POWTOON LEARNING MEDIA CONTEXTUALLY BASED ON THERMOCHEMISTRY MATERIALS TO INCREASE STUDENTS' LEARNING MOTIVATION

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Article Info	ABSTRACT
	Thermokinetics material is a conceptual and abstract topic in chemistry. Therefore, instructional media is needed to make thermokinetics more tangible to enhance student motivation in learning chemistry. The objective of this research is to develop a contextual-based instructional medium using Powtoon for thermokinetics and determine the quality of the developed product. The research method employed is Research and Development, adapting the 4-D model (Definition, Design, Development, and Dissemination). Research instruments include a product quality assessment sheet and a student response sheet. Based on evaluations by subject matter experts, media experts, and chemistry educators/reviewers, the percentages obtained are 93%, 95%, and 90%, respectively, belonging to the "excellent" category. Students responded positively to the video, achieving an ideal percentage of 90%, also categorized as "excellent." Thus, the developed product is deemed suitable as an alternative medium in thermokinetics learning to boost student motivation. For future research, it is recommended to measure the effectiveness of instructional media on student learning outcomes.

MEDIA PEMBELAJARAN POWTOON BERBASIS KONTEKSTUAL MATERI TERMOKIMIA UNTUK MENINGKATKAN MOTIVASI BELAJAR SISWA

	ABSTRAK
	Materi termokimia merupakan materi kimia yang bersifat abstrak dan konseptual. Oleh karena itu, dibutuhkan media pembelajaran agar materi termokimia menjadi lebih konkret sehingga dapat meningkatkan motivasi siswa dalam belajar kimia. Tujuan penelitian ini adalah untuk mengembangakan media pembelajaran Powtoon berbasis kontekstual pada materi termokimia dan menentukan kualitas produk yang dikembangkan. Metode penelitian yang digunakan adalah penelitian pengembangan yang mengadaptasi model 4-D (Definisi, Desain, Pengembangan, dan Diseminasi). Instrumen penelitian yang digunakan adalah lembar penilaian kualitas produk dan lembar respon siswa. Berdasarkan hasil penilaian oleh ahli materi, ahli media, dan reviewer/guru kimia mendapatkan persentase 93%, 95%, dan 90% dengan masing-masing kategori "sangat baik". Video direspon positif oleh siswa dan memperoleh persentase keidealan sebesar 90% dengan kategori "sangat baik". Dengan demikian, produk yang dikembangkan layak digunakan sebagai media alternatif dalam

proses pembelajaran materi termokimia untuk meningkatkan motivasi belajar siswa. Untuk penelitian selanjutnya, disarankan untuk mengukur efektivitas media pembelajaran terhadap percapaian hasil belajar siswa.

1. INTRODUCTION

Educational technology in the era of revolution 4.0 has brought a new era in the world of education [1], [2]. Educational technology is a systematic tool for finding solutions to education and learning problems by facilitating the learning process through technology [3]. Indirectly, educational technology creates innovations so that the learning process is of higher quality [4]. Educational technology can provide variations in learning methods to increase student's interest and motivation to participate in the learning process [5]. Apart from that, the use of educational technology can increase students' enthusiasm for learning by making it easier for them to access information without paying attention to time and place restrictions and also making it easier to share and discuss learning [6]-[8]. Therefore, teachers must master educational technology to facilitate the learning process and achieve learning goals [9]-[11]. Teachers' technological competence still needs to improve [12]. According to the Data and Information Technology Center of the Ministry of Education and Culture, only around 50% of teachers in Indonesia master technology [13].

