

Research Article

Instructional multimedia with local context oriented to numeracy skills: practicality and effectiveness

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Abstract

The aim of this research is to develop instructional multimedia with local context of Lombok Island for junior high school students. The development of instructional multimedia is oriented towards numeracy skills on the probability topic. This research is development research based on the design research model by Plomp which consists of 3 phases, namely Preliminary Research, Development or Prototyping, and Assessment. The subjects in this research were grade IX junior high school students consisting of 24 students. The data were collected using practicality questionnaire to determine the practicality of multimedia and numeracy skills test to determine the effectiveness of multimedia. The results showed that instructional multimedia met the practical and effective criteria. The results of the teacher's assessment showed a total score is 32 in practical classification. Then 83% of students gave an assessment of being in the very practical classification and 17% were in the practical classification. The results of the effectiveness of the numeracy skills test showed that 79% of students achieved the Minimum Completeness Criteria score. Therefore, instructional multimedia is practical and effective for mathematics learning oriented to students' mathematical numeracy skills.

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Introduction

Numeracy skills is an individual's ability to implement mathematical concepts and skills in solving daily life problems (The Ministry of Education and Culture, 2017). Gerakan Literasi Nasional (2017) also revealed the same point that numeracy skills is related to someone's skills to apply various data and mathematical symbols, as well as their various skills in making solutions to solve real problems. Elements of numeracy include knowledge, understanding, and numeracy skills that a person uses to communicate the language of mathematics and to recognize the relationship between knowledge of mathematics (Yunarti & Amanda, 2022).

Numeracy skills is needed as the basis for high-order thinking skills and are needed to solve problems (Inovasi, 2019). In addition, numeracy skills can help a person to be sensitive to existing data and patterns, as well as strengthen one's

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reasoning abilities which function in making decisions to solve problems (Yunarti & Amanda, 2022). This skill is needed by everyone to deal with various problems that occur in various aspects of life. It can be said that numeracy skills is one of the important basic skills to be mastered by students.

However, the students' numeracy skills in Indonesia have not obtained satisfactory score. This is based on the Program for International Student Assessment (PISA) results in Indonesia in 2015 and 2018. In 2015, Indonesia obtained an average score of 386 for mathematics out of an average score of 490 for each country (OECD, 2016). Then it decreased in 2018, the average math score reached 379 with an average score of 487 (OECD, 2019). Indonesia is in position 73 of 79 countries in math score. Therefore, it is important for educational practitioners to find solutions to this problem.

One of the solutions offered to improve numeracy skills is to develop interactive multimedia oriented to numeracy skills. Multimedia is a integration of integration of several elements in media like text (alphabetical or numeric), symbols, figures, sound, video, and animation usually using technology for the purpose to improving students' understanding (Guan, Song, & Li, 2018). Interactive multimedia involving images and animations can affect students' mathematical skills (Nusir, Alsmadi, Al-Kabi, & Sharadgah, 2012). Students can be directly involved in mathematics learning through the interactive element of multimedia (Benny, 2017).

In addition to interactive multimedia, learning that involves local contexts will make students easier to receive the material. Local context in mathematics learning can change students' thinking that mathematics is a fun subject that is linked to students' local culture (Indriani & Imanuel, 2018). Besides that, the local context in learning can influence changes in students' understanding of mathematical objects, the role and function of the learning context (Febrian, Astuti, & Antika, 2019). Students' numeracy skills can be used to solve daily problems so that learning is more meaningful (Jamil & Khusna, 2021).

Previous research has shown that interactive multimedia can help students learn mathematics. This will affect students' abilities in mathematics, especially numeracy skills. The implementation of instructional game, which is interactive multimedia, with local context can be used in mathematics learning (Safitri, Pujiastuti, & Sudiana, 2020). Furthermore, this media can improve students' cognitive aspects, such as conceptual understanding (Salsabila & Setyaningrum, 2020), and affective aspects, such as learning interest (Salsabila & Setyaningrum, 2018), in mathematics.

So, based on the previous description, it can be concluded that interactive multimedia with local contexts has the potential to help students' mathematics learning process. Thus, the development of interactive multimedia with a local context oriented to numeracy skills of junior high school students can be one solution to improve students' skills.

