

Proceeding of International Conference on Islamic Education: Challenges in Technology and Literacy

Faculty of Education and Teacher Training, Universitas Islam Negeri Maulana Malik Ibrahim Malang

November 6-7, 2019

P-ISSN: 2477-3638, E-ISSN: 2613-9804

Volume: 4

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Development Learning Media Mathematics Game Board Triple-F (Fraction For Fun) to Improve Understanding of the Material Various Forms of Fractions

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Abstract. The aim of this research is to produce learning media and explain the effect of using learning media to improve students' understanding. The research method in this study is Research & Development with Sugiyono's development model. The technique of collecting data used questionnaires, observation, interviews, and documentation. The data obtained quantitative and qualitative descriptions. The research samples are 4th-grade students of MINU Maudlu'ul Ulum Malang. The result of the research and development these learning media are: 1) the design of learning media Triple-F (Fraction for Fun) that game board form, that is packed in the box size 31x25 cm and consists of the game board, question card, instruction of use, dice and point. Based on the result of validation, show that media is achieved valid category, the result of validation media expert 90%, content expert 68%, learning expert 95%, 3) the effectiveness level of developed media can be seen from value of pre-test 64,5 and post-test 82,2 it is indicated that the result is significant, and questionnaire of students interest reach 91,6%, it means that the learning media mathematics board game Triple-F can improve the understanding of material various form of fraction.

Keyword: *Development, Learning Media, Games, and Fraction*

Abstrak. Tujuan dari penelitian ini adalah untuk menghasilkan media pembelajaran dan menjelaskan pengaruh penggunaan media pembelajaran tersebut dalam meningkatkan pemahaman siswa. Metode penelitian dalam penelitian ini adalah Penelitian dan Pengembangan model pengembangan Sugiyono. Teknik pengumpulan data pada penelitian ini menggunakan angket, observasi, wawancara dan dokumentasi. Data yang diperoleh secara kuantitatif dan kualitatif. Sample penelitian ini adalah siswa kelas 4 MINU Maudlu'ul Ulum Malang. Hasil penelitian dan pengembangan media pembelajaran ini adalah: (1) desain media pembelajaran *Triple-F (Fraction for Fun)* yang berbentuk papan permainan yang dikemas kedalam box yang berukuran 31x25 cm, didalamnya terdiri dari papan permainan, kartu soal, petunjuk penggunaan, dadu dan pion. Berdasarkan hasil validasi menunjukkan bahwa media ini mencapai kriteria valid, dengan hasil validasi ahli media 90%, ahli konten 68%, ahli pembelajaran 95%. (2) tingkat keefektifan dari media yang dikembangkan terlihat dari nilai rata-rata hasil pre-test dan pos-test yang menunjukkan hasil yang signifikan, yaitu pre-test 64,5 dan pos test 82,2 dan angket kemenarikan oleh siswa memperoleh 91,6%, artinya media pembelajaran papan permainan matematika *Triple-F* dapat meningkatkan pemahaman pada materi berbagai jenis pecahan.

Kata kunci: *Pengembangan, Media Pembelajaran, Permainan, dan Pecahan*

1. INTRODUCTION

Today teacher encounters the big challenges, there are industry revolution 4.0, globalization and technology run fastly. If the teacher is not ready to encounter the challenges, how can teachers prepare his students, with the acceleration of the development of a very fast era. Our education still uses the 2013 curriculum which was revised in 2017. According to Slamet

Widodo in his research "Curriculum 2013 implementation revision edition" propose that teachers must be able to innovate in the instruction, based on that revised it means there are the new things that must be changed to be better. Innovations could do by the teachers for that problem are: 1) teachers teach religion and social to student through integration (hidden curriculum), 2) teacher innovate the syllabus and instructions appropriate need, 3) teacher have a creative for choose and apply the instruction strategy (approach, model, and method instruction), and 4) teacher apply the thinking skills based on digital literate.

Especially in elementary school, there is thematic, in one theme there is some subjects that related to each other and integrated. Although it has been integrated with the theme, mathematics is still considered to be difficult frightening learning. This is must fix it, change our mind, that mathematics is fun and know how mathematics is very important in our life. According to Almira Amir "Mathematics learning in primary school using manipulative media" proposes that mathematics learning in primary school is a different characteristic between student and mathematics. Therefore the bridge needed to neutralize the different. Primary school students are experiencing development at the level of thinking.

