Development of Digital Mathematics Comic Learning Media "Webtoon" Based Karo Culture

1st Nuraini Sri Bina[1], 2nd Dian Armanto[2], 3rd Waminton Rajagukguk[3]

{ rainribi2701@gmail.com[1], dianarmanto@unimed.ac.id[2] , warajagukguk@unimed.ac.id[3]}

Students of Mathematics Education Doctoral Program, Medan State University, st Willem Iskandar, Medan, 20221 and Lecturer of Informatics, Potensi Utama University, st K.L Yos Sudarso, Medan, 20241, Indonesia[1], Lecturer of Mathematics Education Doctoral Program, Medan State University, st Willem Iskandar, Medan, 20221, Indonesia[2,3]

Abstract. Learning media is a tool or means used to facilitate the learning process to be more effective, engaging, and interactive. Learning media can take the form of objects, pictures, sounds, videos, or a combination of these elements. The mathematics learning media "Webtoon" is a learning media that consists of visual elements and text displayed digitally through a computer, tablet, laptop, or smartphone with the help of the internet. The use of learning media can enhance learning motivation, improve understanding of concepts, and provide a more interactive learning experience. This research aims to develop culturally-based learning media in the form of digital media. The research method used is the ADDIE development model. The research result is a valid digital mathematics comic learning media called "Webtoon".

Keywords: Mathematics Learning Media; Mathematics Comic; Webtoon; Karo Culture.

1 Introduction

The use of technology-based learning media in mathematics learning is still very poorly implemented. A researcher in Jambi, Indonesia, namely Rahma [1] said that the use of digital-based learning media is still low. This applies to both young and old teachers. Factors that cause educators to not apply digital-based learning media because teachers lack expertise in technology and information, then lack of technology-based or digital learning facilities. Other researchers in the Netherlands, namely only 30% of students use technology-based learning media to help learn derivative concepts in mathematics subjects [2]. This is caused by the lack of resources or teaching staff who have the ability in the field of technology and the lack of facilities in the form of technology-based mathematics learning media. Next, Sudarmi [3] said that the facilities in the form of digital comic learning media were still minimal, so learning mathematics became less interesting. Other researchers also found that there was a lack of learning media facilities such as digital comics to support mathematical literacy [4]. Based on

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the findings of this researcher, it can be concluded that the availability of digital learning media, one of which is digital comics, is still lacking.

The lack of availability of digital learning media, especially in learning mathematics, causes low mathematics learning achievement. This is evident from the findings of researchers who stated that out of 20 students, no students scored 70 and above in mathematics due to the lack of application of digital learning media [5]. Then, when viewed from the results of the 2019 National Examination, Mathematics is the subject with the lowest score when compared to other subjects on national exams, such as Indonesian, English, Physics, Chemistry and Biology [6]. The explanation above shows that there has been a gap. The ability of students in mathematics can be improved by applying digital comic learning media, but due to the lack of availability of facilities this media is less applicable. In fact, the ability of students in mathematics is still low.

For this reason, this research developed technology-based learning media in the form of digital comics based on Karo culture. Culture in mathematics is called ethnomathematics. The role of ethnomathematics as an instrument in mathematics education serves to improve mathematics education and help clarify knowledge about the nature of mathematics [7]. Karo culture is a rule, customs and arts applied by the Karo people. The Karo people live in the Karo district, North Sumatra, Indonesia. Based on Harahap's research, one of the Karo cultures, namely the traditional house, has almost disappeared [8]. Ethnomathematics aims to draw on a cultural experience and use of mathematics. Ethnomatematics also provides insight into knowledge in mathematics which is embedded in the social and cultural environment and can appreciate the use of mathematics in everyday life.

According to previous research, the application of culture to learning media can introduce students to the diversity of Indonesia so that learning becomes more attractive [9]. Then, learning media in the form of culture-based digital comics can increase students' HOTS [10]. Digital-based comic learning media can make it easier for students to understand math lessons [11]. Based on the search for digital comic learning media, it has never been developed based on Karo culture. So, it becomes a novelty of this research.

2 Method

The purpose of this development research was to find out how the validity of Mathematical Comic Learning Media for Class X Students at the Culture-Based High School level in the Material of Three Variable Linear Equation Systems (SPLTV). The research used is of the type of development research or research and development which is oriented towards developing and implementing the resulting products. The product developed is an instructional material in class X high school mathematics learning to facilitate students in solving mathematical problems, especially in the matter of a system of three-variable linear equations.