Problem of Research

The problem formulation in this research, based on the introduction above, is

- How is the practicality and effectiveness of interactive multimedia with a local context oriented towards the mathematical numeracy skills of junior high school students?

Method

Research Model

This research is development research based on the design research model by Plomp which consists of 3 phases, namely Preliminary Research, Development or Prototyping, and Assessment (Plomp, 2013). This research aims to develop products and assest the quality of these products. The product developed is in the form of interactive multimedia with the local context of Lombok Island for junior high school students. The development of instructional multimedia is oriented toward numeracy skills. Developed multimedia that presents probability topic. The assessment of the feasibility of the product or multimedia developed refers to the criteria of Nieveen, which meet the criteria of validity, practicality, and effectiveness (Nieveen, 1999). Product feasibility assessment is carried out in the Assessment phase. In this article, we will discuss the practicality and effectiveness of products that have previously met valid criteria.

Participants

The subjects in this research were grade IX students of junior high school 2022/2023 Academic Year. The students consist of 24 students, with 10 male students and 14 female students.

Data Collection Tools

The data collection techniques used in this research consisted of non-test and test techniques. In the non-test technique, the researcher used a practicality assessment questionnaire that was filled out by teachers and students. Then in the test technique, the instrument is used to test students' numeracy skills on the probability. These various instruments are used to determine the quality and feasibility of the developed learning multimedia. Data from practicality assessment questionnaires were used to determine the multimedia practicality and data from numeracy skills tests were used to determine multimedia effectiveness.

The practicality assessment questionnaire instrument by teachers and students each consists of 10 statements containing several statements related to the usefulness and ease of use of multimedia. The practicality assessment questionnaire uses a Likert 4 scale, which consists of strongly agree, agree, disagree, and strongly disagree. Meanwhile, the scores obtained through the practicality assessment questionnaire of teachers and students are classified based on the classification in the table below (Widoyoko, 2016).

Table 1. Practicality classification of instructional multimedia based on teacher and student assessment

Empirical Score Interval (X)	Classification
$X > 34$	Very Practical
$28 < X \leq 34$	Practical
$22 < X \leq 28$	Practical enough
$16 < X \leq 22$	Not Practical
$X \leq 16$	Very Impractical

Then the numeracy skills test instrument consists of 3 essay questions. The questions given are related to the probability material for students in junior high school. The following is an example of a question contained in a student's numeracy skills test.

“Mr. Aldi and his son, Sani, eat at the Lombok Restaurant which provides the menu below. If Sani is allowed to choose one food, drink and snack each, how many possible menus can Sani choose? Identify the menu list.”

Food	Drink	Snack
Pelecing	Es Sarang Burung	Cerorot
Sate Bulayak	Poteng Isi	Bantal
Urap		

Furthermore, there are two criteria for interactive multimedia to be practical, that is: (1) the results of the teacher's assessment score on the mathematics instructional multimedia are at the minimum criteria 'practical' and (2) at least 75% of the students' assessment scores of the mathematics instructional multimedia are at the minimum criteria 'practical'. Then for multimedia effectiveness, it has criteria, at least 75% of the overall students reach the score Minimum Completeness Criteria which is 75.

Results

The product developed in this research is instructional multimedia with local context oriented to numeracy skills. The local context used is the local context on the Lombok island, Nusa Tenggara Barat. The local context referred to in this research is the context used to build mathematical concepts through local situations. An example of a local context that is used as numeracy learning in this media is how students have the same probability to play traditional Lombok instruments in turn. Then students can also determine how many possible menus a person can order from a traditional

Lombok restaurant. The material delivered in multimedia uses local contexts, such as traditional tools, traditional foods, and others, which are close to the student’s environment. The display of the multimedia is following below. The display of the multimedia is following below.



Figure 1. Interactive Multimedia Display

Furthermore, the data obtained from the Development or Prototyping phase are used by researchers to measure the practicality and effectiveness of interactive multimedia. Analysis of practicality and effectiveness is carried out in the Assessment phase. The following is an explanation of the aspects of practicality, and effectiveness in this research.

