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# Development of Animation Media based on Multiple Representations in Colloid Flipped Classroom Learning

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**Abstract: Development of Animation Media based on Multiple Representations in Colloid Flipped Classroom Learning.** This research aims to develop and test the feasibility of an animation media based on multiple representations in colloid using flipped classroom learning. The type of this research is research and development with 4-D model (*define, design, develop, and disseminate*) which carried out up to the development stage (*develop*). The feasibility test of an animation video consists of material and media validity test and product trials. Data of feasibility test were analyzed using quantitative descriptive analysis. The results of the material and media validity tests were 82% and 83%, which indicates that the animation video was included in the very feasible criteria and the results of product trials were 85% which indicates that user responses were included in the very good criteria. The results of the feasibility test show that an animation media based on multiple representations was declared feasible for use in colloid flipped classroom learning.

**Keywords:** Animation Media, Multiple Representation, Colloid, Flipped Classroom Learning

***Abstrak: Pengembangan Media Animasi berbasis Multipel Representasi pada Pembelajaran Flipped Classroom Materi Koloid****. Tujuan dari penelitian ini adalah mengembangkan dan menguji kelayakan media animasi berbasis multipel representasi pada pembelajaran flipped classroom materi koloid. Penelitian ini merupakan jenis penelitian dan pengembagan (Research and Development/R&D dengan model 4-D (define, design, develop, disseminate) yang dilakukan hingga tahap develop (pengembangan). Uji kelayakan produk video animasi terdiri dari uji validitas materi dan media serta uji coba produk terbatas. Data hasil uji kelayakan dianalisis menggunakan analisis deskriptif kuantitatif. Hasil uji validitas materi dan media berturut-turut sebesar 82% dan 83% yang menunjukkan produk video animasi termasuk dalam kriteria sangat layak dan hasil uji coba produk terbatas sebesar 85% yang menunjukkan respon pengguna produk video animasi termasuk dalam kriteria sangat baik. Hasil uji kelayakan menunjukkan bahwa media animasi berbasis multipel representasi dinyatakan layak digunakan pada pembelajaran flipped classroom materi koloid.*

***Kata Kunci:*** *Media Animasi, Multipel Representasi, Koloid, Pembelajaran Flipped Classroom*

## • INTRODUCTION

Chemistry is a branch of natural science that studies the characteristics, structure, and changes of matter, as well as laws, concepts, and theories that explain these changes (Effendy, 2016). Chemistry has several characteristics that distinguish it from other sciences. According to Sunyono (2012), the most basic characteristics of chemistry are composed of macroscopic, submicroscopic, and symbolic representations.

Understanding of chemistry requires three forms of representation that are always related, namely macroscopic, submicroscopic, and symbolic. Macroscopic representation is the observation of matter directly through the five senses relating to real phenomena. Submicroscopic representation is the explanation of matter through the image of particles, including atoms, ions, and molecules. Symbolic representation is the use of symbols, images, graphs, formulas, and chemical equations (Sunyono, 2015; Cheng & Gilbert, 2009).

In general, the learning of chemistry emphasizes more on the explanation of concepts macroscopically, while explanations at the submicroscopic and symbolic levels are more rote. Some research results have shown this fact. Herawati (2013) showed that the learning of chemical changes or reactions tends to be explained only at the macroscopic level so that students cannot describe how the processes and structures of the reacting substances. Afriansi and Nasrudin (2014) showed that the learning of colloid that should be explained by connecting the three levels of representation but is only explained at the macroscopic level so that students have difficulty in understanding the concept of colloid and misconceptions at the submicroscopic level.

Understanding the abstract concept of chemistry requires an effort to make the abstract concept more concrete, such as using learning media that relate the three representations in chemistry (Mashami & Ahmadi, 2015). The use of all three representations in chemistry is known as multiple representations. Multiple representations are methods of explaining chemical concepts through representations in a macroscopic, submicroscopic, and symbolic (Jonsoon, 2009).