In accordance with the stages of development students overcome and solve problems through activities that interact directly with objects or the environment in a real way. A student in primary schools, especially in the lower classes, still tend to think concrete in understanding a situation. To understand the situation or that problem, so needed supporting manipulative media. This does not only help understand concepts in mathematics but also as media for solving the problem. The function of learning media here, give the instructions, give an explanation, until the student can open-minded and have a new mindset, can understand from concrete to abstract.

One of the mathematics material that is difficult to understand, for example student 4th-grade 1st semester, has a difficult understanding of fraction material. The student has difficulty converting ordinary fractions into mixtures fractions or percent or decimal. This is based on mathematics basic competencies 3.1 explain the equality fractions with picture and model, 3.2 explain various forms of the fraction (ordinary, mixture, decimal, and percent) and a relationship between them.

There a many factors influence difficulties learning student, pass through observation in the field, factors influence difficulties learning student that is: (1) lack of motivation student to studying mathematics; (2) monotonous learning process, the student must complete the question; (3) there are no supporting learning media.

Based on the above description, it is necessary to formulate the problems in this research, that is how is the design learning media specification and how is the effect Math Game Board Triple-F (Fraction for Fun) to improve understanding of the material in various forms of fractions.

So that, there are some assumptions to support in the developing of learning media mathematics board game Triple-F (Fraction for Fun) among others are: (1) The assessment of the learning process is contained with three aspects, that is attitude, knowledge, and skills as in the assessment book for elementary school.¹ (2) The researcher has the skill to make a visual media design, (3) There is cooperation with digital printing to help produce the media, and (4) The learning media can motivate the student and provides understanding to students in fraction material.

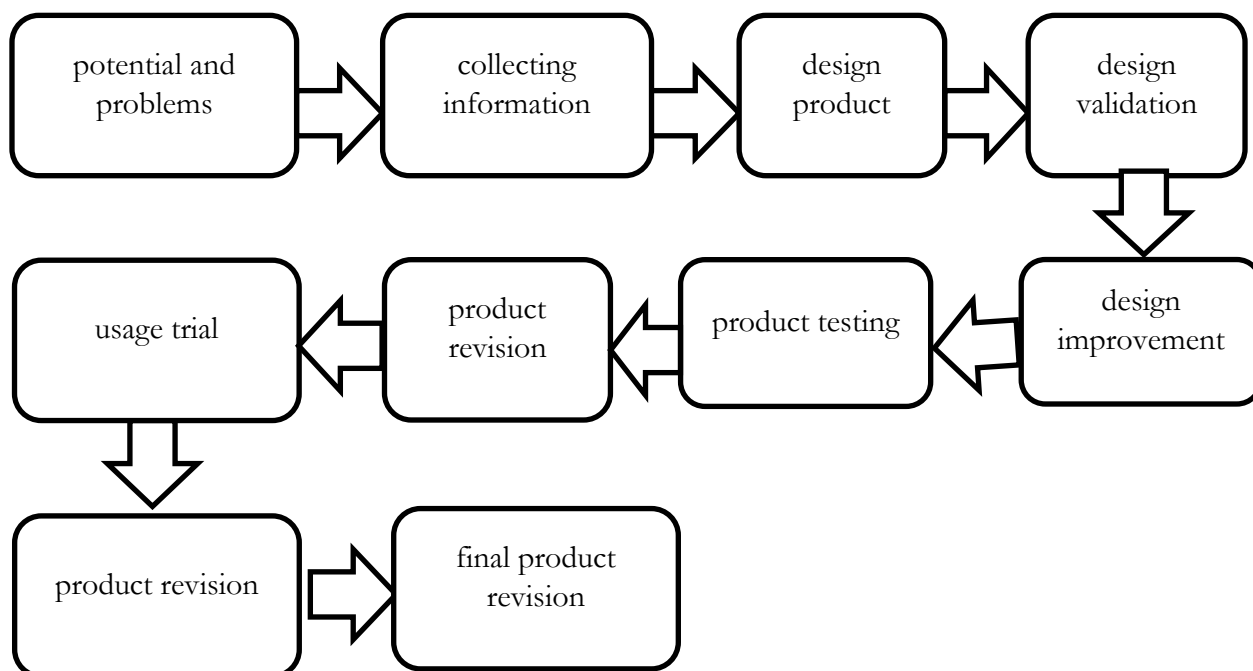
The focus of the study concerns to produced media in the form of non-interactive media called " Triple-F " or Fraction for Fun, in which the media holds from art papers, that has a box formed, has beam steps that must be passed when playing. In each beam, there is a question or clue to be answered by students. The learning media that will be presented in the material of fractions are adjusted to the mathematical of 4th grade SD/MI.

