DESIGNING AND TESTING SETS (SCIENCE, ENVIRONMENT, TECHNOLOGY AND SOCIETY) BASED MOTION COMIC INSTRUCTIONAL MEDIA ON ELECTROLYTE AND NON ELECTROLYTE SOLUTION

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Abstract. *This research was instigated by the lack of instructional media variation used in the learning process. This research aimed at knowing the levels of validity and practicality of SETS (Science, Environment, Technology, and Society) based Motion Comic instructional media on Electrolyte and non-Electrolyte Solution lesson. It was R&D (Research and Development) with 4-D (Devine, Design, Development, Disseminate) model. It was administered at State Senior High School 02 Siak Hulu. The data were primary, the data were obtained directly from questionnaire. The obtained data were analysed by using qualitative and quantitative descriptive analysis techniques. SETS based Motion Comic video media developed was tested valid with 95.7% percentage (very valid) and practical with 90.71% percentage (very practical). Based on these findings, it could be concluded that SETS based Motion Comic video media on Electrolyte and non-Electrolyte Solution lesson was valid and practical, so it could be done the limited trials.*

Keywords: *Motion Comic, SETS, Electrolyte and Non Electrolyte Solution*

INTRODUCTION

The development of technology and information has grown rapidly and its influence on the world of education is inevitable, be it a positive influence or a negative influence, thus requiring the world of education to always adapt to technological developments towards efforts to improve the quality of education, especially in terms of utilising technology and information for the world of education, especially in the teaching and learning process [1]. One form of technology utilisation in education is using technology as learning media. This is because learning media can channel messages, can stimulate the thoughts, feelings, and desires of students so that it can encourage the creation of a learning process in students [2]. In addition, with the existence of learning media, it facilitates interaction between teachers and students so that learning activities will be more effective and efficient. One of the learning media that can be developed is *motion comic*. *Motion Comic* is a combination of traditional comic grids with animation elements, transitions, *panning, zooming* and equipped with a *soundtrack* [3].

In addition to the use of media, learning approaches are also important in learning, especially in the 2013 curriculum. Curriculum 2013 is a curriculum that prioritises understanding, skills and character education. Learners are required to understand the material, be active in discussions and presentations and have high discipline manners. The approach that fits the curriculum is the SETS (*Science, Environment, Technology and Society*) approach [4]. The SETS learning approach is learning that links the four elements of science, environment, technology and society in learning. The subject matter is associated with real examples related to the community around students who are often encountered in everyday life, making it easy to understand the material. Especially in abstract materials such as electrolyte and non-electrolyte solution materials [5].

Electrolyte and non-electrolyte solutions are one of the subjects of chemistry. The characteristics of electrolyte and non-electrolyte solution materials include materials that are quite difficult to learn. This is because electrolyte and non-electrolyte solution material is abstract material. So that students tend to have difficulty understanding the concept of electrolyte and non-electrolyte solution material [6].

Based on the results of interviews conducted by researchers at Sekolah Menengah Atas Negeri 2 Siak Hulu with chemistry teachers, the learning resources they use are books and LKS. And the media used is *Powerpoint* media. The use of media is still fixated on *powerpoint*, where one of the weaknesses of this media can make students feel bored in the teaching and learning process. In addition, by using *powerpoint* media, students tend to be lazy to record material and only focus on seeing the material on the *powerpoint* slide. On the other hand, the use of thick textbooks with long material and unattractive forms is also one of the factors that reduce students' interest in opening textbooks.

METHODS

The research method used in this research is *Research and Development* (R&D). This research was conducted at SMA Negeri 2 Siak Hulu in the even semester of the 2019/2020 school year. The object of this research is SETS-based *Motion Comic*. The subjects in this study were those who validated the SETS-based *Motion Comic* products produced, namely learning media design experts, material experts and chemistry teachers at SMA Negeri 2 Siak Hulu. The development model in this study is the 4-D development model. This design has 4 stages of research, namely:

1) Define
2) Design
3) Development
4) *Disseminate* (*Desseminate*)

However, in this study researchers only conducted research up to the third stage, namely the *development* stage of the revised part of the small-scale product trial.

