

## Development of Refusion Learning Media on Function Material for Class XI MA Students

Nur Fadilah<sup>1</sup>, Arini Hidayati<sup>2</sup>

<sup>1,2</sup> Universitas Nurul Jadid, Indonesia

Correspondence Email: [nurfadilah@gmail.com](mailto:nurfadilah@gmail.com)

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### ABSTRACT

Mathematics is one of the subjects that has an important role in the development of logical, systematic, critical, and creative thinking skills of students. This research aims to develop valid, practical, and effective REFUSI (Relations and Functions) learning media for grade XI MA Lubbul Labib students. This research is motivated by low learning motivation and students' understanding of the concept of function, especially in determining domains, codomains, and ranges. The research method used is Research and Development (R&D) with the Plomp development model which consists of three stages, namely preliminary research, prototyping phase, and assessment phase. The subjects of the study were 26 students of class XI A MA Lubbul Labib. The research instruments include validation sheets, student response questionnaires, and learning outcome tests. The results of the study showed that the REFUSI media obtained a validity score of 3.42 with the valid category, a practicality score of 3.4 with the practical category, and a student learning completeness level of 96% which indicates the effective category. Based on these results, the REFUSI learning media meets the criteria of valid, practical, and effective so that it is suitable for use in learning mathematics in functional materials

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### Corresponding Author:

Nur Fadilah

Universitas Nurul Jadid, Indonesia: [nurfadilah@gmail.com](mailto:nurfadilah@gmail.com)

## 1. INTRODUCTION

Mathematics is one of the subjects that has an important role in the development of logical, systematic, critical, and creative thinking skills of students. Nevertheless, many students still consider math to be a difficult and boring subject. This condition causes low interest in learning and has an impact on student learning outcomes.

Mathematics learning at the junior secondary level requires students to develop a strong conceptual understanding, particularly in abstract topics such as relations and functions. However, many students still experience difficulties in understanding fundamental concepts, including domain, codomain, and range, because these concepts are often presented symbolically and theoretically. Conventional learning approaches that are dominated by teacher explanations tend to limit students' opportunities to explore mathematical ideas actively. As a result, students may memorize procedures

without fully understanding the relationships between mathematical concepts. Therefore, innovative learning media that can visualize abstract mathematical concepts into more concrete and meaningful representations are needed to support students' conceptual understanding and learning engagement.

The development of interactive learning media has become an important strategy in improving the quality of mathematics instruction. Learning media that combine visual representation, direct manipulation, and interactive activities can help students construct knowledge through meaningful learning experiences. Based on constructivist learning theory, students acquire knowledge effectively when they actively participate in the learning process and connect new information with existing experiences. In this context, REFUSI (Relations and Functions) learning media was developed as an innovative instructional tool to facilitate students in understanding the concepts of relations and functions through diagrams, mapping activities, and interactive representations. This study aims to develop REFUSI media that meets the criteria of validity, practicality, and effectiveness so that it can be implemented as an alternative mathematics learning medium to improve students' conceptual understanding and learning outcomes.

Based on the results of observations in class XI A MA Lubbul Labib, the mathematics learning process is still dominated by the lecture method so that students tend to be passive during learning. In addition, students have difficulty in understanding the concept of functions, especially in defining domains, codomains, and ranges. The results of daily tests show that most students have not reached the Minimum Completeness Criteria (KKM) set by the school.

Function material is one of the important materials in mathematics because it is the basis for studying advanced material such as composition functions and inverse functions. Therefore, learning media that is able to help students understand the concept of function in a concrete and interesting way is needed. Learning media is a means used to convey information and learning messages so that it can stimulate students' attention, interest, and learning activities. The proper use of media can help students understand abstract concepts to be more concrete and easy to understand.

One of the media that can be used is the REFUSI (Relationship and Function) media. This media is designed in the form of teaching aids that allow students to carry out mapping activities directly through relationship and function diagrams. With the help of these media, students can understand the relationship between domains, codomains, and ranges in a more visual and interactive way. Based on this description, this study aims to develop REFUSI learning media on functional materials that meet valid, practical, and effective criteria.

## 2. METHODS

This research is research and development using the Plomp model. The research stages include preliminary research, prototyping phase, and assessment phase.