2. METHOD

Research method in this research is Research & Development (R&D) with the model development of Sugiyono, there are ten steps, to develop a new product, that is potential and

¹Kemendikbud. *Panduan Penilaian Untuk SD/MI*. (Jakarta: Kemendikbud, 2015). p. 7

problems, collecting information, design product, design validation, design improvement, product testing, product revision, usage trial, product revision and final product revision.²



Gambar 1 Langkah-langkah Model Pengembangan

The technique of collecting data in this research using questionnaire, observation, interview, and documentation. The data obtained quantitative and qualitative descriptions. The research sample is 4th-grade students of MINU Maudlu'ul Ulum Malang. Data analysis is a processing data that has been collected from a data collection tool into information. Data analysis is also called data processing and data interpretation. The important steps that need to be taken in preparing the scoring and tabulation

To analysis, the data this research used a scale of Likert from questioners processing

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Notes:

P = Reasonability

$\sum x$ = Total score of response (answer)

$\sum xi$ = Total of the highest response score

Table 1 The Manual Conversion of Quantitative Data to be Qualitative Data

Scale	Score distance	Value	Average Score	Category
5	$X > Xi + 1,8 \times sbi$	A	>4,2	Excellent
4	$Xi + 0,6 \times sbi < X \leq Xi + 1,8 \times sbi$	B	>3,4 - 4,2	Good
3	$Xi - 0,6 \times sbi < X \leq Xi + 1,8 \times sbi$	C	>2,6 - 3,4	Enough
2	$Xi - 0,6 \times sbi < X \leq Xi - 0,6 \times sbi$	D	>1,8 - 2,6	Bad
1	$X \leq Xi - 1,8 \times sbi$	E	$\leq 1,8$	Very Bad

²Sugiyono. 2011. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: CV. Alfabeta. Page 297

Notes:

X = Empirical score

X_i (ideal average) = $\frac{1}{2}$ (maximum ideal score + minimum ideal score)

S_{bi} (ideal standard deviation) = $\frac{1}{6}$ ((maximum ideal score + minimum ideal score)

3. RESULT AND DISCUSSION

The development of learning media aims to help students improve understanding of the types of fractions, so students are trained in their skills to work on the problems of various forms of fractions. This development process refers to Sugiyono's development model with ten steps among there,

a. Potential and Problem

The first step, potential, and problem. The researcher conducted observation and interviews with the teacher and several 4th-grade students of MI NU Maudlu'ul Ulum Malang, through the results of observations and interviews. From the results of observations and interviews, is students do not fully understand the material types of fractions, lack of motivation, lack of innovation media, the media used in learning is limited to textbooks, learning activities are only limited to lectures, listening and working on the questions, students do not understand the meaning of learning types of fractions. While the potential is, students more enthusiastic using game-based learning methods, students easily understand the rules of the game and have high sportsmanship, students are able to work well in groups, students have a good competitive spirit. This problem and potential to become the foundation for the development of learning media that will help students learn.

b. Gathering Information

The second step, gathering information. The researcher adjusts to the KD set by the government so that students will have competencies that are in accordance with the KD as follows:

Mathematics

3.1 Explain the equality fractions with picture and concrete model

3.2 Explain various forms of the fraction (ordinary, mixture, decimal, and percent) and a relationship between them

4.1 Identify equality of fractions with the picture and concrete model

4.2 Identify various forms of fractions (ordinary, humorous, decimal, and percent) and relationships between them

c. Designing the Product

The third step is designing the product. At this stage, researchers think about and plan the product specifications to be made, which are in accordance with student needs and basic competencies. The researcher designed the media in the Adobe Illustrator application that used to design the media. Mathematics game board Triple-F (Fraction For Fun) that game board form, that is packed in the box consists of the game board, question card, instruction of use, dice and pawn. The researcher designed the media in the Adobe Illustrator application that used to design the media.

