

Research Article

# Developing cartoon based educative mathematics learning media on mathematical representation ability of junior high school students

Rahman Haryadi<sup>1\*</sup>, Galuh Hartinah<sup>2</sup>

<sup>1</sup> Mathematics Education Study Program, IKIP PGRI Pontianak, Ampera Street No. 88 Pontianak

<sup>2</sup> Guidance and Counseling Study Program, IKIP PGRI Pontianak, Ampera Street No. 88 Pontianak

\*Corresponding Author: [rahmanharyadi72@gmail.com](mailto:rahmanharyadi72@gmail.com)

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## ABSTRACT

This study aimed to describe the level of validity, practicality, and effectiveness of cartoon film-based educative mathematics learning media on the mathematical representation abilities of junior high school students. This research method was the Research and Development method using the Borg and Gall model. The research subjects were students of class VIII at the Catholic Middle School of Saint Petrus Pontianak. Participants in this study included material expert validators and media expert validators and Class VII E students of St. Petrus Catholic Middle School Pontianak. Tools of data collection used including validation sheets, questionnaires, and test questions. Based on the results of the validation of material experts and media experts, the validity of the material was set at 89.57% with very valid criteria, a practical level of 91.50% with very practical criteria, an effectiveness level of 86.67% with very effective criteria.

**Keywords:** cartoon film; mathematical representative; research and development;

## 1. INTRODUCTION

The world of education is closely related to mathematical material. Fahrurrozi & Hamdi (2017) stated that in the process of its development it can be seen that mathematics becomes a tool or basic science when it wants to know the materials of science in other fields. Because the concept is used when studying other objects even for all disciplines. One of the subject matter at the MTS/Junior High School level is mathematics, which has a significant position to meet the learning needs of students (Batubara, 2018). In addition, NCTM in (Astuti, 2017) mentioned that mathematics is not only able to solve problems, but also must have 5 abilities, including: 1) mathematical communication; 2) mathematical reasoning; 3) mathematical problem solving; 4) mathematical connection; 5) mathematical representation.

In reality, the ability of mathematical representation in the school environment is still lacking. The school has basically measured the ability of mathematical representation by giving questions, it's just that it is unknown which implies the directionlessness of measuring mathematical representation ability in students in the school. This is in line with the results of previous studies, where the results of the study stated that the ability to representation is still low, including: 1) Mudzakkir (in Maghfiroh, S., & Rohayati, A., 2020) revealed that the ability to represent mathematical ideas or concepts for junior high school students in Indonesia is still included in the category of lacking. 2) Candra Bagus Wijaya (2018) obtained the result that students' mathematical representation or expression skills, as well as written text representation are still lacking. 3) Ari Suningsih & Ana Istiani (2021) representation ability results in 43.5% achievement and verbal representation ability to achieve 41.2% is still relatively low. The representation of images, visuals, written text and mathematical expressions is part of the ability of mathematical representation (Lestari & Yudhanegara, 2015). Sabirin (2014), states that the form of interpretation of students' thoughts on a problem, whether used as a tool or finding a solution to the problem is part of the ability to represent. (Handayani, 2015) states that mathematical comprehension ability is also the embodiment of mathematical representation ability. Therefore, in constructing students' knowledge and understanding to understand a mathematical concept, representation skills are needed as the main capital (Candra Bagus Wijaya 2018).

Setiyani (2017: 31) said that students' representation ability is relatively low due to students' involvement when learning in class with teachers is not directed. In addition, students only do activities such as receiving materials, taking notes, and practicing questions. Thus making students interact less with the teacher. Therefore, the ability to represent, mathematics, is low, influenced by many problems. This problem can be solved if teachers are required to be able to use learning media that can be seen again by students such as students' daily habits of watching cartoons. Pritasari & Rukmi (2014) Learning media is a tool used when teachers carry out learning, as a learning module tool that can make it easier for teachers to complete learning achievement. One of the media that facilitates learning is cartoon films. Ngatman & Siti

Fatimah (2018) currently children like cartoon films a lot, in addition to interesting storylines, characters that can be idolized, cartoon films also have a high level of viewing and present an attractive animated visual display.

Pritasari & Rukmi (2014) cartoon film was chosen as a learning medium, because it has the following criteria: a) has a storyline that relates to students' daily lives, as well as a place for storylines such as the environment in the student's life; b) the use of language and the level of intelligence in the characters of cartoon characters are balanced with the state of the students; c) the characters in cartoon films, according to the level of maturity and which are educated are compatible with the development of the student; d) stories that contain advice or learning are suitable if directed according to the education module; e) does not contain elements of provocation related to social, religious, tribal and cultural differences; f) the story shown is suitable to support the rules set by the teacher as well as the student learning process. Cartoon films are a substitute medium in addition to the learning process at school, by watching cartoons that have an educational storyline, students can instill values that can foster learning motivation and foster curiosity, the film can be given to small, large, heterogeneous or individual study groups (Pritasari & Rukmi, 2014). Jannah (2014) that this cartoon-based interactive mathematics learning media is suitable for use so that it can facilitate the teacher's family in the implementation of learning both to deliver material, help improve students' curiosity and can be used easily because it can be accessed anywhere and anytime.

