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DEVELOPMENT OF "*STORY OF GEOMETRY*" COMIC WITH CONTEXTUAL APPROACH FOR JUNIOR HIGH SCHOOL STUDENTS

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Abstract

The aims of this work is to develop mathematica learning materials in the form of cartoons with a contextual approach that it valids, practice, and effectife in the building material of equal space. This type of research is development research (R&D) using the ADDIE model, i.e. analysis, design, development, implementations and evaluation. The developed media launch was done on February 5, 2024 in the even semester of academis year 2023/2024 at Satya Wacana Salatiga Christian Junior High School with 24 students of class IX C and a mathematics teacher. The results of this study animed to create a comic "*geometic story*" with an average rating of material experts and an average of of media experts as "very good", the results of student and teacher responses cartoon media that scored an average of and reported "very good", the *pretest* and *posttest* results were analyzed with the Wilcoxon test to show the effectiveness of the carrier, the label results showed a value of 0.000, which means les than 0.05 so it can be said that it is effective. Based on this, it can be concluded that the develop media is valid, practical, and effective so that it can be used as an educational media to support learning.

Keywords: comics, flat side spaces, media development.

Abstrak

Penelitian ini bertujuan untuk mengembangkan media pembelajaran matematika berupa komik dengan pendekatan kontekstual yang valid, praktis, dan efektif pada materi bangun ruang sisi datar. Jenis penelitian ini adalah penelitian pengembangan (R&D) dengan model ADDIE, yaitu *Analyze* (Analisis), *Design* (Desain), *Development* (Pengembangan), *Implementation* (Implementasi), dan *Evaluation* (Evaluasi). Implementasi media yang dikembangkan dilakukan pada tanggal 5 Februari 2024 semester genap tahun ajaran 2023/2024 di SMP Kristen Satya Wacana Salatiga dengan melibatkan 24 siswa kelas IX C dan guru matematika. Hasil dari penelitian ini yaitu menghasilkan sebuah komik "*story of geometry*" yang divalidasi oleh ahli materi dengan rata-rata 85,5 dan oleh ahli media dengan rata-rata 83,3 dinyatakan "sangat baik", hasil dari respon siswa dan guru terhadap media komik memperoleh rata-rata berturut-turut sebesar dan dinyatakan "sangat baik", hasil uji *pretest* dan *posttest* yang dianalisis menggunakan uji Wilcoxon untuk menyatakan keefektifan media dengan hasil signifikasi menunjukkan nilai 0,000 yang artinya kurang dari 0,05 sehingga dapat dikatakan efektif. Berdasarkan semua ini dapat disimpulkan bahwa media yang dikembangkan valid, praktis, dan efektif sehingga dapat digunakan sebagai media pembelajaran untuk membantu belajar siswa.
Kata Kunci : Komik, Bangun Ruang Sisi Datar, Pengembangan Media

INTRODUCTION

Mathematics is very important for students, so its learning starts from elementary school to college (Rahmata et al., 2020). However, learning math is an abstract science (Damayanti & Qohar, 2019) so students have difficulty understanding and solving math problems (Abdurrahman Zakiy et al., 2018). Students find math learning boring and scary (Dwiranata et al., 2019). Spatial geometry, especially in flat-sided building spaces is considered the most difficult aspect to understand in the context of abstract shapes (Indra C et al., 2016).

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A spatial construct is bounded by sides, which are three-dimensional objects (Suharjana, 2008), in this space building material is divided into 2 subchapters, namely pyramids and prisms. In this space building only discusses the elements of flat-sided space building. Based on the BSNP analysis, it was found that the percentage of UN results on low spatial material in schools was 36.32; districts/ cities 38.47; provinces 44.03; and national 52.04 (Bagus et al., 2018). Therefore, a learning tool is needed.

Learning media is an essential component of the learning proces that encourages students in facilitating teacher teaching. Learning media consists of various sources and tools that stimulate thoughts, feelings, and skills to improve their learning (Luh & Ekayani, 2021). Learning media has several benefits such as conveying learning messages can be more standardized, learning becomes fun, the quality of learning can be improved (Riyana & RI, 2012, p. 12). Learning media are categorized according to their features, capabilities, and usage techniques (Alti et al., 2022, pp. 3–4). Learning media has a role that in learning activities is a part that determines the effectiveness and efficiency of achievement (Miftah, 2022). Comics are one of the media used.

