

Mathematic Comic Mobile Learning (MCML) for Class VII

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Abstract

This research started from the students' low understanding of the concept of Linear Equation System material and had never the use of comic media during mathematics learning. This study aims to develop and determine the effectiveness of learning using comics media which is carried out with a scientific approach in terms of student learning outcomes, with the subject of One Variable Linear Equation (PLSV) in grade VII A SMP Kanisius St. Yoris Semarang for the academic year 2021/2022. The subjects of this study were students of grade VII A SMP Kanisius St. Yoris Semarang for the academic year 2021/2022. This study uses the type of research ADDIE (Analysis, Design, Development, Implementation, Evaluation). The research instrument used in data collection consisted of (1) respondent (teacher) interview sheets, (2) student learning interest and attention scale sheets using MCML, (3) direct observations on the object of study, (4) documentation, (5) learning outcomes test. The data from observations and the scale of student learning interest and attention were analyzed quantitatively using the total score and percentage obtained by each student, then based on the results of the percentage determined the criteria for the effectiveness of student learning as a whole. Data from interviews and documentation were analyzed descriptively qualitatively as a reinforcement of the results of student learning effectiveness. Data on student learning outcomes, namely the results of the initial and final tests were analyzed using the total score of each student and the percentage obtained by all students, then based on the results of the percentage the criteria for the effectiveness of student learning outcomes were determined. The results showed that the application of SPLSV learning with comics media was effective in improving student learning outcomes. According to the criteria for the effectiveness of learning outcomes, qualitatively it shows the effectiveness of high learning outcomes.

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INTRODUCTION

By following the advancement of Educational Technology (Educational Technology), and Learning Technology (Instructional Technology) requires the use of various learning media (instructional media) and increasingly sophisticated equipment (sophisticated) (Nurseto, 2011). The information technology revolution is another impact of the globalization era (Widyaiswara, 2018). The development of Information and Communication Technology (ICT) demands that the world of education continues to experience quality improvements, especially adjustments to the use of ICT in the learning process (Sampurno, Maulidiyah, and Puspitaningrum, 2015). A third of 1000 teachers rarely use ICT as a medium of learning. (Marjan, 2014).

Mobile learning can increase *personalization* in learning activities with various available tools and resources (Zeny, Eka, and Yerri, 2018). The specialty of *mobile learning* is that you can do distance learning, anywhere and anytime. In addition, *mobile learning* can make students active and pay attention to learning materials. In building quality human resources (HR), education is the main factor. With the growth and development of interest and a passion for reading, reading is a habit that must be done every day as it fulfills the needs of life (Nurhayati, et al, 2021).

Education is an effort to develop a directed and comprehensive quality of human resources by all generations of the nation to develop optimally with the support of various parties (Pramuditya, et al, 2018). To create learning activities that invite students to be active, the teacher also has the responsibility to create creative and innovative learning activities (Mia Permata and Kristanto, 2020). The *Google Classroom* is a form of learning model that facilitates current social media technology. The learning process using *Google Classroom*, in general, can save time (Rodiawati and Komarudin, 2018).

Along with the development of technology both directly and indirectly can change a person in communicating, socializing, and learning, this

is a challenge for educators to be able to use technology optimally and can facilitate interaction with students in the teaching and learning process both face-to-face and directly. indirectly (online) (Nasrullah, et al, 2017). Digital writing of textbooks with service-learning is an approach that uses three main activities, namely early in service, learning in the workplace, and finally in service-learning (Hidayah, et al, 2021). Changes that can improve education at all levels, in anticipation of future changes. Education that can support development in the future is education that can develop students' potential so that students can face and solve problems in everyday life they face (Amalu and Claravall, 2021).

The use of information technology in education has been widely carried out by various universities throughout Indonesia in the world (Nugroho, et al, 2020). A study said that ICT-supported learning such as discussion forums and short videos discussing material contribute to constructivism and observational learning aspects (Sharma, et al, 2021). One of the mathematics materials taught in class VII odd semesters is Linear Equations of One Variable. In teaching mathematics, not all teachers in grade VII SMP in the city of Semarang have used comics as a medium of learning. The author creates comic media with material represented by three characters, namely Covido, Covidi, and Covida, which are animated using the Canva application. Included in the *Google Classroom* and used in learning activities through the *Google Meet*.

Based on the researcher's brief interview with the mathematics teacher, the teacher has never used comics in classroom learning. In teaching mathematics in the classroom, the teacher uses the question and answer method about problems from textbooks or worksheets. During mathematics learning activities, some students were passive, some did not pay attention to the learning that was taking place and stated that they did not like mathematics because it was complicated, too abstract, and some students were afraid to ask the teacher. Students stated that they were sometimes bored with the ongoing mathematics learning activities.