Colloid is one of the topics of chemistry at the high school level that contains abstract concepts (Pradita, 2015). Concepts in colloid includes the characteristics, types, properties, and manufacture of colloid. Abstract concepts in colloid that require explanation using multiple representations are colloidal characteristics and their application to everyday life (Raida, 2019).

One of the learning media that is easy to use to explain colloid through multiple representations is animation media. Animation media is a media in the form of models or artificial images of real phenomena accompanied by transitions or movements (Ninuk, 2014). Animated media can be created by combining images (visuals) and sounds (audio) to explain the subject matter (Warsita & Bambang, 2011). The results of research by Rosyidah and Winarni (2016) showed that the use of animation media in learning can make students easier to understand concepts and keep concepts in their memory in oder to the learning outcomes in the cognitive, affective, and psychomotor become better.

The results of observations at SMAN 1 Ngunut Tulungagung about colloid learning showed that the learning methods used by teachers were lectures, discussions, questions and answers using learning media in the form of electronic worksheet (e-LKPD). However, there are some problems experienced by teachers in using these media. *First*, teachers cannot be sure that who work on the e-LKPD are really students themselves or others. *Second*, students work on e-LKPD not on time. Therefore, one of the efforts that is expected to overcome the teacher's problem is the use of flipped classroom learning.

Flipped classroom learning is the implementation of teaching and learning activities which are partly carried out in the classroom (face-to-face) and some are carried out outside the classroom (online). Online learning activities outside the classroom are carried out to prepare for learning in the classroom by giving assignments, while learning activities in the classroom are carried out to discuss these assignments by explanations of concepts at a higher level through question and answer, completion of application questions, and reviews (Baeplar, 2014). Through flipped classroom learning, there will be more time in the classroom to process further material in the form of practice questions or other activities. Flipped classroom learning can accommodate differences in motivation, the ability to understand concepts, and students' prior knowledges (Francisca & Yulius, 2016). The results of research by Herry and Sutama (2016) showed that flipped classroom learning makes learning more effective and there is an average increase in students' creativity,

responsibility, and learning ability

## • METHOD

The type of this research is research and development (R&D) with 4-D model, namely define, design, develop, and disseminate, which carried out up to the development stage (develop). The purpose of this research is to develop and test the feasibility of an animation media in the form of animation video based on multiple representations in colloid as a media for student learning independently in flipped classroom learning. The feasibility test of an animation video consists of material and media validity test and product trials.

The product trials sample in this research consisted of 36 grade 11 science students of SMAN 1 Ngunut Tulungagung in the 2020/2021 school year. Sampling in this research was taken by *simple random sampling* technique, namely *probability sampling*. *Population* in this research consisted of ±216 grade 11 science students of SMAN 1 Ngunut Tulungagung in the 2020/2021 school year.

### Data Analysis Techniques

The first step in data analysis is that the animation video that has been developed is tested for feasibility, namely material and media validity test. After the animation video was deemed appropriate by the validators, the animation video was trial on a small group students to find out student responses for this animation video. This research instruments are validation sheet and response questionnaire. The validation sheet is used to test the validity of animation video, while the response questionnaire is used for product trial. Data of this research were scores of material and media validity test and scores of student response on product trial which are analyzed using quantitative descriptive analysis.

The statistical formula used in this study include:

### Feasibility Test

Persentage scores of material and media validity test and student response of animation video were analyzed statistically using the formula as follows:

$$Persentage\ Score\ (\%) = \frac{Total\ Score}{Maximum\ Score} \times 100\%$$

(Arikunto, 1996).

The criteria for persentage scores of the material and media validity tests and student response of animation video according to Arikunto (1996) are shown in Tables 1 and 2.