Teachers' technological competence, which is still relatively low, can be overcome by training in developing technology-based learning media [14]. Through this training, it is hoped that teachers' technological competence will increase to create various creative media to support learning [15]. The COVID-19 pandemic indirectly encourages teachers to improve technical competence [16]. Teachers are required to remain creative in presenting learning media during online learning so that students feel energized and the learning process continues to run effectively and with quality [17]-[19]. Learning media is an intermediary tool for transferring knowledge created and developed creatively, varied, and interestingly to make learning more effective and efficient. Learning media is necessary because it can help improve students' understanding, present and excitingly deliver material, and clarify information [20]. Appropriate learning media selection and use significantly influence learning [21]. Effective learning media can make students interested, motivated, and easily understand the material [22]. Animated video media is one effective learning media that attracts students' attention [23], [24]. However, because the software is not available, is difficult to use, takes a lot of time, and costs a lot of money, the use of animated video media in the learning process is still tiny.

The right breakthrough for teachers to use in creating learning animation videos that are interesting, easy to operate, free, and do not require installing software on a computer is web-based animation [25]-[27]. One web-based animation media that is free and easy to operate is Powtoon [28]. Powtoon is an online service involving sound, images, and video supported by animation features [29]. The animation features provided by Powtoon include handwritten animation, cartoon animation, more lively transition effects, and elementary timeline settings [30]. Then, using Powtoon features benefits teachers in creating learning media that is interesting and understood by students [31], [32]. The advantage of using Powtoon features is that it presents attractive designs and varied cartoon animations that can foster students' interest and motivation to learn so that they can easily understand and remember the material [33]-[35]. Therefore, Powtoon is suitable for describing complex and abstract material [36].

Chemistry is a branch of science considered difficult for most students because it has many abstract concepts [37], [38]. This abstractness often causes misconceptions among students [39]. One chemical material that often causes misunderstandings and is challenging to understand and abstract is thermochemistry [40]. Thermochemistry is a part of chemistry that studies heat changes that accompany chemical reactions [41]. Its material is abstract, conceptual, and full of calculations [42]. The characteristics of this material certainly make students experience learning difficulties because it cannot be described directly and requires students to be able to think down to the microscopic level [43]. The microscopic level is the ability to think to explain and explain observed phenomena so that they become something that can be observed [44]. The aim is to need microscopic-level thinking skills to avoid misunderstandings regarding thermochemical material [45]. Based on research stated that 42.90% of students experienced misunderstandings in thermochemical material because they often interpreted it themselves [46], causing the understanding of thermochemical concepts embedded in students to violate actual thermochemical concepts [47]. Another factor that causes misunderstandings regarding thermochemistry among students is the lack of appropriate methods teachers use in learning. This method makes students feel bored, and students' learning motivation decreases and becomes monotonous [48], [49].

A way of learning that can engage students enthusiastically, innovatively, and meaningfully by implementing a contextual approach to learning [50]. The contextual approach is a learning model that does not just remember or memorize but understands and links the knowledge received with knowledge and experiences from students' daily lives [51]. The contextual approach is a learning theory that assists teachers in connecting the material they teach with real-world contexts and motivates students to connect their knowledge and its practical use in their lives [52]. Applying a contextual approach to learning aims to train students to be brave and able to confidently express their opinions so that misconceptions can be avoided [53]. Apart from that, the learning process with a contextual approach can be carried out in various places, contexts, and settings so that students do not feel bored while learning. However, to maximize learning, more is needed to use the approach, but it requires learning media that is appropriate to that approach. Teaching media in animated videos will make it easier for teachers to provide an overview of abstract material. It can reach all students in the class, thereby saving time and money [54].

Research related to the development of powtoon-based learning media has been widely conducted, including the development of powtoon media learning for the material of linear equations system two variables [16], development of video media based on powtoon in science subjects [21], development of animation video media using powtoon software [25], development of powtoon animation learning media in mathematics subjects [26], development of interactive multimedia powtoon in economic subjects [30]. However, no study yet examines the development of contextual-based powtoon learning media to enhance learning motivation.

Based on the description above, this research aims to produce contextual-based Powtoon animation videos on thermochemical material. Different from existing research, which does not integrate a contextual basis into Powtoon animation videos specifically for thermochemical material, this research has the novelty of using contextually based Powtoon animation videos for thermochemical material, with the hope of facilitating and increasing students' learning motivation on thermochemical material. Apart from that, it is also expected that this research can be used as an alternative medium for teachers to relate

the material to everyday life so that students can more easily understand thermochemical material.