Based on the analysis of previous studies, which have not used comics as the material for One Variable Linear Equations, there is research that has been conducted on seventh-grade students of Kanisius St. Junior High School. Yoris Semarang will be the focus of the research. In learning, the Google Classroom learning platform will be used which includes comic media and short videos with sub-discussions on finding the concept of One Variable Linear Equation and solving problems in the form of One Variable Linear Equation. With this media, it is hoped that it can help students understand the concept of linear equations.

METHOD

The design of this research is development research. This research is research that aims to develop a product to maximize the learning that is carried out in the classroom. In addition, the products developed can cover a wider area, not only in classroom learning but for overall educational activities that are focused on one area. research on the development of *Math Comic Mobile Learning* uses the ADDIE model with the flow of *Analysis* (Analysis), *Design* (design),

Development (development), *Implementation* (implementation), and *Evaluation* (Evaluation) (Dick and Carey, 1996). The subjects of this study were students of grade VII A SMP Kanisius St. Yoris in Semarang for the 2021/2022 academic year. The experimental subjects were 31 students. The data in this study were collected using interviews, polls, and tests. The data analysis technique of this research was carried out by analyzing interviews, expert validation, sharing questionnaire data, and analyzing learning test data.

RESULTS AND DISCUSSION

Analysis

This design begins by making a storyboard (figure 1) to make it easier to make teaching materials in the form of Math Comic Mobile Learning (MCML). The results at this stage are in the form of a framework used in the development of teaching materials. In addition, at this stage, a validation sheet of teaching materials and an assessment questionnaire were also produced on the student's character. Validation aims to assess and determine the feasibility of teaching material products before they are implemented.