Comics are a collection of images that have an interesting storiline that is easy to understand and helps readers to better understand the material (Widyastuti et al., 2017). This comic can increase reading interest because it is equipped with pictures and several characters (Lubis, 2018). Comic development is integrated through digital technology and this can have a positive impact because students can more easily access digital comics that print (Handayani, 2021). This digital comic can help students easily understand this overall picture, so that they can express their thoughts well and can tell the contents of the story on advance, so that it can be used for learning (Narestuti et al., 2021). This digital comic has advantages such as being able to foster student interest, provide entertainment, can illustrate material, help in understanding abstract concepts (Kanti et al., 2018; Nurhayati Ida, 2019). However, according to Trimo, comics have weaknesses, namely comic language sometimes use profanity, many actions emphasize violence, and many prominent love scenes (Riwanto & Wulandari, 2018).

It is important that the use of learning media is balanced with appropriate strategies. The contextual approach is an idea that supports teacher learning by connecting material to real life (Ekowati et al., 2015). The contextual approach is a method applied in the learning

process where the material taught has a direct relationship with real experiences outside of school (Ni Kd. Ayu Sukesari , I Ngh. Suadnyana, 2021). In addition, according to Dewi and Primayana, the contextual approach is one of the strategies for delivering subject matter by exposing students to problems that need to be faced in order to achieve educational goals that are relevant to real life (Apriadi, 2021). So that this researcher produces media with the title "*Story of Geometry*" Comic Development with a Contextual Approach for Junior Hight School Students which is valid, practical, and effective.

METHODS

The research methodology employed is research and development (R&D), R&D research is a method where products are designed and tested and then implemented in the field of education (22). The development model used is the ADDIE model. ADDIE there are 5 phases in ADDIE, namely, analysis, design, development, evaluation. This research was conducted at Satya Wacana Salatiga Christian Junior High School on February 5, 2024 of the 2023/2024 school year, semester II. The research targets were 26 students of class IX C.

The type of data used is qualitative and quantitative data, namely data from validity, practicality, and effectiveness tests. The first data is validation of media and comic material "*Story of Geometry*" with a contextual approach for junior high school students given to 1 lecturer and mathematics subject teacher. Then, the second data on the implementation of the trial. In the sample trial, data were taken in the form of practicality test results, namely teacher and student responses.

The data collection tools in this study were validation forms and practice tests related to student responses and teacher responses. This third data in the form of analyzing the effectiveness of digital comic media is found based on the results of *pretest* and *posttest* scores. The data is used to test the validity, practicality, and effectiveness of products that are in the development stage.

The data colection techniques used by researchers are validations forms, teacher response questionnaires and student response. In this data collection technique using validation forms which include media and material validation, as well as student and teacher response quesstionnaires. In addition, to test the effectiveness of using *pretest* and *posttest*. The criteria in the analysis using a likert scale are presented in table 1.

Table 1. Media and Material Validity Test

Assesment	Interpretation Criteria
	Very good
	Good
	Good enough
	Not good

(Hendriawan et al., 2023)

The difference in means was calculated using the Wilcoxon test with the condition where the data did not follow a normal distribution.

a. Data normality test

Normality test to evaluate the data obtained in the study, the Shapiro- Wilk test is used to assess the distribution of data from samples of less than 50 with a confidence level of and significance level () level of 0.0005. the testing process begins with formulating hypotheses against significance of probability values.

H_0 : data is normally distributed

H_1 : data is not normally distributed

Decisions are made based on the significance value or probability obtained. The significance value is also called asymp. Sig (2-tailed), namely the probability of more than 0.05, then H_0 is taken and conclusion can be drawn that the data is normally distributed (Asyhari, 2015).

b. Wilcoxon test

This test is used to compare differences between *pretest* and *posttest* data.

H_0 : there is no influence between *pretest* and *posttest* results

H_1 : there is an influence between *pretest* and *posttest* results

RESULTS AND DISCUSSION

I. Results

The results if his research is the creation of learning media, namely digital comics "*Story of Geometry*" with a contextual approach for junior high school student that are valid, practical, and efective. This learning environment was developed with respect to ADDIE development model which consists of 5 stages:

a. Analysis

In this stage of analysis of the curriculum and analysis of learning media.