2. METHOD

This research was designed as Research and Development research, which aims to produce products that can increase student learning motivation. The product developed is a contextual-based Powtoon animation video on thermochemical material. This research uses a 4-D model, which includes Defining, Designing, Developing, and Disseminating [55]. This research was conducted at MAN 1 Sleman and MA Nurul Ummah with class XI MIPA as the research subject with 30 students. Four development stages were used in this research, as illustrated in Figure 1.
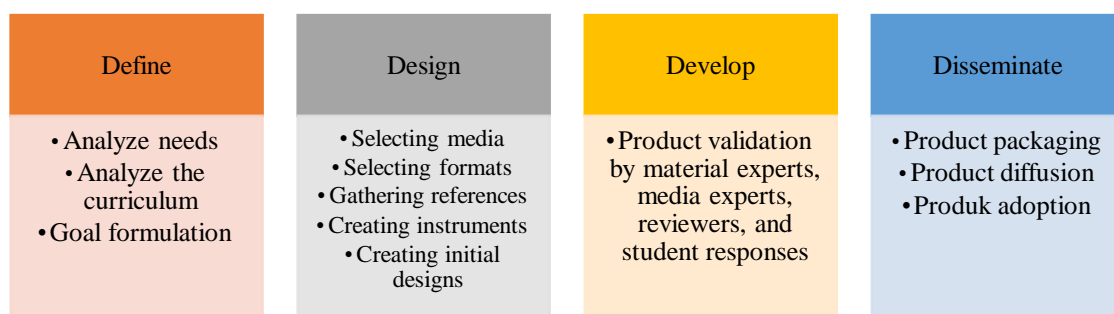
Define	Design	Develop	Disseminate
• Analyze needs • Analyze the curriculum • Goal formulation	• Selecting media • Selecting formats • Gathering references • Creating instruments • Creating initial designs	• Product validation by material experts, media experts, reviewers, and student responses	• Product packaging • Product diffusion • Produk adoption

Figure 1. Development Stages of the 4-D Model

The Define stage was obtained through interviews and observations of chemistry teachers and class XI MIPA students. The Design Stage is used to create a video, which includes processes such as media selection, format, reference collection, instrument creation, and basic design creation. The development stage is carried out to produce a video that has been revised based on input from experts and students as responders to the footage being developed. The Dissemination stage. Products can be packaged well to increase usability and effectiveness using YouTube and Google Drive platforms. In addition, more parties can use research products if the consequences of the outcome are packaged well. Meanwhile, the diffusion and adoption steps involve distributing the product to chemistry teachers and class XI MIPA students so they can use it, study it, and adopt it during learning.

The data in this research consists of validation results carried out by material experts, media experts, and reviewers/chemistry teachers regarding the product's feasibility. Response sheets filled out by students as respondents regarding the product being developed. The instruments used in this research were a product quality assessment validation sheet based on a Likert scale and a student response sheet based on a Guttman scale. The qualitative evaluation assessment was converted into a quantitative assessment based on a Likert scale, which was carried out using technical data analysis of product quality assessment results [56]. Next, the average value for each review aspect is calculated from the scores obtained. The following formula is used to calculate the average value:

$$\bar{X} = \frac{\Sigma x}{n} \qquad (1)$$

Information :
$\bar{X}$: Average score
Σx : Total score of each validator
n   : Number of appraisers [57]

The score obtained is calculated as the average score for all aspects of the validator. The resulting scores were converted into qualitative data using ideal assessment criteria [58], as in Table 1.

