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Development of PowToon Animation Video on Joyful Learning Loaded Reaction Rate Material to Increase High School Students' Learning Motivation

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Abstract: This research aims to produce animated PowToon videos on reaction rate material with Joyful Learning content and to analyze the quality of the product being developed. The method used in this study used a 4-D model consisting of define, design, development, and disseminate stages, but was limited to the developing stage. The instrument used in the study was in the form of video quality assessment sheets and student responses. The data were analyzed descriptively and quantitatively. The results of video evaluation by media experts, material experts, reviewers, and student responses were 90%, 95%, 93%, and 92%, which were included in the very good category. That animated video had the advantage of being fun for students because it could present factual information through engaging animations and learning experiences that are difficult for students to get outside the school environment. Based on the study results, the PowToon animation video on the developed reaction rate material can be used as an alternative learning medium in creating fun learning and increasing student motivation.

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Introduction

The development of information technology in the era of *society* 5.0 is the opening gate for advancing global education (Rakhmawati, 2017). Information technology is used to process data by obtaining, compiling, storing, and manipulating data in the learning process so that the results obtained are faster and more practical (Munir, 2009). Information technology is essential for creating real and significant changes in the learning process (Hardiyana, 2016; Suryadi, 2015). Information technology in the world of education has created a variety of media that can increase the effectiveness and efficiency of learning (Pribadi, 2017). These changes indicate that the use of information technology in the learning process in the classroom has become a need and demand in the global era (Muhson, 2010). The application of information technology in learning is marked by the presence of e-learning (Jamun, 2016). The existence of e-learning makes the learning process possible without being bound by space and time (Darmayanti et al., 2007). *E-learning* is an online learning information technology (Husain & Basri, 2021). However, online learning using e-learning still needs to improve in explaining abstract material (Ronkainen et al., 2019).

Learning to use animated media can be a solution so that abstract material becomes more concrete and easier to understand (Sukiyasa & Sukoco, 2013). *Animation* is a medium containing images processed to produce movement and sound to give a lively impression (Maryani et al., 2016). Animation media in the video makes the material explained in detail and has an appeal that makes it easier for students to understand the material (Garsinia et al., 2020; Judge, 2019). In addition, animated media can explain procedures and sequences of

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events to attract students' attention in the learning process (Lee & Owens, 2004). Animation media is also more effective than traditional learning media in improving student learning outcomes (Aksoy, 2012). However, animation media in schools still needs to be used. However, animation media in schools still needs to be used. Teachers only use PowerPoint in the learning process, so students tend to pay little attention In addition, making animated media for the learning process requires special skills, quite a long time, art and creativity (Sukiyasa & Sukoco, 2013), and paid programs (Degeng, 1993).

One of the animation media that is easy to use, does not require special skills, and is free is PowToon (Adhar, 2016). PowToon is a website-based application with exciting features for making animated videos online (Jatiningtias, 2017; Ernalida, 2018). PowToon provides animated cartoon features, music, sound, handwriting, transition effects, and attractive colors to be created into learning media that can increase student learning interest (Dewi & Handayani, 2021; Sutarsih & Hermanto, 2019). PowToon animated videos can improve student learning outcomes and teacher skills in managing the class (Deliviana, 2017). PowToon animated videos can also make abstract material more concrete, making it easier for students to understand and remember material (Arnold, 2018). PowToon can be used as an animated medium in learning because it fulfills several aspects, namely (1) design aspects, (2) pedagogic aspects, (3) content aspects, and (4) ease of use aspects (Wisnarni et al., 2017). Therefore, PowToon animation videos are suitable for delivering complex material for students to understand (Qurrotaini et al., 2020).

Chemistry is a subject that is difficult for most high school students to understand, so it is not surprising that some of them still need to achieve minimum completeness after an evaluation is carried out (Sariati et al., 2020). This difficulty is caused because chemistry contains abstract concepts and is considered by students as relatively new material (Nurpaidah, 2018). The difficulty of studying chemistry is related to the characteristics of chemistry, which are sequential and develop rapidly according to the development of science (Faridah, 2004). Chemistry is a product of natural knowledge in the form of facts, theories, principles, and laws from scientific work processes; the implementation of learning must cover three main aspects: product, process, and scientific attitude (Wasonowati et al., 2014). In addition, the broad scope of chemistry, descriptively and theoretically, cause students difficulties in studying chemistry (Syahri et al., 2017). These difficulties lead to higher students' understanding of various chemical concepts. Chemical concepts are multilevel, developing from simple to more complex (Zidny et al., 2013).