The curriculum analysis function is to ensure that the media for development is in accordance with the curriculum used, especially wit h the material of space building. Researchers used course analysis interviews during the odd semester of 2022/2023 academic year. In the curriculum analysis, an interview was obtained with one of the teachers who explained that the curriculum currently used uses the independent curriculum, besides that the researcher got information that good flat-sided space building material requires a material as a medioum that can be used to transfer the material.

b. Design

At this stage, researchers began planning the story to be included in the comic. The comic that will be made is inspires by the adventure comic

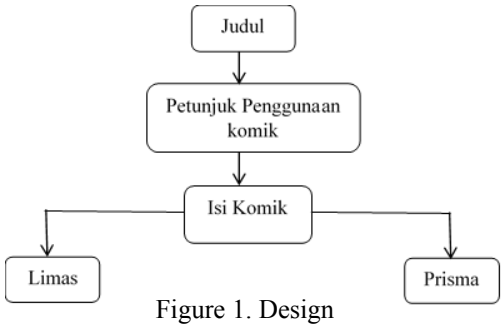

Figure 1. Design

Zahlen (Putro & Setyadi, 2022) which contains equilateral geometric shapes with material area and volume of geometric shapes and a combination geometric shapes' area and volume. while the comics that become the material developed by researchers contain geometric shapes containing rough flat, material spatial elements in pyramids and prism, as well as contextual forms of pyramidal and prismatic spatial forms found in everyday life. The story to be developed must of course be in accordance with the learning outcomes of the balanced building material. The first step to do is to determine the title of the comic, "*Story of Geometry*". After you have a suitable title, the next step is to find and

collect reference material. The equilateral flat building material is collected from several sources, example from the class VII mathematics student book independent curriculum and various sources from the national digital library. Next, the scientist makes a cartoon frame. In addition to planning or designing the learning environment, at this stage the researcher also designed the form of validation, practical, and effective forms and tests used to test and evaluate the developed media. The "*Story of Geometry*" comic design can be seen in figure 1 below

c. Development

At this stage to make media in the form of "*Story of Geometry*" comics based on the design that has been made through Microsoft Office Word and then expressed in the form of characters. The steps used at this stage:

1. Initial Comic Creation

   Creative ideas created using Microsoft Office Word are then created or developed using pixton, arranging layouts and inserting text, some using canva, some directly from pixton. The text is inserted into each chat dialog after the specified page is completed with the text image, and then positioned according to the comic frame that has been created.

   The first page is the cover or cover of the comic that is being created or developed using canva. Then the next page is an instruction for using comics where the instructions can facilitate students in reading comics or reading comic sequences. After that, it continues with the contents of the comic or comic reading in the form of material. As in the following picture

Figure2a. Front Page

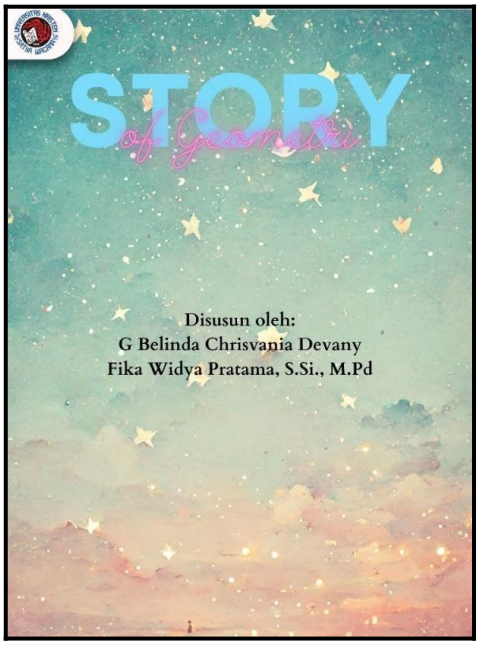

Figure 2b. Cover

Figure 2c. Initial Snippet

Figure 2 above is a snapshot of the title section display, where figure 2(a) is the initial display when entering the link given. Then in figure 2(b) is the cover or title of the comic and the name of comic compiler. Then in figure 2(c) is an early snapshot of the three characters who greet the readers, the leftmost character is Adi, the middle is Nila, and the rightmost is Candra. Furthermore, the second part of the comic is how to use which in figure 3.