The box packaging sized 31 x 25 cm made of strong and hard cardboard, then coated with a design cover sticker printed using bontax sticker paper with a glossy coating, this box describes the interesting media, describe the content of the media. so, when we first see, we have an idea of the media.

Then the game board sized 30 x 42 cm made of strong and hard cardboard, then coated with a design cover sticker printed using bontax sticker paper with a glossy coating. This game board becomes a game arena that is very important for the game because the game path is on this board.

Instruction of use is made to facilitate teachers and students in using Triple-F media. Instructions for use are made like folded comics measuring 7 x 38 cm and printed using Art Paper 210 type paper. Before starting the game, students are invited to read *bismillahirrahminrrahim* and read *alhamdulillahirrahmanirrahim* when finishing the game and do not be arrogant.

This game is inseparable from the question card, The question card made to help students drilled their skills to understanding and develop the skill in the chapter of the fraction. The question card divided into 3 cards, that is earth card, star card, and moon card. The dice and pawn is a symbol of the number of steps each player will take and that shows the player.



Picture 2 Outside Packaging



Picture 3 Inside Packaging



Picture 4 Instruction display



Picture 5 dice and pion



Picture 6 Mathematics Game Board of Triple F



Picture 7 Earth card

Picture 8 Star card

Picture 9 Moon card

d. Design Validation

The fourth step, design validation. After making the product design, researchers validated media experts and content experts, regarding the feasibility of this media before being tested. Media experts evaluate in terms of design media, whether in accordance with goals and objectives. This content expert evaluates the content and meaning contained in the media, whether it can meet the criteria of a learning medium. Based on the result of validation show that media is achieved valid category, with the result of validation media expert 90%, content expert 68%, and learning expert 95%.

1) Media Expert

Assessment of media expert in this product show by this table,

Table 2 The result validation of media expert

Stage I	Number of indicators										Total	Average	Percentage
	1	2	3	4	5	6	7	8	9	10			
Skor	4	4	5	5	5	5	5	4	4	5	45	4,5	90%

Indicator :

- The media front cover design is in accordance with the contents of the material
- The display of mathematics board game "Triple-F (Fraction For Fun)" simple and practically
- The media show color combination very good
- The font used is recognized and clear
- The sentence in the question is easy to read and easy to understanding
- Supporting images on the media are in accordance with the material presented and attract interest in learning
- The design of instruction used is interesting, easy to read, recognizable and practically
- The question in the question card is appropriate with the material various form of a fraction.
- The developed media is safe for students
- The media is easily operated by students

From the assessment of media, experts obtain an average score of 4.50 and after being converted to a feasibility table, the achievement level of 90% is in a decent qualification as a learning medium, so it does not require revision. Based on the guidelines for converting quantitative data to qualitative data, the score is included in the "Very Good/Excellent" category. Although the category is very good, media experts provide development suggestions to improve the following suggestions, namely: this media is feasible to be used for learning skills in the types of fractions, but that the questions do not take into account the calculation process.

2) Content Expert

Assessment of content expert in this product show by this table,

Table 3 The result validation of content expert

Number of indicators													
Stage I	1	2	3	4	5	6	7	8	9	10	Total	Average	Percentage
Stage II	3	3	3	3	3	3	3	3	3	3	30	3	60%
Score	3	3	3	4	4	3	4	4	3	3	34	3,4	68%

Indicator :

- a. Suitability of learning media with curriculum
- b. Suitability of learning media with KI and KD
- c. Suitability of learning media with indicator
- d. The language used in the instruction of use sheet is easily understood by students
- e. The question in the question card includes the material of various form of a fraction
- f. The language used in the question card is easy to read and understood
- g. The material in the question card is appropriate with the learning material various form of a fraction
- h. The question style in the question card can help understanding students.
- i. Learning media can attract learning interest in the material of various form of a fraction
- j. Learning media can help improve skill students of 4th grade in the material of various form of a fraction

Based on the result of validation in table 2 mathematics board game Triple-F (Fraction for Fun) earn a percentage of 60%, included in the "Enough" category. So, it does require revision. Then after revision, based on the result of validation in table 4.8 learning media earn a percentage of 68%, included in the "Good" category. So, it does not require revision.