***Table 1.*** *Criteria for Persentage Scores of the Material and Media Validity Tests of Animation Video*

| Persentage Scores **(%)** | Criteria |
|---|---|
| 76 ≤ score ≤ 100 | Very feasible |
| 51 ≤ score ≤ 75 | Feasible |
| 26 ≤ score ≤ 50 | Quite feasible |
| 0 ≤ score ≤ 25 | Not feasible |

***Table 2.*** *Criteria for Persentage Scores of Student Response of Animation Video*

| Persentage Scores **(%)** | Criteria |
|---|---|
| 81 ≤ score ≤ 100 | Very good |
| 61 ≤ score ≤ 80 | Good |
| 41 ≤ score ≤ 60 | Quite good |
| 21 ≤ score ≤ 40 | Less good |
| score < 20 | Not good |

## • RESULT AND DISCUSSION

### Development of Animation Media

The development of animation media based on multiple representations in this research began with the defining stage (*define*), includes: front-end analysis, student analysis, task analysis, and concept analysis. Front-end analysis was carried out through literature studies of articles in several journals that discussed colloid learning, multiple representations in chemistry, animation media, and flipped classroom learning. Student analysis was carried out through interview with grade 11 chemistry teacher of SMAN 1 Ngunut Tulungagung in the 2020/2021 school year because colloid was taught in students grade 11. Task analysis is carried out by determining learning indicators and learning objectives based on colloid learning competence in syllabus. Concept analysis is carried out based on task analysis to find out the concepts in colloids, including the differences of solutions, colloids, and suspensions, definition of colloid, types of colloid, properties of colloid, application of colloid, and manufacture of colloid.

The results of defining stage are used to determine the design of an animation media in the form of an animation video. The design stage (*design*), includes: constructing criterian-refrenced test, media selection, format selection, and initial design. Constructing criterian-refrenced test is carried out to make practice and evaluation questions that will be presented in animation video. The practice questions are in the form of description questions given in each animation video scene, while the evaluation questions are in the form of multiple choice questions given in the end of the animation video. Media selection is carried out to choose the media to be presented in the animation video, in the form of images, text, audio, and animation. Images obtained from relevant sources based on multiple representation in chemistry, while text, audio, and animation were developed by the researcher. Format selection is carried out to determine document format of animation video. The document format used is the MP4 format because it looks quite light, provides high-quality video while maintaining a relatively large and small file size, and is compatible with devices using Windows, Mac-OS, Linux, and Android operating systems so that it can be accessed easily through computers and smartphones. Initial design of animation video was made in the storyboard in Microsoft Word consisting of 58 scenes or slides.

The results of the design stage are used to develop an animation video. The development stage (*develop*), includes making an animation video and feasibility testing of animation video. Animation videos made with Animaker and Wondershare Filmora applications. Animaker application is used to insert animations created on Microsoft PowerPoint and audio created by recording the researcher's voice, while the Wondershare Filmora application is used to edit backsounds. Animation video that have been made are then tested for feasibility through validity tests and product trials to produce final animation video as an animation media based on multiple representations in colloid flipped classroom learning.

### Validity Tests of Animation Media

Validity tests of animation video, including validity tests of material and media. Validity test in this research was carried out on 3 validators consisting of 2 lecturers and 1 teacher who were experts in material and media of these animation video. The material validity test including 6 aspect, namely: competence, depth of material, breadth of material, correctness of material, suitability of animation and material, and evaluation. The media validity test including 3 aspect, namely: software, display, and quality of media. The results of the material and media validity tests of animation video are shown in Tables 3 and 4.

***Table 3.*** *Material Validity Test Results of Animation Video*

| No. | Aspect | Scores | Percentage (%) |
|---|---|---|---|
| 1. | Competence | 49 | 82 |

| | | | |
|---|---|---|---|
| 2. | Depth of material | 51 | 85 |
| 3. | Breadth of material | 146 | 81 |
| 4. | Correctness of material | 52 | 87 |
| 5. | Suitability of animation and material | 163 | 82 |
| 6. | Evaluation | 11 | 73 |
| | **Average Percentage (%)** | | **82** |

***Table 4.*** *Media Validity Test Results of Animation Video*

| No. | Aspect | Scores | Percentage (%) |
|---|---|---|---|
| 1. | Software | 65 | 86 |
| 2. | Display | 288 | 84 |
| 3. | Quality | 61 | 81 |
| | **Average Percentage (%)** | | **83** |

