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Development of PowToon-Based Audio-Visual Media in Chemical Bonding Materials

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Abstract: *This research was conducted at SMA Negeri 11 Medan with the background being that the teacher had never developed audio-visual media on chemical bonding material with a variety of learning media. This study aims to find out how the needs of teachers and students for learning media, determine the feasibility of media developed on chemical bonding material and to find out how students respond to this development. The type of research used is research and development (R&D) using the 4D model (Define, Design, Development, Disseminate). The data that has been obtained through the questionnaire instrument for the needs of teachers and students is analyzed using the proportion formula and then described. Based on the validation results of the animated video learning media that had been developed by 22 validator teams, an overall average score was obtained with a total proportion of 90.04% with the qualification "very feasible". The results of the trial on students through the distribution of response questionnaires obtained a score with a total proportion of 90.63% with the qualification "strongly agree". Overall, it can be interpreted that the development of PowToon-based audio-visual media on chemical bonding materials has been categorized properly.*

Keywords: *media; audio-visual; PowToon; chemical bonding*

INTRODUCTION

Education is very important and cannot be separated from life. The importance of education, so that it becomes a benchmark for the progress of a nation (Tanjung & Nababan, 2019). Education and learning are one unit that cannot be separated from one another (Ariyana & Sumiyani, 2019). Learning is basically an attempt to direct students into the learning process so that independent learning can obtain learning objectives in accordance with what is expected. Freedom of learning

is freedom of thought (Sudaryanto et al., 2020).

Law of the Republic Indonesia Number 20 of 2003 concerning the National Learning System said the education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and state. In accordance with the objectives stated in the Law of the Republic Indonesia Number 20 of 2003 concerning the National Learning

System which states that the compulsory national education system can ensure equal distribution of learning opportunities, increase the quality and relevance and efficiency of education management to overcome challenges with the demands of transforming local, national life, and globally so that educational reform is needed in a planned, directed, and sustainable way. In accordance with the aim of education in improving human resources in the face of rapid developments in communication and information technology, the Ministry of Education continues to update the education system. One of the updates is the change of the Kurikulum 2013 into an Kurikulum Merdeka.

Quoted from the Ministry of Education and Culture website, the Kurikulum Merdeka is a curriculum with diverse intra-curricular learning where the content will be optimized so that students have enough time to explore concepts and strengthen competencies. The aim of the Kurikulum Merdeka is to create a fun education for students and teachers. Therefore, the teacher must have a learning method that can make learning objectives can be achieved properly. In classroom learning, in addition to the right learning method, teachers also need to use the right learning media. Maswan & Muslimin (2017) say that in the world of education, technology and education are like two sides of a coin that cannot be separated. Technological advances with various other consequences also demand a greater role in the world of education, especially for teachers to apply various techniques, methods, and approaches in transforming material or values to students.

PowToon is an online-based service to create a presentation that has very interesting animation features, including handwritten animation, cartoon animation, and more lively transition effects and very easy timeline settings. PowToon can be accessed by anyone including teachers and students and how to make animated videos is quite easy because the features available are quite complete, such as handwritten animation, animated cartoons,

and livelier transition effects and very easy timeline settings (Kholilurrohmi, 2017).

Chemistry is one part of the natural sciences which is taught at the high school to university level, which requires an understanding of the concept. One of the chemistry subjects studied in class X SMA/MA is chemical bonds. When researchers did a Teaching Assistant at SMA Negeri 11 Medan, researchers saw that the teachers at this school had not utilized technology in learning, such as the use of instructional media in teaching and learning activities, especially in chemistry lessons. The purpose of this research is to create audio-visual interactive learning media and test the feasibility of interactive learning media based on expert judgment, chemistry teachers, and student responses. So, this research intends to carry out a PowToon-Based Audio-Visual Media Development on Chemically Bonded Materials.