One of the complex chemical materials is the reaction rate material (Arifanti, 2019). The material on the reaction rate contains a combination of abstract knowledge in the form of the reaction rate equation, the calculation of the order of the reaction, the factors that influence it, and the theory of collisions. Reaction rate material includes abstract concepts, mathematical calculations, and graphs (Musya'idah et al., 2016). Reaction rate material is often one of the factors causing students' misconceptions because it contains mathematical calculations and many factors cause an increase in the reaction rate (Justi, 2002). Students also often need help understanding reaction rate material because it requires the ability to read and interpret graphs (Gultepe, 2015). In addition, the matter of reaction rates involves multiple representations in the form of macroscopic representations, which can be explained through experiments (Astuti, 2014), sub-microscopic representations used to explain macroscopic observations at a particular scale, and symbolic representations to make it easier to explain phenomena at an abstract level (Devetak et al., 2009). The learning so far only pays attention to the material on the macroscopic and symbolic aspects and does not touch the sub-microscopic level. Presentation of reaction rate material that is less attractive and

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seems complicated often makes students feel bored and bored. This student saturation is one of the factors in the low student learning outcomes (Muthohir et al., 2020).

One of the proper methods to overcome student boredom is *Joyful Learning*. *Joyful Learning* is an interactive and attractive learning method so students can focus on the Learning being undertaken (Azmi & Nurul, 2014). *Joyful Learning* can create creativity and student activity by providing a sense of happiness to make Learning more enjoyable (Juliati & Rafiqah, 2017). Fun Learning is one of the important factors in increasing students' interest and curiosity about something (Hartono, 2013). According to research by Rindaningsih et al. (2019), the *Joyful Learning* method makes students have a positive desire or tendency to learn. In addition, *Joyful Learning* can also help develop thinking skills and build their concepts of the subject matter (Ardani, 2015). Based on the advantages of the *Joyful Learning* method, this method is very suitable for use in abstract and theoretical material through appropriate learning media (Ristiyani & Bahriah, 2016).

Integrating PowToon animated videos with Joyful Learning content is appropriate for generating student motivation (Karomah, 2019). Motivation is an impulse to change the energy in a person into a form of the actual activity to achieve specific goals (Khodijah, 2014). Learning media filled with Joyful Learning with animated PowToon videos can motivate students to express their ideas so they can understand chemistry material well (Kurniawan, 2020). PowToon animation can also make students pay attention and follow every material the teacher delivers (Arumingtyas, 2020). In addition, PowToon animation is the right choice to support the learning process, which can increase student motivation in understanding the material (Anggita, 2020). Learning motivation possessed by students is one of the factors that can determine the success of student learning (Rifa'i & Anni, 2012). Based on the research results of Permatasari et al. (2014), animated video learning media on Chemistry material with the Joyful Learning concept can increase students' interest and learning outcomes in chemistry.

Based on the problem description above, this study aims to develop a PowToon animation video on the reaction rate material with Joyful Learning content and to analyze the quality of the developed video. The hope is that the animated video can motivate students to learn the reaction rate material to improve their learning outcomes. The animated media developed can also be used by teachers in the learning process so that students more easily understand the material.

Research Method

This study used the type of *Research and Development (R&D)*. In this study, a 4-D research model was used, which consisted of 4 stages, namely: *Define*, *Design*, *Development*, and *Disseminate* (Sugiyono, 2019). The 4D development model can be seen in Figure 1. below.