According to Sugiyono [12], research and development (R&D) methods are research methods used to produce certain products using research facilities that are needs analysis and to test the effectiveness of these products so that they can function in the wider community. Research and development of this model in outline, namely Analysis-Design-Development-Implementation-Evaluation can be summarized into three stages, namely: preliminary study,

product development, and product validation. The product compiled in this study is the development of Karo Culture-based comic learning media "webtoon" which is expected to be used by educators and students to increase knowledge in Mathematics. The research phase begins with a needs analysis, namely collecting empirical and theoretical information which is categorized as a preliminary study. Then make a plan or design of learning media. The next stage is validation carried out by experts as a development stage. The last is the implementation and evaluation stage.

3 Result dan Discussion

The initial stage is analysis, which collects theories about learning media in the form of digital comics, Karo culture, and three-variable linear equation system material. The digital comic learning media in this study was named "webtoon". Then the design stage is to design digital comic learning media by:

1. Determine the storyline, which is related to the Karo culture and apply a three-variable linear equation system to the story. The comic strip used in this research is a comic with a final story or no sequel.
2. Determine the characters in the story. With the character of the name and shape resembling the name of the Karo Society.
3. Drawing comic sketches manually. Includes, character, background and text balloons.
4. The manual comic sketch is scanned, then transferred to the Corel Draw application to clarify the image.
5. Coloring and finishing stage.

At the design stage, the initial product "webtoon" learning media was obtained which can be seen in Figure 1 below:

Fig. 1. The design of learning media "webtoon"

After the webtoon learning media is formed, the next stage is the development stage which is carried out by means of product validation with five experts in the fields of mathematics, mathematics education and educational technology then visual communication design. The resulting validation table is as follows:

Table 1. Component validation of the content of the material

Number	Content	Rating average
1	Conformity of the content of the material with syllabus	4.6
2	Compatibility of the material with core competencies and basic competencies	3.4
3	Compatibility of the material with teaching needs	3.8
4	The suitability of learning materials with the indicators to be achieved student	4
5	Benefits of material for additions insight into student knowledge	4.8
6	Ease of understanding learning materials	4

7	The truth of substance in matter learning	3.6

From Table 1 the average obtained for each component of the five validators is 4. Referring to the validity indicator according to [13], the content aspects of learning media are included in the valid category.

Table 2. Validation of construction components

Number	Construction components	Rating average
1	Meaningfulness in learning materials	4.2
2	Appropriateness of learning materials with the ability level of students	4.6
3	Clarity in learning objectives	4
4	Providing motivation for students	4.6
5	The order of presentation in learning materials	4.2
6	Systematics of learning materials	3.8
7	Completeness of information in the presentation of the material	3.8

From Table 2 the average obtained for each component of the five validators is 4.2. Referring to the validity indicator according to [13], the construction component aspect of learning media is included in the valid category.

Table 3. Language Component Validation

Number	Language Component	Rating average
1	Clarity in providing information	4.4
2	Legibility	3.6
3	Effective use of language and efficient	4.2
4	Use dialogue or text interesting and lead to understanding of the concept	3.8
5	The use of language communicative	4

From Table 3 the average obtained for each component of the five validators is 4. Referring to the validity indicator according to Akker [13], the language component aspect of learning media is included in the valid category. Note that validators for all components are usable with minor revisions. The revision suggested by the validator is to fix the incorrect text in the text bubbles. As shown in the image below:

Fig. 2. Incorrect text correction examples

In figure 2 there is an error in the text of the equation from:

$$85.000\ b + 100.000\ b + 100.000\ c = 5.100.000, \quad (1)$$

should,

$$85.000\ b + 100.000\ b + 80.000\ c = 5.100.000 \quad (2)$$

This revision has been fixed. Of the three components, the average overall component of all validators is 4.1 (valid). Then the implementation or application of this learning media was carried out in class X SMA Negeri 1 Berastagi and SMA Negeri 1 Kabanjahe in learning mathematics. The result of the application of the comic learning media "webtoon" is that student scores on the three-variable linear equation system material 95% of 36 students are above the KKM, namely 70. This finding is supported by research conducted by Widodo who said comic media was able to bridge the transition from a certain stage to the abstract stage of learning mathematics so that it was more interesting and could improve students' problem solving abilities.

