry teachers evaluated its suitability, and finally, 10 high school students provided feedback on aspects like media design, material content, and perceived benefits (as shown in Table 11). Based on these combined evaluations, the video is considered a valuable learning tool that can support both teachers and students in the learning process.

Student responses confirm that the Dora toon learning video is effective for educational purposes. This success can be attributed to several factors. Firstly, the video content aligns with the identified student needs through a systematic and theory-based needs analysis using the ADDIE model. Following the ADDIE model during development ensures the feasibility of the final product (Kurniawan et al., 2017; Siddiq et al., 2020). Research shows that learning videos developed using the ADDIE model are effective in supporting both student and teacher learning (references provided). Furthermore, existing research by Anwariningsih & Ernawati (2013) and Ariani & Ujiti (2021) highlights the positive impact of learning video media on overall learning outcomes, often achieving "very good" results. Additionally, studies by Asyhari (2024), Melisa & Fadlan (2023), and Rahayu et al. (2023) demonstrate that Dora toon-based learning videos specifically help students grasp the material more effectively and enhance the learning process.

Second, the use of video media in the learning process can facilitate understanding and strengthen students' memories by linking video material with students' daily activities (Candra & Negara, 2021; Lestari et al., 2021). This learning video is designed with the aim of displaying text, colored images, sound and animation in one unit so that it can attract students' interest in learning through audio-visual material (Fitriyah & Fardhani, 2022). The diversity of elements presented in this learning video provides added value for students in improving learning outcomes and assists teachers in delivering learning material (Gae et al., 2021; Kurniawan et al., 2017; Tegeh et al., 2019). Video media has advantages in delivering material because it combines the context of the material in an effective way and can arouse students' enthusiasm in the learning process. Apart from that, learning videos can also use elements of color, sound, movement and coherent explanations, as well as

integrating other media such as slides, photos and images to increase student motivation and foster greater curiosity (Marliani, 2021; Kurniawan et al., 2017; Wuryanti & Kartowagiran, 2016).

Numerous studies support the effectiveness of learning videos. Research by Octavyanti & Wulandari (2021), Yendrita & Syafitri (2019), and Yusuf et al. (2017) demonstrates how learning videos can facilitate the learning process for students. Additionally, studies by Puryono (2020), Dayutiani & Fitrianna (2021), and Sulihin et al. (2020) highlight the benefits for teachers, including increased student motivation and a smoother learning experience. Mulyana et al. (2023) further emphasize the significant influence of learning videos on student learning and skill development. This positive impact is amplified when teachers leverage innovative media like learning videos, which, as Wisada & Sudarma (2019) explain, stimulate students' thoughts, feelings, and engagement with audio-visual information.

The advantage of the video media developed is video media with a combination of animation with movement patterns, color, audio, material content, as well as evaluation to measure the extent of students' knowledge and understanding. The implication of this research is that this animated video is able to raise student motivation and make it easier for students and teachers during the learning process. Thus, learning activities can occur anywhere and at any time. Video media can be operated easily and can be repeated, making it easier for students to understand the material. Apart from that, video media can also show demonstrations that are difficult for teachers to demonstrate (Afrilia et al., 2022). Based on these advantages, the use and utilization of video media in learning can improve understanding of the material. The more five senses students use when studying, the easier the material will be absorbed during the learning process. Learning by using video media, students obtain information from the senses of sight and the senses of hearing.

The use of 4D models in developing learning videos is considered the right choice. The 4D model is an instructional research approach so it is suitable for developing learning media. The learning video development process follows the stages set out in the 4D model, and the results of each stage can become the basis for the next stage, thus providing a detailed framework. In research specifically conducted by Sari & Sari (2019)(Kosassy, 2019), the use of the 4D model is considered more appropriate in developing learning tools, the description of the stages is more complete and systematic, as well as the involvement of experts in the assessment before trials are carried out so that the product can be revised based on assessments, input and suggestions the experts. The obstacle experienced by researchers in the product development process is that making animations takes quite a long time, inserting every movement and background sound into the video must be done carefully so that the results are satisfactory.

Disseminate Stage

The disseminate stage in the 4-D development model is the final stage in the learning media development process. At this stage, the learning media that has been developed will be distributed or distributed to target users or students. The distribution process can be done by distributing the video link and including it on social media with certain hashtags to attract viewers to see the video and reach the target. However, researchers did not carry out the dissemination stage due to time constraints.

Conclusion

Based on the results of the research and discussion regarding the development of learning videos about petroleum using the Dora Toon web app, it can be concluded that the videos have been created using the 4D model which is limited to the disseminate stage. This media has characteristics including; can be used classically or individually, has high resolution, user friendly, easy to operate video, oil material with sub-chapters on petroleum formation processes, processing techniques, and utilization of processing results. In the manufacturing process, supporting software is used, namely Capcut. Assessments from material expert show that this video gets an ideal percentage of 95%, which is included in the very good category. Likewise, the assessment from media expert who gave an ideal percentage of 95%, as well as three chemistry teachers who gave an ideal percentage of 86.06%, were all included in the very good category. The response from students also shows a percentage of 100%. Therefore, it can be concluded that this animated video can be used as an alternative learning media in class for petroleum material.

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