Table 1. Ideal Assessment Category Criteria [58]

Quantitative (i) Score Range	Qualitative Category
$Xi + 1.8\ SBi < X$	Excellent
$Xi + 0.6\ SBi < X \leq Xi + 1.8\ SBi$	High
$Xi - 0.6\ SBi < X \leq Xi + 0.6\ SBi$	Moderate
$Xi - 1.8\ SBi < X \leq Xi - 0.6\ SBi$	Low
$X \leq Xi - 1.8\ SBi$	Poor

Information:
Xi   : Average ideal score = 1/2 (ideal max score + ideal min score)
SBi   : Standard deviation of ideal score = 1/6 (ideal max score – ideal min score)
X   : Actual score

By using the Guttman scale, descriptive data from student responses is converted into quantitative data for data management. The results are converted into ideal percentages using the formula below [59].

$$\text{Ideal Percentage} = \frac{\text{Achieved score}}{\text{Maximum ideal score}} \times 100\% \qquad (2)$$

3. RESULTS AND DISCUSSION

The product developed in this research is a contextual-based Powtoon animation video on thermochemical material to increase student learning motivation. Animation is a learning medium because it can strengthen motivation and attention and make it easier for students to understand the material. This research uses a 4-D model with the following stages.

3.1 Define Stage

The define stage includes needs analysis, curriculum analysis, and goal formulation. Interviews with chemistry teachers and students of class XI MIPA MAN 1 Sleman and MA Nurul Ummah were used to conduct a need analysis. This interview aims to discover problems in learning and the products needed during the learning process. Based on the discussions and observations, information was obtained that the learning media used were textbooks, student worksheets, and PowerPoints. Teachers used conventional methods in the learning process that caused boredom. Teachers also employed learning media such as YouTube videos. However, the videos did not match the material presented in class and looked monotonous; thus, videos were rarely used during learning. The interview results also stated that students felt bored when learning. It was easier to understand the material when it was related to everyday life. The next step was curriculum analysis by analyzing the chemistry curriculum in the independent curriculum. Next, determine the learning objectives to be achieved in the lesson. The material used in this research was thermochemical.

These findings show that students are very bored when learning in class and have difficulty understanding thermochemical material. Therefore, these problems motivated researchers to develop contextual-based Powtoon animation videos, which are used as fun learning media to increase students learning motivation.

3.2 Design Stage

Prototyping is part of the design stage. This stage includes selecting media and formats, collecting references, making instruments, and making initial designs. The first step at the design stage is determining media needs following the interview results. The media developed is a contextual-based Powtoon animation video on thermochemical material. The animated video format used consists of opening, content, and closing. References for thermochemical material were obtained from reference books, websites, and YouTube. The content of the animated video consists of twelve sub-chapters, namely understanding thermochemistry, systems and the environment, enthalpy and enthalpy changes, exothermic reactions and endothermic reactions, thermochemical equations, standard enthalpy changes, standard formation enthalpy changes, standard decomposition enthalpy changes, standard combustion enthalpy changes, changes standard neutralization enthalpy, how to calculate enthalpy changes and examples of the application of thermochemistry in everyday life. The next step is to create a product quality assessment instrument using a Likert scale and a student response instrument using the Guttman scale. Aspects that will be assessed from the product include material, video, contextual elements, and motivation. The final step at the design stage is creating an initial design plan to simplify the development of the video.

The initial design of learning media was made with the help of hardware and software. The hardware used at the design stage is laptops and smartphones. Meanwhile, the software used in this research includes Powtoon, Canva, Capcut, YouTube, and Google Drive. Because there are so many helpful animation support features, Powtoon is used to create animated videos. Canva is used to create material components to support animation. Capcut is used for sound recording and combining audio and visuals from animated videos that have been compiled. YouTube exports animated videos from the Powtoon software and disseminates the products created. Google Drive, meanwhile, serves as a repository for essential learning media assets and animation video storage. It was removing videos or image backgrounds using the supporting websites www.remove.bg and www.unscreen.com to shorten the link www.bit.ly.com.