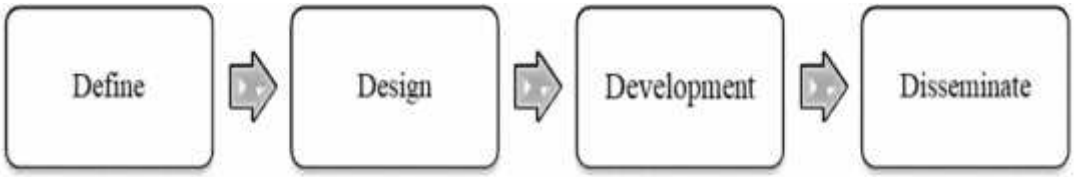

Figure 1. 4D Development Model

The *define* stage defines the requirements needed in developing the product. The *define* stage includes the stages of needs analysis, availability analysis, curriculum analysis, and material analysis. The define stage was obtained through interviews and

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observations of chemistry teachers and high school students. The *design* stage is the stage of designing the media to be developed. The design phase is implemented by selecting media, selecting formats, collecting references, making instruments, and making initial designs. The *development* stage is the stage for testing and improving the product. Products are assessed by experts so that quality products are produced. The *dissemination* stage is the stage of product dissemination that has been made.

The instruments used were product validation sheets, product quality assessment sheets using the Likert scale, and student response sheets using the Guttman scale. Product validation and quality data were obtained from media experts, material experts, and reviewers (high school chemistry teachers). Student response data were obtained from the response sheets of class XI high school students. The data were analyzed descriptively and quantitatively. The data analysis technique was carried out by changing the assessment data from media experts, material experts, and reviewers into qualitative assessment data based on a Likert scale with the answer options Very Good (SB), Good (B), Enough (C), Less (K), Very Less (SK) where each option has a score of 5, 4, 3, 2, and 1. Then the average value of each aspect and all aspects of the assessment of the score obtained is calculated using the formula:

$$\bar{X} = \frac{\Sigma x}{n}$$

$\bar{X}$ = Average score
Σx = Total score of each assesor
n = Number of appraisers

The score obtained is then converted into a qualitative value following the reference for converting the score into a five-point scale, as shown in Table 1 (Sukardjo, 2005).

Table 1. Ideal Assesment Criteria

Score Range	Category
$Xi + 1{,}80\ SBi < \bar{X}$	Very Good
$Xi + 0{,}60\ SBi < \bar{X} \leq Xi + 1{,}80\ Sbi$	Good
$Xi - 0{,}60\ SBi < \bar{X} \leq Xi + 0{,}60\ Sbi$	Enough
$Xi - 1{,}80\ SBi < \bar{X} \leq Xi - 0{,}60\ Sbi$	Less
$\bar{X} \leq Xi - 1{,}80\ Sbi$	Very Less

Student response data is converted into quantitative data using the Guttman scale as a score (Riduwan & Sunarto, 2010). The data is converted into a score, then calculates the percentage of product ideality. The formula used to calculate the ideal percentage is as follows:

$$\% = \frac{\text{Score is reached}}{\text{Ideal maximum score}} \times 100\%$$

Results and Discussion

Define Stage

Analysis of needs and availability was conducted through interviews with chemistry teachers at Senior High School (SMA) in Yogyakarta. This interview aims to find out the problems and products needed at school. Based on the observations and interviews, information was obtained that learning media on reaction rate material still used conventional methods such as lectures, PowerPoint, and textbooks and had not used learning media such as animated videos. Chemistry teachers have used learning media in the form of videos from YouTube. However, the video used does not follow the material presented in class and looks dull, so learning using video is rarely done. Students were also informed that the learning

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process in the reaction rate material only listened to the teacher's explanation of the material contained in the textbook. Then working on the questions tends to make students bored and not enthusiastic. Therefore, exciting learning media is needed to increase student learning motivation.

Curriculum and material analysis at this stage is carried out to make it easier when entering material in the video according to the applicable curriculum. Furthermore, the material that has been determined is made into learning objectives and concept maps so that the material is more focused. The material used in this study is the reaction rate which consists of 1) The concept of the reaction rate, 2) The theory of collisions, 3) The factors that affect the reaction rate, 4) a Discussion of the factors that affect the reaction rate, and 5) The order of the reaction and the reaction rate equation.