There are several studies that develop educational mathematics learning media based on cartoon films, including: 1) Jannah, Desfitri, Edrizon & Zuzano (2014) stated that learning media using cartoon films, must be developed in accordance with teacher teaching programs so that teachers can use them for interesting learning processes, 2) Hariyanti, Rachmat & Murdjito (2013) stated that 66.67% of students gave a positive response, 3) Pritasari & Rukmi (2014) The learning process becomes more active, and activities in learning become more increased. Cycle I showed that student scores reached an average of 68.12 and cycle II student scores reached an average of 84.06. Students' classical learning completion in cycle I with an average of 72.97% with good categories and cycle II with an average of 97.29% excellent categories This development research is carried out referring to the research strategic plan with the topic of learning media development where the media developed is in the form of educational mathematics learning media based on cartoon films. Based on this description, researchers are trying to develop educational mathematics learning media based on cartoon films that can meet valid, practical, and effective criteria so that they can be used in an active learning process.

## 2. RESEARCH METHOD

The research method used in this research is a research and development method or commonly in English called Research and Development. Research and Development is a research method that can be used to produce a certain product and test the effectiveness of the product (Sugiyono, 2015: 297). The resulting product is the development of mathematics learning media based on educational cartoon films on the ability of students' mathematical representation on statistical material in class VIII of Santu Petrus Catholic Junior High School Pontianak. The study design used in this R&D research is the Borg and Gall development model, which is a development model that has ten stages consisting of Research and Information Collecting, Planning, Develop Preliminary Form of Product, Preliminary Field Testing, Main Product Revision, Main Field Testing, Operational Product Revision, Operational Field Testing, Final Product Revision, Dissemination and Implementation.

## 3. RESULTS AND DISCUSSION

### 3.1. Results

The following describes the procedure used to produce the product in this investigation:

#### a. Product Design

Initial design of cartoon film-based educational mathematics learning media on students' mathematical representation ability is made based on basic competencies, indicators, and learning objectives This initial design will be validated with the aim of revising or improving cartoon film-based educational mathematics learning media products against students' mathematical representation abilities developed before being piloted. The initial design of cartoon-based educational mathematics learning media on students' mathematical representation ability is to Make Cartoon Film Titles, Define characters, Create Film Storylines, Design covers of educational mathematics learning media based on cartoon films, Make opening remarks, Make Definitions of Data Presentation, Make Image Displays of Data Presentation Material, Make Percentage Answers About According to Indicators Material Presentation Data First, Make Percentage Answers About According to Indicators Material Presentation Data second, Make Percentage Answers About According to Indicators Material Presentation Data third.

#### b. Design Validation and Revisions Based on Validation Results

In this study, three validators determined the validity of cartoon-based educational mathematics learning media against students' emerging mathematical representation skills. Validation findings are used to change or improve animations before testing. At this stage, the researcher provides validation sheets to the three validators to evaluate the impact of cartoon-based educational mathematics learning media and instruments on students' mathematical representation ability, then corrected based on validator responses. After making modifications, researchers conferred with validators on the revision of instruments and cartoon-based mathematical learning media on the ability of students' mathematical

representations to determine the accuracy of the revised findings.

The results of the validation of cartoon-based educational mathematics learning media on the ability of students' mathematical representation by the three validators can be seen in Table 1 below.

**Table 1.** Results of Validation of Cartoon-Based Educational Mathematics Learning Media against Students' Mathematical Representation Ability by Media Experts and Material Experts

Assessment Instruments	Validators			Average	Criterion
	I	II	III		
Media Expert	87,14%	92,85%	90,00%	89,99%	Highly Valid
Material Expert	85,00%	92,50%	90,00%	89,16%	Highly Valid

Based on **Table 1**, it shows that the average percentage of validation results of cartoon-based educational mathematics learning media experts against students' mathematical representation skills by the three validators is 89.99% with very valid criteria. The material expert validation results of 89.16 percent of the criteria are very valid. The validation results provided by the three validators also contain comments and suggestions about the influence of cartoon-based educational mathematics learning media on students' mathematical representation ability and the instruments to be used in the study. Therefore, Cartoon-Based Educational Mathematics Learning Media against Students' Mathematical Representation Ability on Statistical Material in Class VIII of antu Petrus Catholic Junior High School Pontianak is suitable for use in learning.

### c. Trials and Revisions Based on Trial Results

This research was conducted at St. Peter's Catholic Junior High School Pontianak. This study aims to determine the practicality of cartoon-based educational mathematics learning media on students' mathematical representation ability. This limited trial starts on May 23, 2022, consists of 18 students in SMP Katolik VIII Santu Petrus Pontianak for the first semester of the 2021/2022 school year. The following is the result of a questionnaire of teacher and student responses to cartoon-based educational mathematics learning media to students' mathematical representation ability on statistical material in class VIII SMP Katolik Santu Petrus Pontianak.