3) Learning Expert

Assessment of content expert in this product show by this table,

Table 4 The result validation of learning expert

Number of indicators												
Stage I	1	2	3	4	5	6	7	8	9	Total	Average	Percentage
Score	5	5	5	5	4	4	5	5	5	43	4,7	95%

Indicator:

- a. The operation of learning media is easy for students.
- b. Color display of learning media is very interest.
- c. Design and display learning media is practical, clear and easy to understanding.
- d. Suitability of learning media with KI and KD.
- e. Suitability of learning media with indicators.
- f. Suitability of learning media with the content.
- g. The question style in the question card can help understanding students.
- h. Learning media and instruction for use is easily understood.
- i. Learning media can attract learning interest in the material of various forms of a fraction.

From the assessment of learning experts obtain an average score of 4,70 and after being converted to a feasibility table, the achievement level of 95% is in a decent qualification as a learning medium, so it does not require revision. Based on the guidelines for converting quantitative data to qualitative data, the score is included in the "Very Good/Excellent" category. Learning experts provide development suggestions to improve the following suggestions, that is: the form of questions does not have to be a matter of the story, to make it easier for children to understand and solve problems, attractive forms make children interested in playing.

e. Design Improvement

The fifth step, design improvement. Changes in design were carried out to improve the concept of media that had been developed. *The sixth step*, product testing. Before conducting a large-scale trial, researchers conducted a small-scale trial that aimed to identify the weaknesses and strengths of the media so that they were really ready to be tested on a larger scale.

f. Product Revision

The seventh step, product revision. Product revision is done to revise, repair, or redesign inappropriate products. Product revision is done on the advice of media experts, content experts, and learning experts or when researchers find design errors.

g. Field Trials

The eighth step, field trials. Field trials conducted on a large scale, that is all of the students of 4th-B grade MI NU Maudlu'ul Ulum Malang. The subjects of research totally 22 students The researcher tested the learning media for students and conducted observations and interviews to find out the effectiveness of the media. Pre-test post-tests were conducted to measure student learning outcomes, and questionnaires were given to determine media attractiveness according to students.

Analysis of the effectiveness of learning media mathematics board game Triple-F (Fraction for Fun) based on the result of pre-test and post-test. According to the result of pre-test and post-test, students experience increased learning, the average from 64,5 become 82,2 with 19 students experience increased from the pre-test, 1 student experience decrease from the pre-test, and 2 students who have not to change.

Then the result of the interesting questionnaire by the student shows that they significant result in earn a percentage of 91,6%. that a positive effect on students. Learning media mathematics board game Triple-F (Fraction for Fun) can motivate and improve learning interest students, so the learning becomes more quality.

4. CONCLUSION

This research and development produce a learning media product non-interactive in the material various form of a fraction. The type used in this study is product-oriented research and development (R & D) in the field of education.

In the develop learning media mathematics board game Triple-F (Fraction For Fun) there are some strengths and weaknesses. The strength among them, media is board game form, so can motivated student more spiritly again and improve curious student, Fractional chapters are one of the materials that are difficult for students to understand. This media focused on mathematics subjects, however also integrated with the theme. This design media appropriate with the affective domain (KI-1 and KI-2), cognitive domain (KI-3), and psychomotor (KI-4). In this game, there are written values and implied values, the written values such as spiritual values by reading *bismillahirrahmanirrahim* and *alhamdulillahirabbil'amin* on instructions for use, and implied values (unwritten) such as honest and trustworthy social values when playing the game.

Whereas the weaknesses in this media, including when students have answered one question, then the other students also get the same problem sometimes it makes them not want to think again, but instead, memorize answers. This can be overcome by involving the role of the teacher, the teacher can change the question, for example changing the form of common fractions to percent fractions, replaced by converting common fractions to decimal fractions. In general, this media can be an alternative medium of learning, motivating students, and practicing student skills.

The product of this development should be further developed in the next fraction material, namely fraction operations with new nuances and new approaches that are fresher in accordance with the characteristics of the field of study.

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