Design Stage

The first step at the design stage is determining the media requirements according to the interview results in a PowToon animation video on Joyful Learning-based reaction rates. The PowToon web apps were chosen because they are easy to use, and there is no need to download the program. PowToon can be a learning medium because it has exciting features, such as making presentations or animated videos that can be used easily (Ernalida, 2018). In addition, animated videos can be used as learning media because they can attract students' attention, strengthen motivation, and students' ability to explain changing circumstances at any time (Al Farizi et al., 2019). Based on research by Melda & Putri, (2021); Permatasari et al., (2019), state that the use of animated videos in learning can give an exciting impression and make it easier for students to understand the content of the subject matter.

The next activity is formatting. The video format is in the form of opening, content, and closing. In addition, the animation in the video is designed to relate to everyday life and the characteristics of *Joyful Learning* (Trinova, 2012). Research conducted by UNESCO shows that most students want to learn in pleasant situations. The instruments used to assess product quality include material aspects, *Joyful Learning*, and videos. The last step in the design stage is making the initial design plan which aims to simplify the video design process that will be developed (Wahyuni et al., 2020). The initial design of learning media was made with the help of Web Apps PowToon software, Canva, Movavi Video Editor Plus 2021, Camtasia Studio 8, Noise Remover on Dolby On as an audio editor, and Google Drive. Web Apps PowToon is used for preparing animated videos because it has many supporting animations that can be used easily. The supporting websites used are www.remove.bg to remove the background on the image. They are making graphic designs using Canva, as seen in Figure 2.

Figure 2. Component Editing Process in Canva

Next, videos are produced by inserting animation and other components into the PowToon slides, as seen in Figure 3.

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Figure 3. The Editing Process PowToon

The PowToon videos that have been made are then edited using the Movavi Video Editor Plus application to include the sound recordings that were previously made. The editing process for the video content is done by cutting, speeding up, and slowing down the video speed, adding dubbing while aligning it with the video content, and removing noise, as shown in Figure 4.

Figure 4. Video editing process in Movavi Editor Video Plus

Sound recordings not included in the previous video use an additional application, namely Dolby On, to produce clear sound recordings because it has *Noise Reduction Tools, as* seen in Figure 5.

Figure 5. Dolby On Sound Editing

The final product produced is a PowToon animation video on Joyful Learning-based reaction rate material divided into five videos. Videos are made with opening, content, and closing formats. The opening of a video is an important part that becomes the introduction and initial appearance of a video (Yuni & Edy, 2021). The opening section consists of greetings, learning objectives, and titles, as seen in Figure 6.

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Figure 6. The Opening Section of the Video

The contents of the video are an explanation of the reaction rate material beginning with an apperception. Apperception in the video relates to everyday life events that can reduce learning boredom. Based on the research conducted by Nuriyadin & Husein (2021), states that apperception activities are beneficial in providing an initial description of the material delivery and can increase students' understanding and motivation in learning. Some of the apperception scenes presented in the video include the rusting process of iron, a chemical reaction that takes place quickly (Muliaman, 2021). The process of digestion of rice in the human body also occurs in chemical reactions with the help of catalysts. Carbohydrates in rice will be digested in the stomach with the help of the enzymes maltase and H2O, thus breaking down maltose into glucose (Susanto et al., 2022). The maltase enzyme acts as a catalyst in the human digestive process (Damira et al., 2021). Apperception illustration animation can be seen in Figure 7.

Figure 7. Apperception Illustration

The video content section explains the reaction rate material with explanations related to everyday life to motivate students to express their ideas and absorb learning well (Kurniawan, 2020). The video also creates a fun atmosphere (*Joyful Learning*) by selecting exciting features and interactive animations and linking material to everyday life. Animated videos made to explain the reaction rate material can also stimulate students to be motivated to learn. The explanation of the reaction rate material can be seen in Figure 8.

Figure 8. Explanation of the Reaction Rate Material

In addition, exercises are presented in the animated video about reaction rate material to increase student understanding. Examples of questions are presented with exciting

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animations to reduce boredom in learning and focus students' full attention on the learning material. Exercise questions and discussion can be seen in Figure 9.