The technique used in this research is a questionnaire. Questionnaires were given to teachers who taught chemistry (2 teachers) and several students who were or had studied chemistry material, especially Electrolyte and Non-Electrolyte Solution material in accordance with the products in this study (10 students). Questionnaire is a data collection technique that is done by giving a set of questions or written statements to respondents to answer [7]. Questionnaires are used to determine the level of success in development research, namely by measuring the feasibility of media based on material and technical sides [8]. The questionnaire assessment is prepared based on the *Likert* scale calculation. *Likert* is a subjective measure made on a scale [8]. The questionnaire scale table is as follows:

Table 1. Criteria for Validity Test Results of SETS-Based *Motion Comic*

Instrument item answers	Score
Very good	5
Good	4
Good enough	3
Less good	2
Not good	1

The data analysis techniques used are qualitative descriptive analysis techniques and quantitative descriptive analysis techniques that describe the results of validation tests and practicality tests. To analyse the validity or practicality of the *motion comic* developed, *Likert was* used and obtained:

1) Determining the maximum score
2) Determining the score obtained by adding up the scores from each validator.
3) Determining the percentage of validity.

$$\text{Persentase Kevalidan} = \frac{\text{Skor Yang Diperoleh}}{\text{Skor Maksimal}} \text{X } 100\%$$

The idealised percentage results are then interpreted in qualitative terms based on the following table:[9]

Table 2. Percentage of Criteria for the Validity Test Results of SETS-Based *Motion Comic*

No.	Interval	Criteria
1	81%-100%	Very Valid

2	61%-80%	Valid
3	41%-60%	Fairly Valid
4	21%-40%	Less Valid
5	0%-20%	Invalid

RESULTS AND DISCUSSION

The results of the research carried out based on the 4D type development steps are as follows:

1. *Defining* Stage (*Define*)

The purpose of this stage is to establish and define learning requirements. In determining and defining the terms of learning begins with an analysis of the objectives of the material boundaries for which the device is developed [10]. The steps taken in analysing the objectives are:

a. Front End Analysis

Front end analysis aims to determine the fundamental problems faced [10]. And it needs to be raised in the design of SETS-based *Motion Comic* video-based learning media that can make it easier for students to understand electrolyte and non-electrolyte solution material that is theoretical or memorised.

b. Student Analysis

This analysis is carried out to examine the characteristics of students who will be used as test subjects [11]. Student character analysis is needed in making SETS-based *Motion Comic* video media products and is used as the basis for making SETS-based *Motion Comic videos* because the learning process must be adjusted to the stage of cognitive development that students go through.

c. Formulation of Learning Objectives

The formulation of objectives is carried out to produce learning objectives that students must achieve in the learning process. Learning objectives are formulated based on KD and learning indicators in the 2013 curriculum [11].

2. *Design* Stage

At this stage the product is in the form of media using *Motion Comic* videos on Electrolyte and Non-Electrolyte Solution material which is designed and adjusted to core competencies, basic competencies, indicators of competency achievement, and learning objectives. This product design is adjusted to the learning media quality assessment instrument and based on the *storyboard* that has been made for the learning media design.

The *Motion Comic* video designed consists of three parts, namely the introduction, the content, and the closing.

a. The Introduction section contains the *Motion Comic cover*, introduction, character introduction, and concept map.

Figure 1. *Cover* view

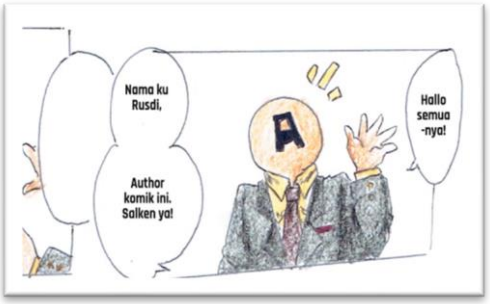

Figure 2. Introduction View

Figure 3. Character introduction

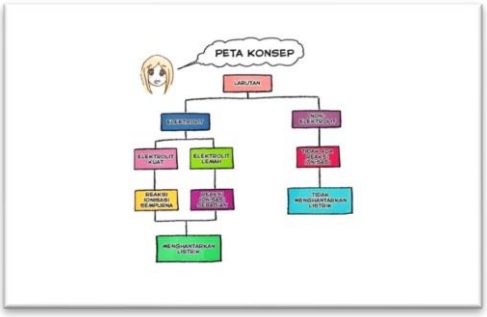

Figure 4. Concept Map

b. The content section contains core competencies, basic competencies and indicators and learning objectives that can be used as a reference in the implementation of learning activities and the material described.