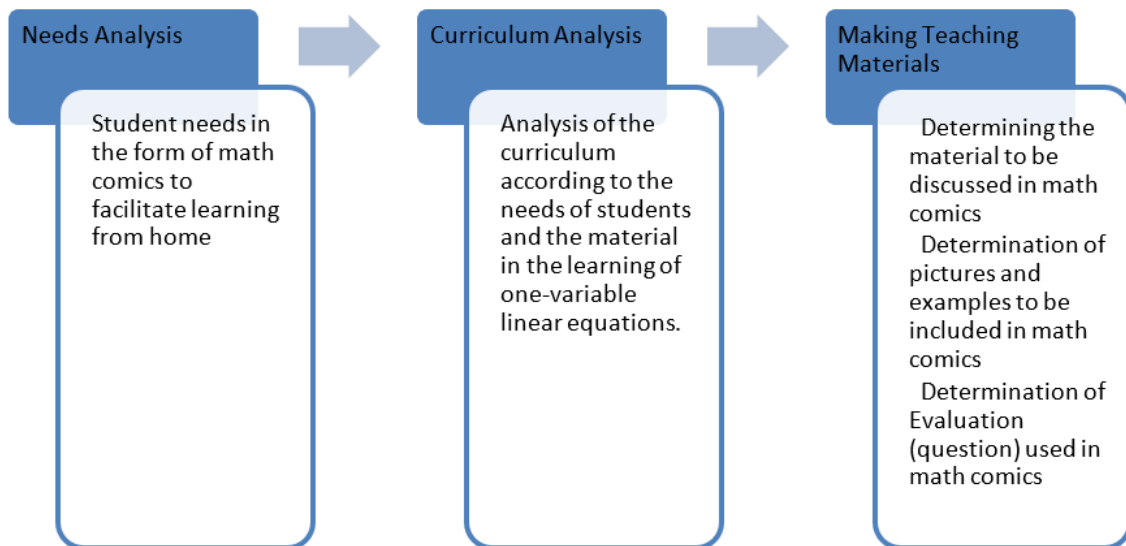


Figure 1. Storyboard Stage 1

Design

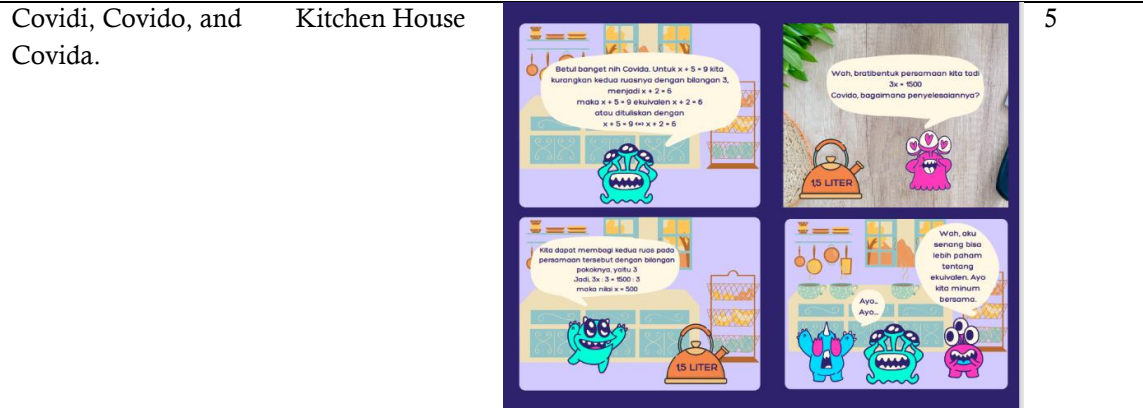
This product aims to design a product to obtain an initial draft. This product design activity begins with product design. Product

design begins with a discussion again between the teacher and students. The teacher and students together convey the results of the *need analysis* that has been found in the previous stage. After the

delivery took place, the researcher began to developed. After that, jointly design the product conduct discussions about the product to be to be developed.

Table 1. StoryBoard Design of Teaching Materials in the form of Mathematical Comic Strip Design

Figure	Background	Illustration of	Part
Covidi and Covida Segments	House	<p>Persamaan Linear Satu Variabel</p> <p>BERSAMA COVIDI, COVIDO, DAN COVIDA</p> <p>Panel 1: Hai Covida, Apakah kamu mau wedang jaje besok buatkan? Wah, mau dong Covidi, aku suka wedang jaje.</p> <p>Panel 2: Baiklah, ayo kita ajak Covida juga. Kita manemem wedang jaje bersama ya. Aku senang sekali jika Covida mau ikut bersamaku.</p> <p>Panel 3: Ayo kita ke rumah Covida sudah, menunggu kita di dalam. Baiklah, aku mau kerumahmu yang penting saneman ada Covida ya nanti.</p>	1
Covido and Covida	Kitchen	<p>Panel 1: Hai Covida, aku mau ikut memangganya sama rata. Wah, baiknya aja Covido. Terakhirlah sebelumnya.</p> <p>Panel 2: Ayo Covida, bantu aku memangganya sama rata. Wah, aku suka banget jika bisa membantumu Covida.</p> <p>Panel 3: Aku ingin menged wedang jajenya sama rata. Tapi, 15 liter itu berapa matter?</p>	2
Covido and Covida.	Kitchen	<p>Panel 1: Baiklah, akan kujelaskan lebih lanjut. Misalnya, kita punya 2 Persamaan Linear Satu Variabel yaitu: $x + 5 = 9$ dan $x + 2 = 6$. Apakah kedua persamaan itu ekuivalen? Sebenarnya kedua persamaan tadi ekuivalen lho.</p> <p>Panel 2: Untuk persamaan $x + 5 = 9$ mempunyai dua ruas, yaitu ruas kanan dan ruas kiri. Kedua ruas harus mempunyai jumlah yang sama. Aduh, aku jadi bingung, coba kamu jelaskan lagi.</p> <p>Panel 3: OK, untuk mendapatkan persamaan yang ekuivalen, apakah kedua ruas pada persamaan tersebut harus dikurangi/ditambah/dikalorival dengan bilangan yang sama? Aduh, aku jadi bingung, coba kamu jelaskan lagi.</p>	3
Covido and Covida	Kitchen	<p>Panel 1: Baiklah, akan kujelaskan lebih lanjut. Misalnya, kita punya 2 Persamaan Linear Satu Variabel yaitu: $x + 5 = 9$ dan $x + 2 = 6$. Apakah kedua persamaan itu ekuivalen? Sebenarnya kedua persamaan tadi ekuivalen lho.</p> <p>Panel 2: Untuk persamaan $x + 5 = 9$ mempunyai dua ruas, yaitu ruas kanan dan ruas kiri. Kedua ruas harus mempunyai jumlah yang sama. Aduh, aku jadi bingung, coba kamu jelaskan lagi.</p> <p>Panel 3: OK, untuk mendapatkan persamaan yang ekuivalen, apakah kedua ruas pada persamaan tersebut harus dikurangi/ditambah/dikalorival dengan bilangan yang sama? Aduh, aku jadi bingung, coba kamu jelaskan lagi.</p>	4



Development

The process of realizing the design that has been designed into a product. At this stage, product development is carried out starting from the material contained in the teaching materials and also the appearance of the teaching materials. Material development is carried out by reviewing the curriculum first, then determining the sub-materials that will be included in the teaching materials.