Figure 9. Practice Questions and Discussion

The last scene is the closing part of the video, which contains two scenes, namely the conclusion and the closing. The conclusion section contains conclusions about the reaction rate factors, including the more surface area of the reactants, the faster the reaction occurs(Fadhilah et al., 2020). The greater the concentration, the greater the number of colliding particles, so the reaction rate is faster (Umam et al., 2015). The higher the temperature, the faster the reaction rate (Sarah et al., 2022). The last factor, namely the addition of a catalyst, will speed up the reaction rate without affecting the reaction's results (Ilyas et al., 2018). The closing scene can be seen in Figure 10.

Figure 10. The Video Closing Section

Development Stage

Products that have been made are then validated and assessed for quality by material experts, media experts, reviewers and responded by class XI senior high school (SMA) students. The results of product quality assessment and student responses can be seen in Table 2.

Table 2. Results of Product Quality Assessment and Student Responses

Assessment /response	Assessment Aspect	∑ Score	∑ Ideal Maximum Score	Ideal Percentage	Category
Material expert	Theory	10	10	95%	Very Good
	Joyful Learning	9	10		
Media expert	Videos	9	10	90%	Very Good
Reviewer	Material	9,4	10	93%	Very Good
	Joyful Learning	9,2	10		
	Video	9,3	10		
Student	Language	10	10	92%	Very Good
	Theory	10	10		
	Presentation	8,5	10		
	Joyful Learning	9,5	10		
	Animation	8	10		

Table 2 shows the results of the PowToon animation video evaluation on the reaction rate material based on *Joyful Learning* by material experts, media experts, and reviewers with an ideal percentage of 95%, 90%, and 93%, respectively, and the Very Good category. The

results of this assessment indicate that the PowToon animation video on reaction rate material based on *Joyful Learning* is appropriate for use as a learning medium to create fun learning. Rizqo (2016) states that implementing *Joyful Learning* strategies in the learning process can make students become active in the learning process and make it easier for educators to convey teaching materials and materials. In addition, the PowToon animation video on reaction rate material based on *Joyful Learning* is suitable as a learning medium in class to increase student learning motivation.

The following process is student responses to the products that have been developed. Student responses were made using a Google Form questionnaire using the Guttman scale, filled in by Class XI SMA students. The ideal percentage of student response results is 92% in the very good category. This positive response occurred because students felt happy learning using the Joyful Learning-based PowToon animated video. Based on the questionnaire, information was obtained that students were more enthusiastic and easy to understand when learning using animated videos. Based on research (Hadi, 2017) animated videos have the advantage of being fun for students because they can present factual information and learning experiences that are difficult for students to obtain outside the school environment. In addition, animated videos are considered very interesting because they have many benefits, such as attracting students' attention and focus, beautifying the appearance of the teaching and learning process, simplifying learning arrangements, and facilitating student understanding (Ayuningsih, 2017; Kasih, 2017). According to the evaluation results of media experts, material experts, reviewers, and student responses, the PowToon animation video on Joyful Learning-based reaction rate material is appropriate for alternative learning media in class. The aim is to improve student learning outcomes, understanding, and motivation in learning chemical reaction rate material.

Conclusion

The study results showed that the animated video developed had an ideal percentage by media experts, material experts, reviewers, and student responses of 90%, 95%, 93%, and 92%, respectively. These ideal percentages were in the Very Good (SB) category. The PowToon animation video on reaction rate material based on Joyful Learning, which aims to increase high school students learning motivation, is appropriate to be used as a learning medium to support a fun learning process and increase student learning motivation. Hence, students understand more, especially the relationship between reaction rate material and everyday life.

Recommendation

Some recommendations that can be conveyed in this study are that research using the R&D method only reaches the development stage because the dissemination stage requires quite a long time. In addition, the developed PowToon animation video can only be used with good internet access. The new PowToon web app account gets free premium access, making it easy to upload to YouTube. Special advice is given to chemistry teachers to create a fun learning atmosphere through animated videos and other fun learning media. From these several things, it is necessary to conduct further research to the dissemination stage to perfect this research.

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