Making a video begins with pre-production, namely creating a script that describes the scenes and dialogue in the video. Next, sound recording according to the script plan using the Capcut application to clear and maximize good quality, as seen in Figure 2.
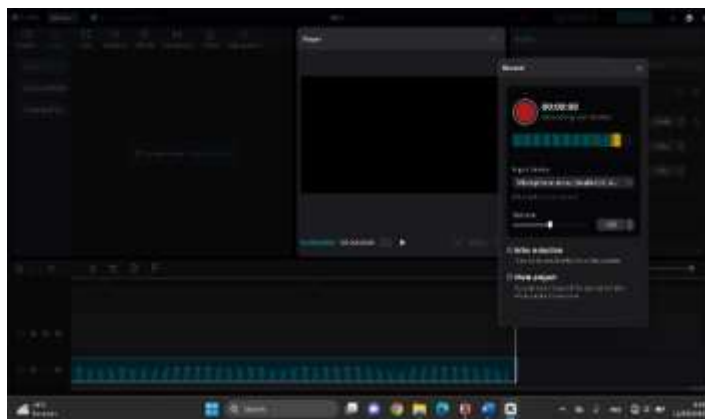

Figure 2. Voice Recording in Capcut

Then, make a video by inserting the sound recording into the Powtoon slide and placing the animation and Powtoon features according to the sound recording so that the sound is in harmony with the animation display, as seen in Figure 3.

Figure 3. Editing Process in Powtoon

Next, create supporting material components that are not available in Powtoon but are needed in the script design using the Canva website, as seen in Figure 4.
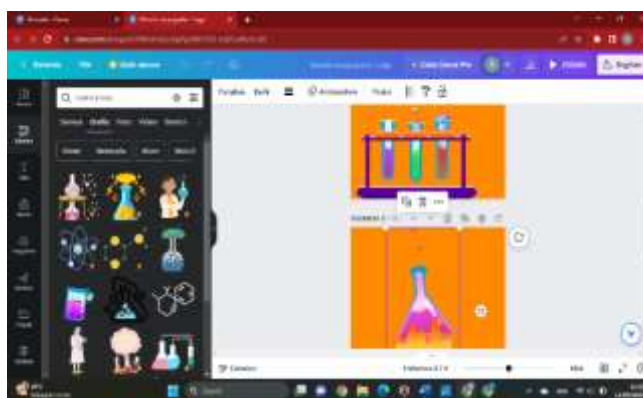

Figure 4. Component Editing Process in Canva

The material supporting components created using Canva are then uploaded to the PowerPoint slide. Next, the animated video that has been made is edited again using the Capcut application. The editing process for the video content is cutting, adding sound effects while aligning them with the video content, and merging the two videos to become one video from the material sub-chapters, as seen in Figure 5.
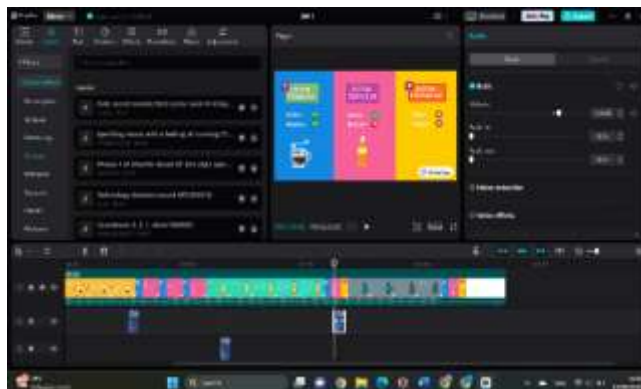

Figure 5. Editing Process in Capcut

The final product produced is a contextual-based Powtoon animation video on thermochemical material for 4-15 minutes. Overall, the video consists of opening, content, and closing. The opening contains an introduction, self-identity, material topic, and

learning objectives. The writing layout, type and size of letters, and transition effects are made as attractive as possible, as seen in Figure 6.

Figure 6. Video Opening Section

The content of the video is an explanation of thermochemical material, starting with an apperception display. Apperception is connected to real-world events to facilitate student's understanding of the material. Apperception is very helpful in providing an initial overview of the material and its application in everyday life [60]. An animated illustration of apperception can be seen in Figure 7.