LITERATURE REVIEW

The word media comes from the Latin medius which literally means "middle, intermediary or introduction". In Arabic, the media is an intermediary or delivery of messages from the sender to the recipient of the message (Azhar Arsyad, 2013). Media is an introduction to messages from the sender to the recipient of the message, thus the media is a vehicle for distributing learning information or distributing messages (Rusman, et al, 2013). Learning media is media used as a tool to convey material or information from teachers to students. Learning media can be in the form of audio media, visual media, or video. Learning media in the learning process aims to equalize students' perceptions of the material presented (Puspitarini & Hanif, 2019).

Learning media is one example of external factors that can be used to improve learning efficiency. This can be achieved because learning media can overcome various obstacles, including: communication barriers, limited classrooms, passive student attitudes, student observations that are less uniform, the

nature of learning objects that are less special so that it is not possible to study without media, remote learning places and etc. (Asmara, 2015).

Choosing media should not be done arbitrarily but based on certain criteria. Mistakes in the selection, both the selection of the type of media and the choice of topics to be mediated, will have long consequences that we do not want in the future. There are many questions that we must answer before we make a particular choice of media (Tambunan et al., 2021). Although the use of the PowToon animation video application is simple and uncomplicated, if teachers and students want to use this learning media, at least it requires user skills to operate technological devices such as computers/laptops and also the internet. Another obstacle that can also hinder the use of PowToon learning media is the cost that is also required to access the internet (Deliviana, 2017). Learning media is used as a learning tool in schools to improve the quality of education and is used as a useful intermediary to increase effectiveness and efficiency in achieving goals (Ruhban, et al, 2017). Learning media is everything that can be used to channel the sender's message to the recipient, so that it can stimulate the thoughts, feelings, concerns, and interests of students to learn (Tafonao, 2018).

According to Shannon Mershand (2014), PowToon is Web-based animation software that allows you to create animated presentations quickly and easily with your students by manipulating pre-created objects, imported images, provided music and user created voiceovers. Furthermore, Shannon Mershand (2014) also stated, PowToon can be used by educators to create animated presentations of content for students to view. Multimedia has its own charm and can help teachers in the learning process and improve teacher-student interactions in the classroom. The learning process takes place actively by involving students (Yulhendri et al., 2022). One of the media that can be used by the teacher as a teaching aid is video animation.

Animated video is a series of images that move to form a single unit. Animated videos are used because they can generate student interest and increase student motivation in accepting learning. There are so many applications that can be used to create animated videos for learning media, one of which is PowToon (Farizi et al., 2019). PowToon can make animated videos more interesting, and it can be described that chemistry is very close to our lives. With this interactive media, students can learn independently because students can operate the media independently (Deliviana, 2017).

Chemical bonding material is usually grouped into four sub-themes, namely ionic bonds, covalent bonds, metallic bonds, and intermolecular forces. Chemical bonding material explains how atoms form bonds, both with the same atom and with different atoms. Chemical bonds occur because a group of atoms shows a more stable unity because they have a lower energy level than the energy levels of the constituent atoms in a separate state (Widarti, et al., 2018).

METHODS

The type of research used in this study is the type of Research and Development (R&D). Research and Development is a research method used to produce certain products, and measuring the effectiveness of these products (Fransisca, et al., 2018). The learning media in this study were compiled and developed based on the 4D model which consisted of four stages, namely define, design, develop, and disseminate (Rajagukguk, et al., 2018). This research was be conducted at the SMA Negeri 11 Medan which is located at Jl. Pertiwi No.93 Medan, Bantan, Tembung District. Medan City, North Sumatra 20224. This research was be conducted in Odd Semesters, 2022/2023 Academic Year. Population in this study were students of class X MIPA 3 SMA Negeri 11 Medan, the number of students 32 people for the academic year 2022/2023. Sampling using random sampling technique.

Instrument used was a questionnaire in the form of a checklist sheet with a Likert scale. Questionnaires are used to obtain data on the quality of instructional media aimed at media experts, material experts, chemistry subject teachers and students. With a Likert scale, the variable to be measured is translated into an indicator variable. Then the indicator is used as a starting point for compiling instrument items which can be in the form of questions or statements.