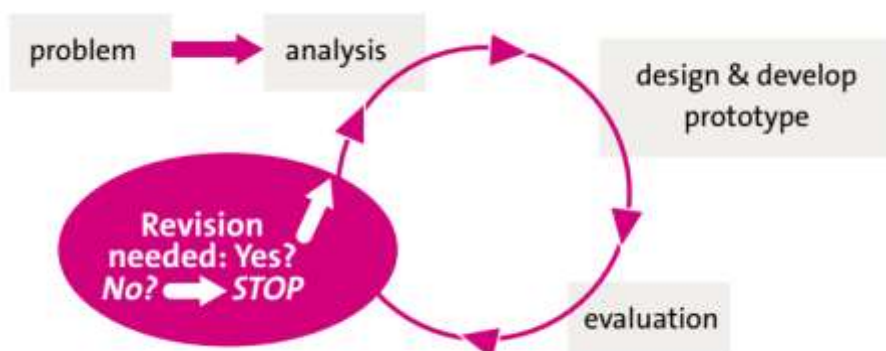


Figure 1. step of the 2013 plomp development model

(Source: Plomp, 2013)

In the preliminary research stage, learning problems were identified and needs analysis was carried out. The prototyping phase includes the design of REFUSI media and research instruments consisting of validation sheets, student response questionnaires, and learning outcome tests.

Furthermore, in the assessment phase, expert validation, product revision, and field trials were carried out to determine the practicality and effectiveness of the media.

The subjects of the study were 26 students of class XI A MA Lubbul Labib. Data collection techniques are carried out through validation sheets, student response questionnaires, and learning outcome tests. The data is analyzed descriptively quantitatively to determine the level of validity, practicality, and effectiveness of the product.

### 3. FINDINGS AND DISCUSSION

#### The Role of the Principal as a Supervisor in Fostering Teacher Professionalism

The results of the interviews showed that the principal of Adam School Integrated Islamic Kindergarten carried out his role as a supervisor through several complementary coaching strategies. First, strengthening teachers' academic and professional competencies is carried out by providing full support to teachers who take the initiative to develop themselves, both through teacher working groups (KKG) and the school's internal learning community, so as to create a culture of sharing experiences between The initial research stage showed that mathematics learning was still teacher-centered and students had difficulty understanding functional material. The average student learning outcomes before media development are still below the KKM.

In the development stage, the researcher designed the REFUSI media consisting of relationship and function diagrams, association member cards, question spinning wheels, mapping arrows, and supporting materials regarding the concept of functions. The media is designed to help students understand the relationship between domains, codomains, and ranges in concrete terms.

The validation results showed that the REFUSI media obtained an average score of 3.42 and was included in the valid category. In addition, the student response questionnaire obtained a score of 3.2 and the test questions obtained a score of 3.0 which was also in the valid category. These results show that research media and instruments are suitable for use in the learning process.

**Table 1. Recapitulation of Refusi Media Validation**

| Yes           | Statement                                                                           | $I_i$ | $A_i$ | $V_a$ |
|---------------|-------------------------------------------------------------------------------------|-------|-------|-------|
| Material      |                                                                                     |       |       |       |
| 1             | Functional materials in accordance with learning objectives                         | 3.5   | 3.5   | 3.45  |
| 2             | The concept of function is presented correctly and does not cause misunderstandings | 3.5   |       |       |
| 3             | Examples of relevant function questions                                             | 3.5   |       |       |
| 4             | Practice questions support understanding of function concepts                       | 3.5   |       |       |
| Media display |                                                                                     |       |       |       |
| 5             | REFUSI's media display is interesting                                               | 3.5   | 3.4   |       |
| 6             | The use of appropriate and neat colors                                              | 3     |       |       |
| 7             | Display clarity                                                                     | 3.5   |       |       |
| 8             | Easy-to-use media                                                                   | 3.5   |       |       |
| 9             | Easy-to-read writing/symbols                                                        | 3.5   |       |       |