Figure 7. Apperception Illustration

The content of the video is an explanation of thermochemical material with an animated display that can stimulate students to be active in learning. The contents of the description of thermochemical material can be seen in Figure 8.

Figure 8. Explanation of Thermochemical Materials

The closing section contains a scene showing the video's end with several closing sentences. The closing scene includes a cover, conclusion, credits (creative team), YouTube channel, and Instagram. The closing section can be seen in Figure 9.
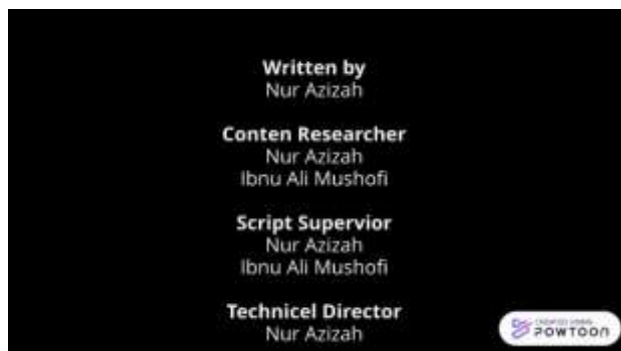
Figure 9. Video Closing Section

After the preparation of the animated video is complete, the final stage is video publication. The product uses mp4 format and has a screen resolution of 1334 $\times$ 750. The video will be apparent because the screen resolution is standard High Definition (HD). Ease of accessing videos via YouTube and Google Drive. After that, the product is corrected by the supervisor. Based on the improvement findings, a research instrument was then created. The instruments developed include two types, namely product quality assessment instruments and student responses. The Likert scale produces product quality assessment instruments, while the Guttman scale is used to construct student answer instruments. Product quality assessment includes material, video, contextual elements, and motivation. After the instrument is created, the following process is to validate it with an instrument expert.

3.3 Development Stage

At this stage, the developed animated video is equipped with an audio explanation of the material and animated characters, which clarifies the thermochemical material delivery. Information regarding thermochemistry is presented in depth, in detail, and with a contextual perspective. Students can learn subjects and how to apply them in real-world situations using contextual methods. Based on literature studies, there are several studies on creating animated video learning media [61]-[63]. Based on related studies, creating animated video learning media that utilizes the Powtoon website and contextualizes thermochemical material is still rare. In addition to related research, the creation of this product provided contextual content. In addition to related research, the design of this product offered contextual content.

Constructivism, asking, discovering, learning communities, modeling, reflection, and authentic assessment are the seven elements that make up contextual content [64]. The constructivism component in this animated video is presented as a problem that students must understand, as in Figure 10.

Figure 10. Component View of Constructivism

Next, the questioning component is presented as questions that encourage students to think about how to calculate enthalpy changes, as in Figure 11.

Figure 11. Component View of Ask

The discovery component is presented as observations of the thermochemical concept discovery process, as in Figure 12.

Figure 12. Component View of Discover

Next, the learning community component is adapted as assignments or materials that can be discussed with friends in class. The discussion material contained in this animated video is the application of thermochemical science in everyday life and problems. The questions consist of textual knowledge from applying thermochemical science in everyday life. The questions are presented via Google Form, which has been introduced in the video as a link, as in Figure 13.

Figure 13. Component View of Community

The modeling component is presented in the form of example questions that students are expected to be able to work on the questions given, as in Figure 14.

Figure 14. Component View of Modeling

Next, the reflection component is presented as a reflection or a summary of the material, as in Figure 15.