Instructional Multimedia Practicality

The practicality of instructional multimedia can be seen from the results of the practicality assessment of teachers and students. The assessment sheet for the practicality of multimedia of the teacher is filled out by mathematics teacher at IX grade junior high school. The teacher’s assessment result showed a total score 32 in ‘practical’ classification. Based on the table below, it can be concluded that interactive multimedia meets the practical criteria.

Table 2. Instructional multimedia practicality based on teacher’s assessment

No	Information	Result
1	Number of items	10
2	Maximum score	40
3	Minimum score	10
4	Total score	32
5	Classification	Practical

Furthermore, the students also gave an assessment of interactive multimedia after using it. The multimedia practicality based on students’ assessment and the result practicality classification of instructional multimedia by students can be seen in the table below.

Table 3. Instructional multimedia practicality based on students’ assessment

No	Information	Result
1	Number of items	10
2	Maximum score	40
3	Minimum score	10

4	Highest score	40
5	Lowest score	31
6	Average score	36.08

The following are the details of the multimedia practicality classification by students.

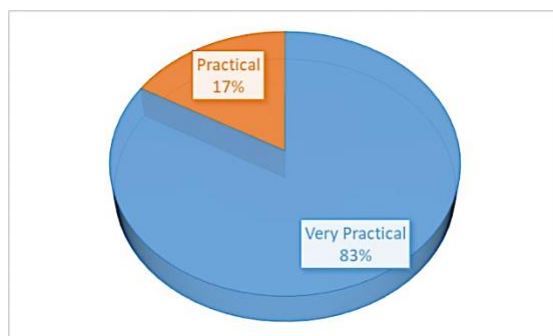


Figure 2. Multimedia practicality classification by students

Based on the data above, it can be seen that 83% of students' multimedia assessment gave 'very practical' classification, 17% gave 'practical' classification, and 0% of students gave 'practical enough', 'impractical' and 'very impractical' classification. It can be concluded that the learning multimedia meets the practical criteria.

Then the practicality data by students is also detailed by gender in the diagram below.

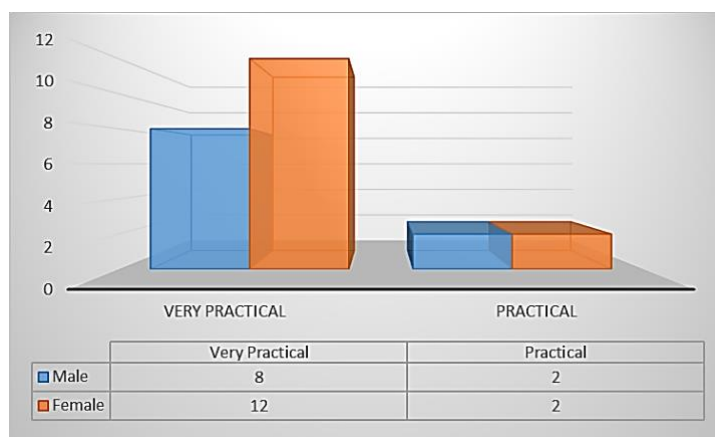


Figure 3. Multimedia practicality classification based on students' gender

It can be seen that only 2 students, each male student and female student, whose assessment is in the 'practical' classification. Most male and female students' assessments are in the 'very practical' classification. This indicates that multimedia is useful and easy to use for both male and female students.

Instructional Multimedia Effectiveness

The results of students' numeracy tests were used in research to determine the effectiveness of the developed instructional multimedia. The instructional multimedia effectiveness criteria in this research are at least 75% of the overall students achieve the Minimum Completeness Criteria score or MCC. The student's Minimum Completeness Criteria score in mathematics is 75. The following are the results of the student's numeracy skills test after using interactive multimedia.

Table 4. Student's numeracy skills test results

No	Information	Result
1	Number of students	33
2	Highest score	100
3	Lowest score	65
4	Average score	77.08

5	Number of students achieve MCC	19
6	Percentage	79%

Based on the table above, it can be seen that the average score of students' numeracy test is 77.08. In addition, the percentage of students who achieve the Minimum Completeness Criteria score is 79% or 19 students. Therefore, it can be concluded that multimedia is effective based on the results of students' numeracy skills tests.