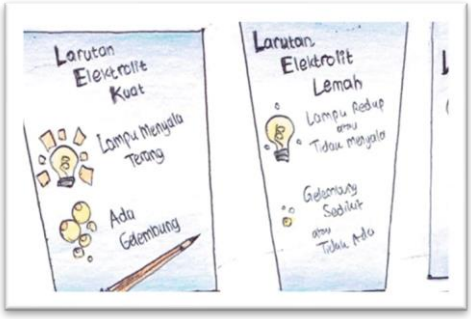

Figure 5. Contents View

c. The concluding section contains the researcher's profile.

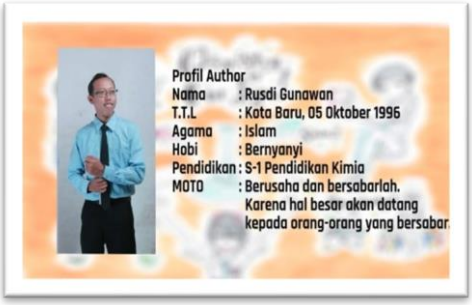

Figure 6. Researcher Profile

3. *Development* Stage

a. **Validation Stage**

Validation of SETS-based *Motion Comic* was carried out by 2 experts or experts consisting of one media design expert and one learning material expert.

1) Media Expert Validation

Media expert validation was carried out SETS-based *Motion Comic*. The media validator is one of the chemistry education lecturers with expertise in the field of education science. Media validity test with the following results.

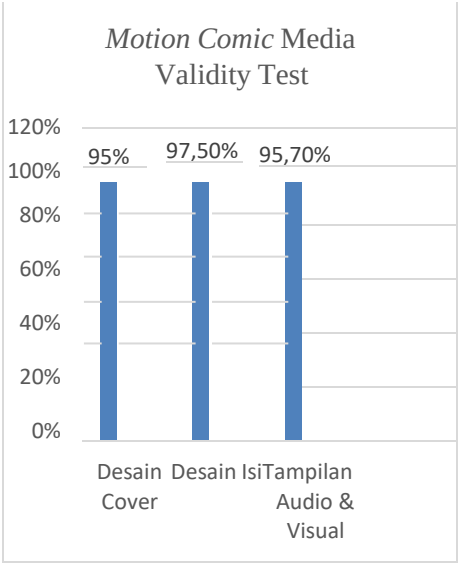

Figure 7: Media Validity Test Results

Based on the results of media validation, the average of the *cover* design criteria is 95%, content design is 97.5%, audio and visual display is 95.7%. With an overall average of 95.7%. If the value is converted based on the guidelines for converting quantitative data to qualitative data, the SETS-based *Motion Comic* product designed is included in the very valid criteria.

2) Material Expert Validation

Product validation by learning material experts is done by showing and explaining about learning media products in the form of SETS-based *Motion Comic* videos to one learning material expert, namely a chemistry education lecturer at Uin Suska Riau.

Material expert validation is carried out with the aim of assessing the feasibility of material in SETS-based *Motion Comic*. Material validity test with the following results:

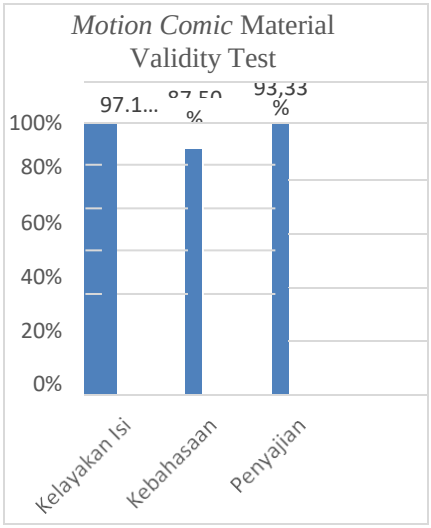

Figure 8: Material Validity Test Results

Based on the results of media validation by validators, the percentage value for the content feasibility aspect is 97.14%, the language aspect is 87.50%, and the presentation aspect is 93.33%. With an average value of 92.38%. If the value is converted based on the guidelines for converting quantitative data to qualitative data, the material in the SETS-based *Motion Comic* product is included in the very valid criteria.