Tables 3 and 4 show that the average percentage scores of material and media validity test results of animation video are 82% and 83%, which indicates that animation video is included in the very feasible criteria. Animation video that has gone through several revisions based on the results of the material and media validity test is final animation video that developed in this research. The display of final animation video is as follows:


**Figure 1. Opening Page**


**Figure 2. Competency Page**

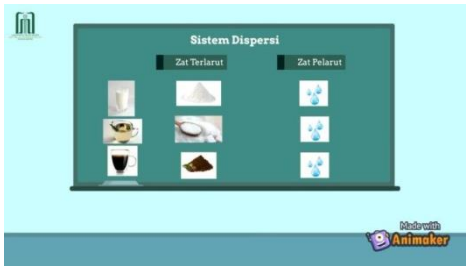


**Figure 3. Dispersion System Page**


**Figure 4. Differences in Solutions, Colloids, and Suspensions Page**


**Figure 5. Types of Colloid Page**


**Figure 6. Properties of Colloid Page**

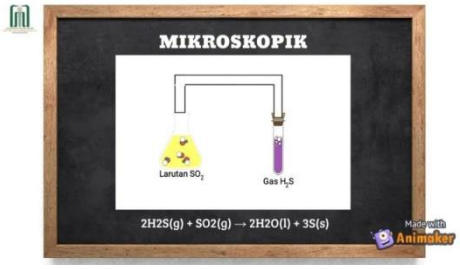


**Figure 7. Manufacture of Colloid Page**


**Figure 8. Application of Colloid Page**


**Figure 9. Summary Page**


**Figure 10. Question Page**



**Figure 11. Closing Page**


**Figure 12. Profile Page**

## Product Trial

The final animation video was trial on a small group of 36 students. The product trial was carried out online by showing the final animation video for students to use as colloidal learning media, then asking students to fill out a response questionnaire after using these animation video.

The response questionnaire of animation video consists of 20 questions that include 3 aspect, namely display of media, presentation of media, and benefits of media. The results of product trial of animation video are shown in Table 5.

***Table 5.*** *Product Trial Results of Animation Video*

| No. | Aspect | Scores | Percentage (%) |
|---|---|---|---|
| 1. | Display of media | 939 | 87 |
| 2. | Presentation of media | 1220 | 85 |
| 3. | Benefits of media | 908 | 84 |
| | **Average Percentage (%)** | | **85** |

Table 5 show that the average percentage scores of product trial results of animation video is 85%, which indicates that students' response to the animation video is included in the very good criteria. Total scores of product trial results of animation video also showed that most of the students gave a positive response to the three aspects of the assessment for the final animation video that developed in this research. The results of data analysis showed that students were interested in using animation video that developed in this research to learn colloid.

Students' interest can be caused by the animation of colloidal concepts based on multiple representations that contained in these animation video. Presentation of colloidal concepts, especially abstract concepts, in the form of animation based on multiple representations combined with audio explanations of concepts and accompanied by supportive backsound can increase students' motivation and make it easier for students to learn colloid. This is relevant to the results of Sufidin's research (2017) which showed that animation media based on multiple representations can make it easier for students to understand colloidal concepts and increase students' motivation.

## • CONCLUSION

Based on the results of this research regarding the Development of Animation Media based on Multiple Representations in Colloid Flipped Classroom Learning, it can be concluded as follows. *First*, the development of animation media based on multiple representation in colloid flipped classroom learning using the 4-D method, namely define, design, develop, and disseminate, which carried out up to the development stage (develop). *Second*, the feasibility test of animation media based on multiple representation in colloid flipped classroom learning consists of material and media validity tests, shows results of 82% and 83% which indicates that animation video are including in the very feasible criteria and product trials, shows results of 85% which indicates that user responses of animation video is including in the very good criteria.

The development of animation media based on multiple representations in this research is intended for colloid flipped classroom learning. Animation media was developed as a media for learning outside the classroom. Based on the response given by students in the product trial of animation video, showed that animation media in the form of animation video based on multiple representation was declared feasible for use as learning media independently in colloid flipped classroom.

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