Then we also detail the student's numeracy skills test result based on gender in the table below.

Table 5. Student's numeracy skills test results based on gender

No.	Information	Male	Female
1	Number of students	10	14
2	Highest score	85	100
3	Lowest score	65	65
4	Average score	77	77.14

Based on table above, it can be seen that the average scores of male and female students are not much different. The highest score for the results of the numeracy skills test was obtained by female students. Then the average value of the numeracy skills test for female students is higher than that of male students. This shows that the numeracy skills of female students are better than those of male students.

Conclusion and Discussion

Based on the result, interactive multimedia developed that meets practical and effective criteria. Interactive multimedia contains local contexts that are oriented towards numeracy skills on probability material. The results of the teacher's assessment showed a total score of 32 in the 'practical' classification. Then 83% of students gave an assessment in 'very practical' classification and 17% were in 'practical' classification. Then the effectiveness of the product based on the students' percentage who meet the Minimum Completeness Criteria score on the numeracy skills test reaching 79%. Thus, instructional multimedia is feasible to use for mathematics learning oriented to students' numeracy skills.

Several previous research have shown that multimedia can help students learn mathematics (Chiu & Mok, 2017; Ulusoy, 2020). The implement of interactive multimedia can also improve students' numeracy skills (Handayani, 2018; Rohendi, Sumarna, & Sutarno, 2017). Furthermore, instructional multimedia such as educational games, whose characteristics resemble interactive multimedia, can develop students' cognitive and affective abilities in mathematics learning (Salsabila et al., 2021; Salsabila & Setyaningrum, 2020, 2019, 2018). In addition, educational games can also facilitate students' numeracy skills (Nurfatanah, Yudha, Marini, & Sumantri, 2021; Rohendi, 2019).

This is because interactive multimedia displays images and information simultaneously in learning (Mayer, 2014), which can attract students' attention (Handayani, 2018). Interactive multimedia can stimulate students' mathematical understanding through attractive visual presentations (Ahmad, Yin, Fang, Yen, & How, 2010; De Vita, Verschaffel, & Elen, 2014). Then, fun learning through multimedia encourages students to be actively involved in mathematics learning (Miller, 2018). The teacher in this case as a facilitator in the classroom certainly has an important role in the implement media in the classroom (Jiang, Mok, & Yin, 2021; Legesse, Luneta, & Ejigu, 2020; Russo et al., 2020). The appliance of this multimedia will provide a mathematics learning experience by utilizing technology for teachers and students (Chen & Wu, 2020; Clark-Wilson & Hoyles, 2019).

Furthermore, the learning multimedia developed containing the local context of Lombok Island can help students learn mathematics (Irawan, Lestari, Rahayu, & Dwitiyanti, 2022; Kurnia, Azmi, Yuberta, Maris, & Apriliani, 2022), which in this case certainly has a role in the feasibility of multimedia. The local context provided by multimedia shows that it can develop students' numeracy skills (Jamil & Khusna, 2021; Kamsurya & Masnia, 2021). It is important in learning to develop media with local contexts to build students' numeracy skills (Damayanti, Roza, & Maimunah, 2022).

Students will find it easier to explore the material presented in multimedia if they use local contexts that are close to their daily lives. The local context in mathematics learning also makes students interested and enthusiastic (Aziz, Suprayitno, Prahmana, & Prasetyo, 2021; Priyani, 2022). In addition, numeracy questions designed according to the local context of students, such as tourism areas around students, can help students understand the information in the questions (Ariyanto & Kusumaningsih, 2022).

Recommendations

Instructional multimedia with local context oriented to numeracy skills needs to be further developed in other topics. In addition, instructional multimedia can also facilitate the development of other student skills, besides numeracy skills. Some elements in multimedia also need to be developed more sophisticated to be effective in learning.

Limitation of Study

Instructional multimedia with local context was developed only on junior high school probability topic. In addition, instructional multimedia focuses on students' numeracy skills. The subject of this research was also limited to grade IX students in the one of junior high schools in Indonesia.

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