3) Overall Data (Media Expert and Learning Material Expert)

The overall validity results were carried out by adding up the assessments from media design experts and learning material experts as in the following data.

Table 3. Media Expert and Material Expert Data

No.	Variable Validity	Percentage
1.	Media Expert	95,7 %
2.	Material Expert	92,38 %
	Average	94,04%

Table 3 shows the overall percentage of the assessment of media experts and material experts. It is clear that the percentage of the assessment of media experts and learning material experts is "very valid" because it is in the range of 81% to 100% so that the SETS-based *Motion Comic* video can be tested at school. This is in line with research conducted by Annisa Rahmawati & Ahmad Luthfi that the percentage of each aspect obtained a fairly good percentage and the average results of students' responses also obtained a good percentage of 93.46% with a very valid category [12].

However, suggestions and comments from experts are used as improvement materials in perfecting this SETS-based *Motion Comic* video. Suggestions and improvements from media design experts and material experts are as follows:

Table 4. Media Expert & Material Expert Suggestions

No.	Validator	Advice	Improvements
1.	Media Expert	1. Change the writing in the character introduction section	Fixed
2.	Material Expert	1. Improve video duration 2. Add an example	Fixed

b. **Limited Trial**

SETS-based *Motion Comic* media that has been validated by experts is tested at school. The trial was conducted at SMA Negeri 2 Siak Hulu, namely to 2 chemistry teachers and 10 students. The trial results were used to determine the practicality of the designed product.

The results of the limited trial were obtained through filling out a questionnaire to find out the response of chemistry teachers and students to the resulting SETS-based *Motion Comic* video. This limited trial questionnaire was filled in by chemistry teachers and students after watching the SETS-based *Motion Comic* video. *The* assessment of the two chemistry teachers was declared "very practical" with a percentage of 88.57% and the response of students was declared "very practical" with a percentage of 90.71%. The details are as follows:

1) Teacher Practicality Test

The practicality test of SETS-based *Motion Comic* video media was carried out by 2 chemistry teachers with S1 chemistry education who had taught since 2005 and 2008 as respondents. Teacher practicality test with the following results.

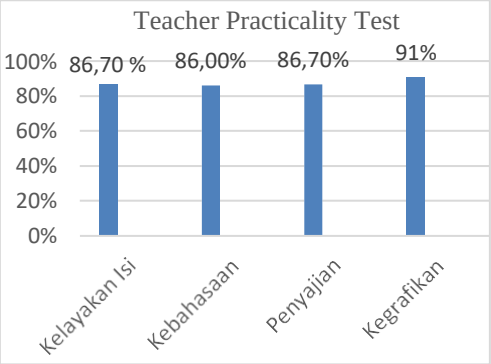

Figure 9. Teacher Practicality Test Results

The questionnaire given to chemistry teachers consists of 21 items based on 4 aspects of indicators with the highest weight of 5 and the lowest weight of 1. Figure 9 shows the percentage of each aspect, namely Feasibility with a percentage of 86.7%. Language with a percentage of 86%. Media presentation is categorised with a percentage of 86.7%. Graphics with a percentage of 91%. So that an average percentage of 88.57% is obtained, meaning that learning media in the form of SETS-based *Motion Comic* videos are very practical and can be tested on high school students in the learning process on electrolyte and non-electrolyte solution materials at school.

In line with the results of research conducted by Muhammad Azziz Fauzan et al, who developed video media on machining theory. The results of the teacher's assessment for all aspects were 76.25% with a very good classification and it was concluded that video-based learning media was declared practical to use for the learning process [13].

2) Learner Response Test

The results of students' responses to the designed SETS-based *Motion Comic* video were carried out by 10 students for each aspect. Student response test with the following results.

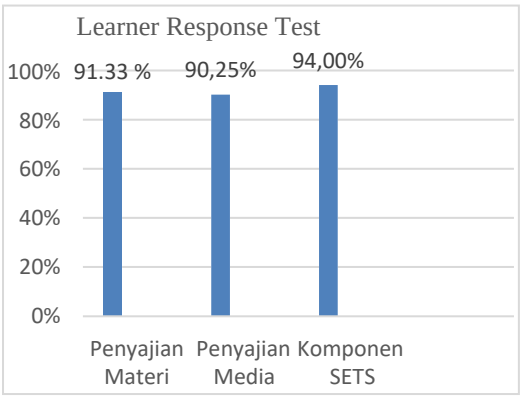

Figure 10. Learner Response Results

a) Aspects of Material Presentation

In this aspect there are several statements regarding the presentation of material, including the delivery of material in this SETS-based *Motion Comic* video media related to everyday life, the material presented is easy to understand, the problems that exist can strengthen students to understand concepts, in SETS-based *Motion Comic* there is a section to find concepts, sentences, paragraphs, letters and the language used is easy to understand.