Product quality assessment data were obtained from the results of questionnaires by media experts, material experts, chemistry teachers and students. The data will then be analyzed with the following steps:

a. Calculate the average score of each indicator with the formula:

$$\bar{X} = \frac{\sum x}{N}$$

Information:
$\bar{X}$ = Average score
$\sum x$ = Total score
N = Number of trial subjects

b. The total assessment score obtained is entered into the Likert scale category level with the formula:

$$P_k = \frac{s}{N} x 100\%$$

Information:
P_k = Eligibility scale category value
s = Number of selected scores
N = Total score ideal

The value of the product feasibility scale category as a result of validation by material experts, media experts and chemistry teachers as follows:

Table 1. Product feasibility scale

Eligibility Scale	Criteria
76% - 100 %	Very worth it
51% - 75%	Worthy
26% - 50%	Decent enough
< 25%	Not worth it

The value of the student response assessment category is as follows:

Table 2. Student Response Assessment

Eligibility Scale	Criteria
78% - 100%	very agree
52% - 77%	Agree
26% - 51%	Not agree
0 – 25%	Strongly disagree

RESULT AND DISCUSSION

The defining or needs analysis stage is carried out through an analysis of the needs of teachers and students. The teacher never uses the media when teaching chemistry, especially chemical reactants, the teacher only uses blackboards and books provided by the school. In fact, it is very important for teachers to develop learning media to increase students' motivation and interest in learning. After knowing the needs of teachers and students at the analysis stage, the researchers then carried out a design-to-design PowToon-based audio-visual media.

The development stage is the stage that is carried out after the design stage. This stage is the stage of the process of making audio-visual media in the form of videos according to the procedures that have been designed. Products that have been developed are then evaluated by the validator team. The products that have been developed are validated by 2 validators who are lecturers from the Chemistry Education study program, Faculty of Mathematics and Natural Sciences Universitas Negeri Medan and by 20 chemistry teachers spread across North Sumatra.

At the development stage, an evaluation is carried out based on the assessment given by the supervisor and the validator team on the audio-visual media created and developed by the researcher in order to produce a better and more attractive product by revising the results of the media validation based on the validator team's suggestions. Validation aims to determine the final development results and suggestions from the validator team and

measure the validity of the media that has been made by researchers.

Material experts in validating PowToon-based audio-visual media on chemical bonding material are 2 expert lecturers. The media expert's assessment is based on the feasibility of material eligibility and language eligibility. The results of the media assessment can be seen in the Table 3.

Table 3. Material Expert Validation Results

| Aspects | Validators | | Average (%) |
	Lecturer 1	Lecturer 2	
Material Eligibility (%)	88.89	88.89	88.89
Language Eligibility (%)	87.50	81.25	84.38
Average Score (%)	88.19	84.37	86.63
Criteria	Very Feasible	Very Feasible	Very Feasible

Based on Table 3 above, the data from the results of the material validation assessment on audio-visual media in the form of animated videos obtained "very feasible" results with a percentage of 86.63%. Material validation includes two aspects of assessment, namely the depth aspect of the material and the language feasibility aspect. It is known that the material feasibility aspect obtained an average score of 88.89% was in the "very feasible" criteria and the language feasibility aspect obtained an average value of 84.38% was in the "very feasible" criteria.

Material experts in validating PowToon-based audio-visual media on chemical bonding material are 2 expert lecturers. The results of the media assessment can be seen in the Table 4.

Table 4. Media Expert Validation Results

| Aspects | Validators | | Average (%) |
	Lecturer 1	Lecturer 2	
Influence on the quality of learning (%)	93.75	100.00	96.87
Software engineering (%)	95.00	95.00	95.00
Visualization (%)	85.00	100.00	92.50
Average Score (%)	91.25	98.33	94.79
Criteria	Very Feasible	Very Feasible	Very Feasible

Based on Table 4 above, the data from the results of the media validation assessment obtained a proportion of 94.79% with the "very feasible" criteria. Shows that the aspect of influence on the quality of the learning value is an average of 96.87% with the "very feasible" criteria, in the software engineering aspect the average score is 95.00% with the "very feasible" criteria and the visualization aspect obtains an average score of 92.50% was in the "very feasible" criteria. Based on this assessment, it can be interpreted that the material presented in the PowToon-based audio-visual media that is being developed is included in the category that is very feasible for use as learning media.