4 Conclusion

The conclusion of this study is that the development of digital comic learning media products or what is called "webtoon" is valid. After going through the process of analysis, design, validation and evaluation of the learning media products that have been developed, they have been finalized and can be used as classroom learning media for mathematics subject material on a system of three-variable linear equations

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References

[1] F. A. Rahma, H. S. Harjono, and U. Sulistyo, “Problematika Pemanfaatan Media Pembelajaran Berbasis Digital,” J. Basicedu, vol. 7, no. 1, pp. 603–611, 2023, doi: 10.31004/basicedu.v7i1.4653.

[2] M. van Geel, T. Keuning, and I. Safar, “How teachers develop skills for implementing differentiated instruction: Helpful and hindering factors,” Teach. Teach. Educ. Leadersh. Prof. Dev., vol. 1, no. July, p. 100007, 2022, doi: 10.1016/j.tatelp.2022.100007.

[3] S. Y. Sari, Y. Gusmania, and N. H. Hasibuan, “Pengembangan komik digital sebagai media literasi numerasi,” Pythagoras J. Progr. Stud. Pendidik. Mat., vol. 12, no. 1, pp. 85–94, 2023, doi: 10.33373/pythagoras.v12i1.5033.

[4] N. H. Hasibuan, Y. Gusmania, and S. Rahman, “Efektivitas Pengembangan Media Pembelajaran Komik Berbasis Kodular untuk Kemampuan Pemahaman Literasi Matematika Siswa SDS Edustar,” J. Absis J. Pendidik. Mat. dan Mat., vol. 4, no. 2, pp. 501–510, 2022, doi: 10.30606/absis.v4i2.1218.

[5] M. Kurniawarsih and I. M. Rusmana, “Pengembangan Media Pembelajaran Komik Matematika Siswa Kelas IV Sekolah Dasar Berbasis Budaya,” J. Lebesgue J. Ilm. Pendidik. Mat. Mat. dan Stat., vol. 1, no. 1, pp. 39–48, 2020, doi: 10.46306/lb.v1i1.

[6] N. S. Bina et al., “PENGARUH MODEL ICAP TERHADAP KEMAMPUAN,” vol. 4, no. 2, pp. 195–203, 2022.

[7] M. Rosa et al., Current and future perspectives of ethnomathematics as a program. 2016.

[8] K. Harahap and E. Nurlaelah, “Eksplorasi Keunikan Rumah Adat Batak Karo Dalam Mengungkapkan Nilai Filosofis Dan Sudut Pandang Matematika,” vol. 7, no. 1, pp. 179–191, 2023.

[9] H. M. Saputri, “Indonesian Culture-Based Comic for Teaching Young Learners in Indonesia,” in The 2nd Teylin International Conference, 2017, no. April, pp. 122–130, doi: 10.24176/03.3201.15.

[10] T. Widiyastuti, S. Slamet, and S. B. Kurniawan, “Development of Science Comic Media Based on Local Culture Wisdom to Improve HOTS,” Proc. 5th Int. Conf. Arts Lang. Cult. (ICALC 2020), vol. 534, no. 534, pp. 120–126, 2021, doi: 10.2991/assehr.k.210226.056.

[11] E. Dharmayani, H. Suhendri, and Y. Wiratomo, “The Development of Mathematical Comics Presenting Statistical Data for Class VII Culture-Based Junior High Schools,” Intelektium, vol. 3, no. 2, pp. 244–254, 2022, doi: 10.37010/int.v3i2.1050.

[12] E. Wibowo and D. D. Pratiwi, “Pengembangan Bahan Ajar Menggunakan Aplikasi Kvisoft Flipbook Maker Materi Himpunan,” Desimal J. Mat., vol. 1, no. 2, p. 147, 2018, doi: 10.24042/djm.v1i2.2279.

[13] J. van den Akker, R. M. Branch, K. Gustafson, N. Nievenn, and T. Plomp, Design Approaches And Tools In Education And Training, vol. 29, no. 7. Kluwer Academic, 1999.

[14] S. Adi Widodo, T. Turmudi, J. Afgani Dahlan, I. Istiqomah, and H. Saputro, “Mathematical Comic Media For Problem Solving Skills,” pp. 101–108, 2018, doi: 10.4108/eai.23-4-2018.2277592.