As seen in Figure 10, this aspect received an average percentage score of 91.33%, thus obtaining a positive response from students who were categorised as "very practical".

b) Media Presentation Aspect

In this aspect, there are several statements regarding the presentation of the media, including the size of the SETS-based *Motion Comic* video media is compact, easy to carry around because it is in the form of a video file. Its use is very easy, the content of the story attracts students' attention, the diverse colour composition makes students interested in seeing it, so that this SETS-based Motion Comic video can motivate students to be interested in learning. So that it will support the implementation of the learning process

which is more coloured by student centered than teacher centered because students independently learn to understand concepts through videos [14].

In this aspect, it gets an average percentage value of 90.25%, thus obtaining a positive response from students which is categorised as "very practical".

This research is in line with research conducted by Irma Asmarani, et al who developed inquiry-based *Motion Comic* media. The results of data on students' responses or responses to *Motion Comic* media in small-scale trials the average score of students' responses was 73.4 which was categorised as very practical. This shows that students give positive responses to inquiry-based *Motion Comic* media [15].

This is in line with the statement of Desi Julia, et al that the development product is declared good if the product gets a positive response from students as seen from the percentage [16].

c) SETS Component Aspects

In the aspect of the SETS component, the percentage obtained is 94% with the criteria of "very practical" with the aspect statement "the *motion comic* video adds new knowledge about the material of electrolyte and non-electrolyte solutions associated with technology, environment and society. These results can be said that the *motion comic video* designed contains good SETS elements, especially in providing information about technology, environment and society associated with electrolyte and non-electrolyte solution materials.

This is in line with research conducted by Nugraha, et al. That "Teaching materials developed based on SETS get a positive response from students, because students are not only brought to material that is theoretical but also related to everyday life. SETS-based learning that links the theory learned with its application in the form of technology, its impact on society and the environment is a form of learning effort that is real and contextual [17].

c. **Final Product Revision**

At this stage, researchers made improvements based on suggestions or input on the initial field trial. Suggestions and input from teachers and students are as follows:

Table 5. Teacher's Suggestions for *Motion Comic* Media

No	Validator	Advice	Improvements
1.	Subject Teacher	1. Adding video time duration	Fixed
2.	Learners	2. Clarify the colours in the image to make it more vivid	Fixed

CONCLUSIONS AND SUGGESTIONS

Based on the results of the development of SETS-based *Motion Comic on* electrolyte and non-electrolyte solution materials, it can be concluded that: The validity quality of SETS-based *Motion Comic* on electrolyte and non-electrolyte solution materials based on validator assessments is classified in the very valid category with a validity percentage of 94.04%. The practicality of SETS-based *Motion Comic on* electrolyte and non-electrolyte solution materials based on practicality trials to chemistry teachers is classified in the very practical category with a practicality percentage of 88.57%. Student response to SETS-based *Motion Comic on* electrolyte and non-electrolyte solution material obtained a result of 90.71%.

Based on the results of the development of SETS-based *Motion Comic* on electrolyte

solution material, the researchers provide the following suggestions:

Utilisation Suggestions

Researchers suggest that this SETS-based *Motion Comic* video media be used in the learning process of electrolyte and non-electrolyte solution materials because based on the validity and practicality tests it is feasible to use in the learning process.

Product Trial Design Suggestions

1. Researchers suggest that future researchers design and test SETS-based *Motion Comic* video learning media on other materials, so that they can be used as supporting media in the learning process.
2. Researchers suggest for further researchers to test this SETS-based *Motion Comic* video learning media in a wide group so that its effectiveness can be known in a wide group and also perform all stages in the 4-D design.
3. For other researchers who want to do similar research, they can use the premium *Adobe After Effect* application so that the duration of the SETS-based *Motion Comic* video is not limited.

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