**Table 2.** Results of Teacher and Student Response Questionnaires

Respondents	Rating Results (%)	Criterion
Teachers	91,67%	Very Practical
Students	91,33%	Very Practical

Based on **Table 2**, the results of the teacher response questionnaire were 91.67 % with very practical criteria, while the results of the student response questionnaire were 91.33% with very practical criteria. The difference in questionnaire results between teachers and students depends on the application of cartoon-based educational mathematics learning media to students' mathematical representation ability. The effectiveness of cartoon-based educational mathematics learning media on students' mathematical representation ability on statistical material can be seen in Table 3, from the results of the student's mathematical representation ability test. The following are the results of the student's mathematical representation ability test. Cartoon-based educational mathematics learning media.

**Table 3.** Student Effectiveness Results

Rating Results (%)	Criterion
86,67%	Highly Effective

Based on **Table 3**, the results of the student's critical thinking ability test for cartoon-based educational mathematics learning were 86.67% with very effective criteria.

### 3.2 Discussion

The validation results of the three validators are used to determine the validity of cartoon-based educational mathematics learning media on students' mathematical representation ability. With an average index percentage of 89.57% and very valid criteria confirmed by material experts, it is stipulated that cartoon-based educational mathematics learning media to improve students' mathematical representation skills may be used in learning. This is in accordance with the findings of Maharani, Maghfira (2018) entitled "Development of Cartoon-Based Mathematics Learning Media to Reduce Student Anxiety". Findings of media evaluation conducted by media professionals. The results of this development research are shown by the percentage of validation test scores obtained by material expert validators who obtained an average score of 3.52 on the Very Interesting criteria from material experts and an average score of 3.57 from media experts. Based on this research, it can be concluded that cartoon-based educational mathematics learning media on students' mathematical representation skills have met the requirements of validity, practicality, and efficacy. Validation findings include comments and recommendations on the influence of cartoon-based educational mathematics learning media produced on students' mathematical representation skills and research instruments. Before being tested, limited media for learning educational mathematics based on cartoon films on students' mathematical representation ability went through the revision stage first based on validation results, comments, and suggestions from validators. The validity results resulted in a film-based educational mathematics learning media category on the ability of valid student mathematical representation based on expert validation with revisions, but researchers received suggestions, comments, and made modifications to

educational film-based learning media. Mathematics learning media products on students' mathematical representation ability. According to Budiarta (2014), the implementation stage is an important step in disseminating the learning materials made. Everything that has been generated is implemented for students at this level. It is important to improve this to produce an almost perfect product. Furthermore, credible findings suggest that the film-based stages of educational mathematics learning on students' mathematical representation skills can effectively teach children.

Based on the results of the student response questionnaire given during the limited trial, the average percentage of the practicality index was 91.67 percent with very practical criteria, while the percentage of the practicality index of teacher responses was 91.33 percent with very practical criteria. This is in accordance with previous research conducted by SMA Gama Kedungadem Bojonegoro with the title Flash-Based Learning Media Development on Software Installation Competency Standards Yudhaskara, H & Tjahyaningtias (2016), The results of the study stated that from the results of the study conducted for the results of media validation were declared valid with a reting of 80.25%, while for the results of student responses with a reting of 83.1%. It can be seen from these results that the use of flash-based learning media on competency standards for installing software is declared valid, so that the media can be used in the learning process. This shows that the educational mathematics learning media based on cartoon films to the ability of mathematical representation developed meets the criteria of practicality with high interjection.

Students' mathematical representation ability in data presentation materials was determined to be effective at 86.67 percent based on test results that measured students' mathematical representation ability after utilizing cartoon-based educational media products. This is in accordance with the research on the Development of Masi Graphic Animation Video Media in Science Subjects at SDN Pandanrejo 1 Malang Regency Efendi, Y. A, dkk. (2020), The result of the study was to produce a learning media for mation graphics animation videos. The results showed that the value of media expert validation results was 87.5%, material expert validation results were 83.3% while for individual trials 100%, small group tests 97%, large group tests 97.35% and learning outcomes tests based on the completeness of KKM 75 standards. Therefore, based on the results of the study, the use of animated graphic media is considered legitimate and practical, thus allowing the media to be incorporated into the learning process. Based on these findings, the use of flash-based learning media on the competency criteria of installing software is considered legitimate, allowing the media to be incorporated into the learning process.

#### 4. CONCLUSION

Based on the study, it was concluded that the cartoon-based educational mathematics learning media on the ability of students' mathematical representation in the data presentation material has a level of validity. of 89.57% with very valid criteria, for practicality level of 91.50% with very practical criteria and 86.67% effectiveness with very effective criteria.

#### AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

#### CONFLICT OF INTEREST

There are no conflicts of interest declared by the authors.

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