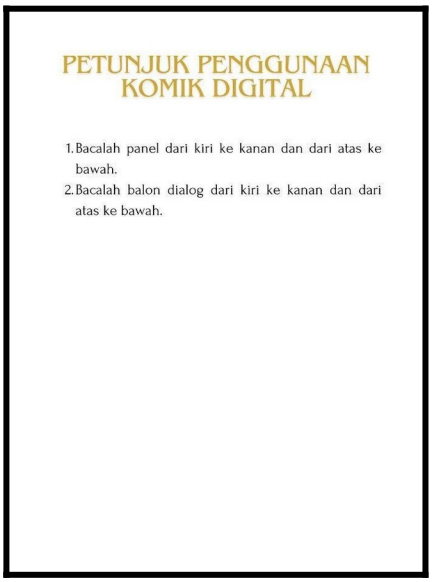

Figure 3. Comic Instructions for Use

From figure 3 above, it explains the layout or flow of reading the story in the comic. Furthermore, the 3rd part of the comic is an introduction to the material as well as the first material problem and a brief explanation for the first material, namely the existing pyramid, presented in the following figure 4.

Figure 4a. Introduction to the Material

Figure 4b. First Problem

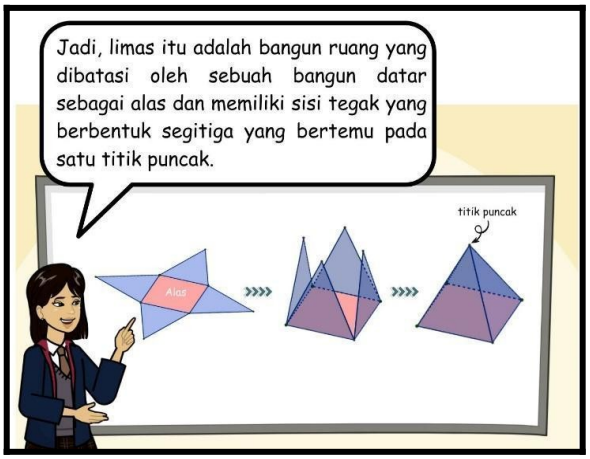

Figure 4c. Limas Material

Figure 4d. Pyramid Explanation

From figure 4 above, it explains the initial material that will be conveyed by the material provider by providing problems such as in figure 4(a) telling the story between the 3 characters talking about the semester vacation where one of the characters named Nila is camping using a tent while for Candra's character he is only at home and sees a pyramid in the form of precision. Then in figure 4(b) provides a problem that such a large pyramid can be formed with precision. Furthermore, for figure 4(c) explains the pyramid material which is explained using images from open nets to closed shapes. Furthermore, figure 4(d) explains that the pyramid is a form of pyramid. In addition, in the 4th section in the comic, the explanation related to the tent of explanation of the prism is presented in the following image.

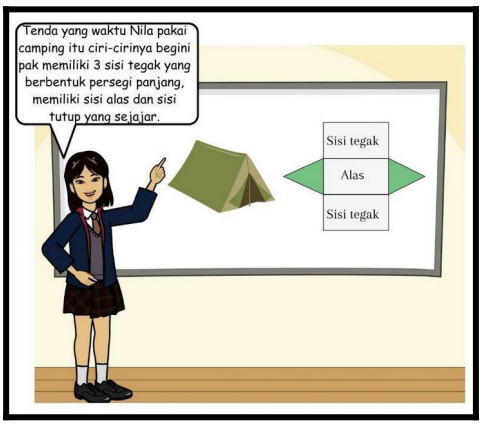

Figure 5b. Explanation of Material

Figure 5a. Problem two

In figure 5 above explains about the second material, namely the prism in figure 5(a) is a second problem besides the pyramid. In figure 5(b) explains the prism material in the tent.

2. Validation of Media and Learning Materials

The comic "Story of Geometry," which utilizes a contextual approach, has undergone validation by three individuals: one lecturer from the mathematics education program and two mathematics teachers. This validation process aims to assess the suitability of the developed comic media and materials. The outcomes of the validation test for both material and media are presented in Table 2 below.