**Table 2. Results of Student Response Questionnaire Validation Validation**

| No         | Statement                                                                        | $I_i$ | $A_i$ | $V_a$ |
|------------|----------------------------------------------------------------------------------|-------|-------|-------|
| <b>Isi</b> |                                                                                  |       |       |       |
| 1          | Questionnaire statement in accordance with the purpose of measuring practicality | 3     | 3.25  | 3.2   |

|                     |                                                                    |     |      |
|---------------------|--------------------------------------------------------------------|-----|------|
| 2                   | Statements reflecting the use of REFUSI media                      | 3.5 |      |
| <b>Construction</b> |                                                                    |     |      |
| 3                   | Clear and unambiguous statement sentences                          | 3   |      |
| 4                   | Statements do not give rise to double interpretation               | 3   | 3    |
| 5                   | Systematic statement structure                                     | 3   |      |
| <b>Language</b>     |                                                                    |     |      |
| 6                   | Language easy for students to understand                           | 3.5 |      |
| 7                   | The use of words according to the rules of the Indonesian language | 3   | 3.25 |

**Table 3. Test Question Validation Recapitulation Results**

| No                          | Statement                                                                   | $I_t$ | $A_t$ | $V_a$ |
|-----------------------------|-----------------------------------------------------------------------------|-------|-------|-------|
| <b>Material Suitability</b> |                                                                             |       |       |       |
| 1                           | Questions according to the class XI function material                       | 3     |       |       |
| 2                           | Questions according to learning indicators                                  | 3     | 3.25  |       |
| 3                           | Questions to measure understanding of the concept of function               | 3.5   |       | 3.0   |
| <b>Language</b>             |                                                                             |       |       |       |
| 4                           | The language of the questions is easy for students to understand            | 3.5   |       |       |
| 5                           | No typos                                                                    | 3     | 3.25  |       |
| <b>Compatibility</b>        |                                                                             |       |       |       |
| 6                           | Questions are able to measure students' abilities appropriately             | 3     |       |       |
| 7                           | The difficulty level of the questions is according to the student's ability | 2.5   | 2.75  |       |

The practicality of the media was measured through a questionnaire of student responses after using the REFUSI media in learning. The results of the analysis showed an average score of 3.4 with a practical category. This shows that the media is easy to use and able to help students understand the functional material.

**Table 4. Results of Student Response Questionnaire**

| No | Name            | $\bar{S}$ | Average | Ket.             |
|----|-----------------|-----------|---------|------------------|
| 1  | Student 1(LL)   | 3         |         |                  |
| 2  | Student 2 (NKW) | 3.7       |         |                  |
| 3  | Student 3(ZQ)   | 3.1       |         |                  |
| 4  | Students 4(HA)  | 3         |         |                  |
| 5  | Student 5(SK)   | 4         |         |                  |
| 6  | Student 6(DO)   | 4         |         |                  |
| 7  | Student 7(IKN)  | 3.8       | 3.4     | <b>PRACTICAL</b> |
| 8  | Student 8(IN)   | 3.7       |         |                  |
| 9  | Student 9(DNZ)  | 3.3       |         |                  |
| 10 | Student 10(IR)  | 2.5       |         |                  |
| 11 | Student 11(SA)  | 3.3       |         |                  |
| 12 | Student 12(DMB) | 3         |         |                  |
| 13 | Student 13(DRA) | 3         |         |                  |

|    |                 |     |
|----|-----------------|-----|
| 14 | Student 14(DR)  | 4   |
| 15 | Students 15(SM) | 3.6 |
| 16 | Students 16(FK) | 3.1 |
| 17 | Student 17(LM)  | 3.2 |
| 18 | Students 18(RA) | 3.4 |
| 19 | Siswa 19(EN)    | 3.3 |
| 20 | Student 20(NS)  | 3.3 |
| 21 | Students 21(MS) | 3.7 |
| 22 | Student 22(MSA) | 3.5 |
| 23 | Student 23(ZJ)  | 3.7 |
| 24 | Student 24(BJ)  | 3.4 |
| 25 | 25 Students(RS) | 3.3 |
| 26 | Student 26(HJ)  | 3.2 |

The effectiveness of the media was measured through a test of learning outcomes after learning using REFUSION media. The test results showed that 25 out of 26 students achieved scores above the KKM so that the learning completion rate reached 96%. These results show that REFUSI media is effectively used in mathematics learning.