Implementation

At this stage, the developed teaching materials have been declared very good by the validator with the validity of the test instrument using the Pearson correlation product moment. For this reason, the value of r_{table} with a significance level of 5% and the number of students 30 is 0.361 so that it can be continued in the next stage. This research was piloted on grade VII A SMP Kanisius St. Yoris for the 2021/2022 school year. The results of the reliability of the test instrument were measured using the Alpha Cronbach from the analysis of the calculation of the student's test score data with the variance of all items. $s_t^2 = 234.44$. The test questions are reliable with sufficient qualification by calculating r_{count} is 0.53335.

As preparation before the research, the researcher together with the teacher made preparations related to the learning process, namely the preparation of the Learning Implementation Plan (RPP), Comics, along with practice questions on comics. In this study, those who carry out the learning process are teachers and students. Each learning instrument is

consulted with the mathematics teacher for class VII A so that the learning instrument is adapted to the student's circumstances.

Before learning, the teacher reminds students of the social arithmetic material that has been studied before, which is also related to the One Variable Linear Equation material. The teacher informs the students that during the study of the One Variable Linear Equation material, they will study together using the comics provided by the researcher.

The research was conducted in 2 learning meetings in class VII A of SMP Kanisius St. Yoris Semarang. The number of students consisted of 31 students, but during the implementation of learning the number of students who took the final test was 26 students. In this study, there was 1 student who did not take the final test, so the data analysis of student: interest and attention only used data from 26 students. During the learning process with comic media, the researcher acts as an observer. The details of the learning activities are as follows:

The first meeting will take place on Tuesday, January 4, 2022, at 08.30 – 09.30. Researchers distributed comics, and students were allowed to see the contents of the comics and read the first story. At this meeting, the teacher invites students to read the story in the first part, to learn to understand the meaning of One Variable Linear Equation by the learning objectives written in the second story. From the apperception activities at the first meeting, it was shown that most of the students were enthusiastic in participating in learning, paying attention, and responding to the teacher's questions.

In the discussion, almost all students asked what is a Variable Linear Equation. Some students are confused about what open sentences are based on the examples given in the comics and try to ask the teacher. From this activity, it can be seen that there is attention and learning effort from students to improve their understanding of the meaning of One Variable Linear Equation. After the discussion is over, the teacher asks the student representatives to present the results of their discussion in class. At the first meeting, because time was limited, there were not many responses given by students after the explanation was given. The teacher also concludes the results of the discussion briefly and informs that for the next meeting the second story will be discussed, namely the equivalent of one-variable linear equations.

The second meeting will be held on Wednesday, January 5, 2022.07.30 – 08.30. The

activity begins with discussing the practice questions in the first story. Some students were asked to submit their answers. Other friends respond to the answers that have been submitted, by responding to answers that they feel are not clear, and try to correct less precise answers. In the next step, after discussing the problem, the teacher invites students to enter into the equivalent One Variable Linear Equation material. Students are invited to play the characters in the comics in the third story. In this activity, several students played the roles of Covida, Covidi, and Covido. The teacher acts as a narrator and storyteller. The next activity is for students to work on Google form questions. Most of the students were quite interested and enthusiastic to ask the teacher and researchers when working on the questions.

Table 2. Percentage of Criteria Results of the analysis of observations of student interest and attention

Percentage of Effectiveness	ST	ST+T	ST+T+C	ST+T+C+R	ST+T+C+R+S	Effectiveness Criteria
	15.38%	42.31%	57.69%	88.46%	100%	Low

Judging from the analysis of students' final tests on mathematics learning using the Math Comic Mobile Learning (MCML) media, it shows that the percentage of the effectiveness of student outcomes in learning activities with very high, high, sufficient, and low criteria reaches, 88,46%. Therefore, it can be concluded that the overall effectiveness of student learning outcomes is in low criteria. By the criteria for the effectiveness of qualitative learning outcomes, the use of Math Comic Mobile Learning (MCML) comics in learning activities is said to be effective if the percentage of students whose scores meet

the criteria is very high, high, and sufficient to reach 75%.