Table 2. Validity Test Results

Validator	Score obtained from Media Expert	Percentage	Score obtained from Material Expert	Percentage
Validator 1	70		32	
Validator 2	65		28	
Validator 3	65		30	
Average				

The validity test results for the instrument gave a percentage and also the material produces as a percentage which means it is in the “Very Good” category. From the results of the study, it is concluded that in terms of media and material, the comic “*Story of Geometry*” is said to be valid because the percentage score obtained is more than equal to the percentage score obtained .

d. Implementation

The “*Story of Geometry*” comic learning media with a contextual approach after being developed was then tested at Junior High School in the second semester of the 2023/2024 school year on February 5, 2024 involving junior high school class IXC students consisting of 26 students. There are *pretest* and *posttest* questions that must be done by students. These questions were given to test the effectiveness of the media. At the beginning of the implementation activities, students were given *pretest* questions presented in the following figure.

Figure 6. *Pretest* Work

Figure 7a. Media Share

Figure 7b. Media Usage

Figure 8. *Posttest* Work

e. Evaluation

In this evaluation stage, analyzed information about the competence, practicality, and effectiveness of the digital comic learning environment "*Story of Geometry*" with a contextual approach for junior high school students.

1. Effectiveness Test

This test is used to determine the effectiveness of the comics developed Based on the academic achievements of students who don't utilize media compared to those who utilize comic media. The following results of the Wilcoxon test to test the effectiveness by looking at the difference of means between the pretest and the posttest table 3.

Table 3. Wilcoxon Test Results

Ranks

		N	Mean Rank	Sum of Ranks
Posttest - Pretest	Negative Ranks	0[a]	.00	.00
	Positive Ranks	23[b]	12.00	276.00
	Ties	3[c]		
	Total	26		

a. Posttest < Pretest
b. Posttest > Pretest
c. Posttest = Pretest

Test Statistics[a]

	Posttest - Pretest
Z	-4.208[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on the Wilcoxon test table, there is no pretest value greater than the posttest value (negative ranks = 0). While the students' posttest scores have increased or the posttest is higher than the pretest scores (positive ranks = 23), in addition, there are several students whose posttest scores are the same as the pretest scores (ties = 3). While based on the results of statistical tests, the significance results contain a value of 0.000 which means less than 0.05. So it is concluded that there is a significant difference between the pretest results and the posttest results, so that the comic media "*Story of Geometry*" is effective to be applied as a learning media, especially in flat-sides space building.

2. Practicality Test

With the help of this test, the practicality of the cartoon "The Story of Geometry" developed independently and given to students was determined. To find this out, the researcher administered a student respondent questionnaire and a teacher respondent questionnaire. get to know the practicality of the cartoon "The Story of Geometry". The results of the student and teacher surveys are presented in Tables 4 and 5.

Table 4. Student Response Questionnaire

Class	Number of Participants	Percentage	Description
IX-C	26		Very good

Table 5. Teacher Response Questionnaire

	Teacher 1	Teacher 2	Average	Description
Average Score				Very good

From tables 4 and 5, the percentages and . Thus, it can be said that it is practical to use comics as an educational

II. Discuccion

the average percentage of valid results of comic media “Story of Geometry” with a contextual approach from media experts and material with the predicate “very good”. So that the qualification of this media has been achieved and can be concluded as a comic media “Story of Geometry” with a valid contextual approach set on the teaching and learning process for flat-sided space building material. Because, students easily understand the material from the media and students are interested in reading comics.

The results of the practicality test of the comic media “Story of Geometry” got an average percentage of and falls into the “very good” category so that it is a practical tool that can be used anytime and anywhere to learn with geometry material. This is because students are interested in reading cartoons, so students can easily understand equilateral geometry material through a contextual approach.

Based on the effectiveness test, it can be concluded that the tools used are effective. This is a supported by the results of significance value of 0.000. this is also helped by the opinions of the students with a percentage of 82% and it is "very good"

The results show that the educational media is practical, valid, and effective as a teaching tool for flat-sided shapes. The “Story of Geometry” comic with a contextual approach contains stories about the same-sided flat prisms and pyramids that are related to students’ daily lives.

CONCLUSION

Based on the results of the research conducted by the researchers, it can be concluded that those who develop the cartoon "The Story of Geometry" with an average percentage of contextual access of 84.4% can be recognized as competent high school students of equilateral geometry material, In addition to the validity of the development of comics “Story of Geometry” with a contextual approach to equilateral geometry material for junior high school students can be said to be practical, this is shown from the average survey results of student and teacher responses, and effective as seen from the results of the Wilcoxon test with a significance of 0.000

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