The teacher acts as a material validator and media validator. The feasibility assessment of PowToon-based audio-visual media is based on the feasibility of the aspects of material feasibility, language feasibility, influence on the quality of learning, software engineering and visualization. This media will be assessed by 20 chemistry teachers spread across schools in North Sumatra. The results of the media assessment can be seen in the Table 5.

Table 5. Teachers Validation Result

Aspects	Percentage of Assessment Aspects (%)		
	Each of aspect	Overall aspect	Criteria
Material Eligibility	89.17		
Language Eligibility	90.31		
Influence on the quality of learning	89.06	89.38	Very Feasible
Software engineering	88.25		
Visualization	89.75		

Based on Table 5 above, the data from the results of the validation by chemistry teachers on audio-visual media in the form of animated videos obtained "very feasible" results with a percentage of 89.38%.

The following is a summary of the results of material and media validation carried out by 22 validators in the Table 6.

Table 6. Summary of the Results Validation

Aspects	Validators		Average (%)
	Lecturers	Teachers	
Material (%)	86.63	89.74	88.18
Media (%)	94.79	89.02	91.90
Average Score (%)	90.71	89.38	90.04
Criteria	Very Feasible	Very Feasible	Very Feasible

Based on Table 6 the audio-visual media that has been developed is declared "very feasible" with an eligibility percentage of 90.04%. Media is designed with an attractive appearance so that it can help students follow the learning process well. the average material validation value with a percentage of 88.18% was in the "very feasible" criteria. For media validation, the average with a percentage of 91.90% was in the "very feasible" criteria. This percentage value was obtained from the results of the validator team's suggestions and comments on the development of the audio-visual media being developed.

After being validated by material expert lecturers, media experts and 20 chemistry teachers spread across North Sumatra and made several revisions according to the suggestions given. The media will then be distributed to students. This stage was carried out to get student responses to the PowToon-based audio-visual media that had been developed, suggestions and comments from students by giving a questionnaire or questionnaire to students to fill out.

Animated videos can show abstract material to be more real. Student response questionnaire data can be seen in Table 7.

Table 7. Student Response

Statement	Percentage (%)	Overall Percentage (%)	Criteria
1	88.84		
2	88.28		
3	92.97		
4	87.50		
5	92.97	90.63	Strongly agree
6	92.19		
7	92.19		
8	92.19		
9	87.50		
10	90.63		

Based on Table 7 above, there are 10 (ten) statements that are used to see students' responses to the audio-visual media being developed. The results of the responses obtained from 32 students obtained a score of 90.63% with the criterion "strongly agree" through filling out the response questionnaire given by the researcher. The use of video in learning activities can make students motivated to learn, make it easier for students to understand the contents of learning material and create new learning methods so that they don't bore students in participating in the learning process.

CONCLUSION

A needs analysis is carried out through the distribution of teacher needs questionnaires and student needs which are distributed via the Google form. Based on the results of the teacher needs analysis, it shows that the chemistry teacher at the school has never developed audio-visual media in the learning process. Teachers still tend to use the lecture method and do not use media in teaching chemical bonding. Based on the results of the analysis of the needs of students, students gave positive responses which explained that they needed learning media in the learning process. Based on the results of material and media validation by 22 validator teams it showed an overall average percentage of 90.04% with the criteria of "very feasible" for the development of PowToon-based audio-visual media on chemical bonding material at SMA Negeri 11 Medan. Based on the results of the student response questionnaire in class X MIPA 3 SMA Negeri 11 Medan towards the development of PowToon-based audio-visual media, the percentage was 90.63% with the criterion "strongly agree".

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