Figure 15. Component View of Reflection

The final contextual component is an authentic assessment, which adapts the form of data collection by practicing questions to see student development, as in Figure 16.
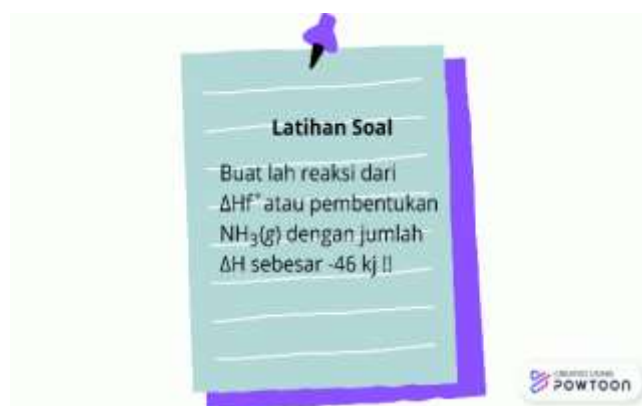

Figure 16. Component View of Assessment

After the preparation of the animated video is completed and published, the product is verified and evaluated for quality based on input from material experts, media experts, and reviewers/chemistry teachers. Table 2 Displays the findings from the product quality evaluation and student responses.

Table 2. Product Quality Assessment Results and Student Responses

Evaluation	Assessment Aspects	∑ Score	∑ Ideal Maximum Score	Ideal Presentation	Category
Material expert	Material	9	10	93%	Excellent
	Contextual	10	10		
	Motivation to learn	9	10		
Media expert	Videos	19	20	95%	Excellent
Reviewer/ Chemistry teacher	Material	9	10	90%	Excellent
	Contextual	8	10		
	Motivation to learn	9	10		
	Videos	19	20		
Student	Interest	9	10	90%	Excellent
	Attention	9	10		

Table 2 shows the results of the contextual-based Powtoon animation video assessment on thermochemical material obtained. The material expert received an ideal percentage of 93% in the excellent category, so the material in the Powtoon video is suitable for classroom learning. The results of the material expert assessment following research stated that the material in contextual-based Powtoon animation videos is of excellent quality, so it is suitable for classroom learning [65]. Media experts received an ideal percentage of 95% in the excellent category, making it suitable for classroom learning media. The results of the media expert's assessment align with research that shows that the quality of contextual-based Powtoon animation videos is in the perfect category to be used as alternative media in classroom learning [66].

Furthermore, the video quality assessment from the reviewer/chemistry teacher resulted in an ideal percentage of 90% in the excellent category, so it is suitable for use in the learning process by teachers and students. According to reviewers/chemistry teachers, the products developed are the materials and curriculum used to increase students' understanding and motivation to learn through the animations presented in Powtoon videos. The following process is to find out students' responses to the products that have been developed. 30 XI MIPA students completed a Google Form questionnaire using the Guttman scale to collect student responses. The percentage obtained is 90% in the excellent category. This proves that students' curiosity about the products being made gave a good response; it is proven that students prefer and easily understand the material presented in the video. In line with research results, students will understand abstract concepts better if they apply contextual rather than conventional methods [67].

Based on the assessments of material experts, media experts, chemistry reviewers/teachers, and student responses, it can be concluded that contextually based Powtoon animation videos on thermochemical material are suitable for alternative learning media in the classroom. The aim is to increase students' motivation and understanding in studying thermochemical chemistry.

3.4 Dissemination Stage

The goal of the dissemination stage is to make the product's benefits available to more people. Product packaging is completed by uploading an animated video to a YouTube account so students can see it. Apart from that, product packaging also uses Google Drive. Research products are distributed on a limited basis only to chemistry teachers and class XI MIPA students at MAN 1 Sleman, MA Nurul Ummah, YouTube, and Instagram. Product dissemination ensures that other people can use that animated video learning media.

4   CONCLUSION

The product developed is a contextual-based Powtoon learning medium on thermochemical material. The evaluation results from material experts obtained a score of 93% in the excellent category, 95% in the excellent category from media experts, and 90% in the excellent category from reviewers/chemistry teachers. The product is very suitable for use, with an optimal percentage of 90%, according to the responses of XI MIPA students, and is rated as excellent. Therefore, a contextual-based Powtoon animation video on thermochemical material to increase the learning motivation of MAN class XI MIPA students is worthy of being used as a learning medium that can improve students' understanding and learning motivation.

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