Data on students' interest and attention were also obtained from the results of filling out the scale by all students who took part in learning with the comic media of One Variable Linear Equation. The scale is used to determine students' interest and attention while participating in mathematics learning activities with the Math Comic Mobile Learning (MCML) media. From the results of filling in the scale (complete analysis can be seen in the appendix), it is obtained as follows:

Table 3. Results of Analysis of Student Interests and Attention

Criteria for Motivation	Very High (ST)	High (T)	Low (R)	Very Low (SR)
Number of Students	3	15	5	3

Based on the table above, 15 students responded with high criteria and 3 students responded with very high criteria. The percentage of the number of students who are motivated with very high and high criteria reaches 73% or 0.73

so that they are included in good criteria. Therefore, it can be concluded that all students gave positive responses.

Interviews were conducted after learning One Variable Linear Equation using comic media

was carried out. Interviews were conducted with mathematics teachers in class VII A, with the results of interviews that the right media to streamline the learning process is media that invites students to be actively involved in making and using these learning media.

Evaluate

At this stage, is a process to see whether the learning system being built is successful and by the initial design or not. For the results, media experts stated that the products developed were very good. So, it can be concluded that; (1) The comics developed have been by the steps for compiling and developing comics with the ADDIE, namely analysis, design, development, implementation, and evaluation. developed has met the criteria of validity, practicality, and effectiveness. The results of the products that have been tested get evaluations from material experts to improve some sub-materials that are still not coherent. After all stages of development and testing have been carried out, the results of this study indicate that with the development of comics teaching materials, the One Variable Linear Equation System will increase student interest and learning outcomes. In addition, through Math Comic Mobile Learning (MCML) teachers find it helpful to have comics in learning activities because they can help students learn from home with more detailed explanations from the teacher.

The author's findings are strengthened by previous research, which shows that there is an influence between those who use comics intensely, infrequently, and do not use them on student learning independence (Muchiyidin and Winarso, 2017). The comic media that has been developed is effectively used as a learning medium in the classroom. This is based on the analysis of quiz results given to students when the lesson is over (Syahwela, 2020). Based on the research that has been done, it can be concluded that there is an effect of learning media for mathematics comics for students of class VII SMP/MTs with triangular and quadrilateral material based on culture at MTs Negeri 23 Jakarta (Fitrianingsih et al, 2019). Based on the

score data of the student's assessment scores, the results of the analysis of student assessment scores showed that the daily assessment scores that met the criteria of sufficient, high, and very high were 16 students, with a percentage by the criteria for the effectiveness of quantitative learning outcomes. 88.64%. By doing learning using Math Comic Mobile Learning (MCML), learning outcomes increase and students' interest in learning is quite high. As a result, creating a liking or interest in mathematics lessons through Math Comic Mobile Learning (MCML) during lessons will affect student learning outcomes.

CONCLUSION

By the limitation of the problem in the research, namely "*Mathematics Comic Mobile Learning (MCML for Class VII*", then to develop and determine the effectiveness of using comic media, the researcher analyzed the results of the test scores. development model *ADDIE* has 5 sequential stages, namely (1) *Analysis* (Analysis), namely the stage of analyzing needs (*needs analysis*) which includes a needs analysis, the needs obtained the results that teaching materials are needed in learning to overcome student problems in learning, then curriculum analysis, a curriculum that taken, namely the One Variable Linear Equation, this is adjusted to the needs of students on the material, the curriculum is also adapted to the achievements of student graduates so that the material developed will also be by the existing curriculum; (2) *Design* (Design) in the form of formulating learning objectives the S by the subject of One Variable Linear Equation System and making *storyboards*. The purpose of this lesson is to see how effective this comic is in the learning that will be applied. In addition, the learning objectives will facilitate the design of the evaluation that will be given. (3) *Development* is the process of realizing a design that has been designed into a product, after going through the design stage, the development stage is in the form of making comics with Canva as a form of evaluation. After the comics are developed, validation tests will be carried out regarding the materials and comic products developed, the

result is that the developed comics can be tested. From the data on the scores of students' assessment scores, the results of the analysis of student assessment scores showed that the daily assessment scores that met the criteria of sufficient, high, and very high were 16 students, with a percentage by the criteria for the effectiveness of learning outcomes quantitatively . 88.64%. So that the feasibility of *Math Comic Mobile Learning (MCML)* can be used in learning, of course, taking into account the inputs given by students and material experts and media experts. (5) *Evaluation*, the comics developed have met the criteria of validity, practicality, and effectiveness. The evaluation of the material experts has been improved and after evaluating the input of various parties, it is concluded that comics, as teaching materials developed, can increase student interest and learning outcomes. Thus, the results obtained are very high effectiveness and the media needs to be developed by being given practice questions and their discussion in comics.

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