**Table 5. Student Test Results**

| No | Name             | KKM | Value |
|----|------------------|-----|-------|
| 1  | Siswa 1(EN)      | 75  | 75    |
| 2  | Student 2 (HJ)   | 75  | 80    |
| 3  | Student 3(LM)    | 75  | 75    |
| 4  | Student 4(MS)    | 75  | 70    |
| 5  | Student 5(SM)    | 75  | 85    |
| 6  | Student 6(NKW)   | 75  | 85    |
| 7  | Student 7(ZQ)    | 75  | 75    |
| 8  | Student 8(HA)    | 75  | 85    |
| 9  | Student 9(DMB)   | 75  | 80    |
| 10 | Student 10(DNZ)  | 75  | 75    |
| 11 | Student 11(SA)   | 75  | 80    |
| 12 | Student 12(IRK)  | 75  | 75    |
| 13 | Student 13(DRA)  | 75  | 95    |
| 14 | Students 14(LL)  | 75  | 75    |
| 15 | Students 15(DO)  | 75  | 75    |
| 16 | Student 16(SK)   | 75  | 75    |
| 17 | Students 17(IKN) | 75  | 85    |
| 18 | Students 18(IN)  | 75  | 85    |
| 19 | Student 19(BJ)   | 75  | 75    |
| 20 | Student 20(NS)   | 75  | 75    |
| 21 | Student 21(RH)   | 75  | 75    |
| 22 | Student 22(DR)   | 75  | 85    |
| 23 | Student 23(ZJ)   | 75  | 85    |
| 24 | Students 24(FK)  | 75  | 75    |
| 25 | 25(BA) Students  | 75  | 75    |
| 26 | Student 26(MSA)  | 75  | 75    |

### Discussion

The REFUSI media developed meets the product quality criteria according to Plomp and Nieveen, which are valid, practical, and effective. Media validity shows that the content and design of the media have been in accordance with the learning objectives. The practicality of media shows that students can use media easily during the learning process. Meanwhile, a learning completeness rate of 96% shows that the media is able to help students achieve their expected learning goals.

The results of this study are in line with previous research which shows that the use of interactive learning media can improve students' understanding of concepts and learning outcomes in relational

and functional materials. The visualization provided by the REFUSI media helps students understand concepts that were previously considered abstract to become more concrete and easy to understand.

The findings of this study indicate that the development of REFUSI (Relations and Functions) learning media successfully fulfilled the validity criteria with an average score of 3.42. This result demonstrates that the developed media is aligned with learning objectives, material characteristics, and students' needs in learning relations and functions. The preliminary study revealed that the learning process was still teacher-centered, causing students to experience difficulties in understanding the concepts of domain, codomain, and range. The implementation of REFUSI media transformed abstract mathematical concepts into more concrete and understandable forms through the use of diagrams, mapping activities, and interactive learning tools. Consequently, this media serves as an effective solution for overcoming students' low conceptual understanding in mathematics learning.

In terms of practicality, REFUSI learning media achieved an average score of 3.4, indicating that it belongs to the practical category. This finding suggests that the media is easy to use by both teachers and students during the learning process. Students showed positive responses toward the attractive design, systematic presentation, and ease of operation of the media. From a theoretical perspective, practical learning media can increase student engagement and participation, resulting in a more meaningful learning experience. Furthermore, the direct interaction provided by the media supports constructivist learning theory, which emphasizes that knowledge is actively constructed through concrete experiences and active participation in learning activities.

Furthermore, the effectiveness of REFUSI media is reflected in the students' learning achievement, where 25 out of 26 students successfully attained scores above the Minimum Mastery Criteria (KKM), resulting in a learning completeness rate of 96%. This high level of achievement indicates that the media significantly contributed to improving students' understanding of relations and functions. The visualization and interactive elements embedded in REFUSI media enabled students to better comprehend abstract mathematical concepts and facilitated meaningful learning experiences. These findings are consistent with previous studies suggesting that interactive learning media can improve conceptual understanding, learning motivation, and students' academic performance in mathematics education.

#### 4. CONCLUSION

This research produced REFUSI learning media on functional materials for grade XI MA Lubbul Labib Labib students. The developed media obtained a validity score of 3.42, a practicality score of 3.4, and a learning completeness rate of 96%. Thus, the REFUSI learning media is declared valid, practical, and effective so that it is suitable for use in mathematics learning in functional materials.

This study concludes that the REFUSI (Relations and Functions) learning media developed through the Plomp development model is valid, practical, and effective for mathematics learning on function material. The media obtained a validity score of 3.42, a practicality score of 3.4, and achieved a learning completeness rate of 96%, indicating its suitability for classroom implementation. Therefore, REFUSI media can be recommended as an innovative instructional medium to enhance students' conceptual understanding, engagement, and learning outcomes in mathematics, particularly in learning relations and functions.

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