Development of Instagram Filters in Interactive E-Books Mathematics Learning Build a Flat Side Space

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Abstract

The importance of learning mathematics well in the digital era of the 21st century demands the effective use of digital learning media. This research aims to develop interactive E-books for building flat sided space materials as learning media. The subjects in this study were grade VIII students at SMP Negeri 1 Salatiga. This research uses a Research and Development approach with the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) development model. Data were collected through observation, tests, and questionnaires to assess the validity, practicality, and effectiveness of interactive E-book media build flat side spaces. The results of data analysis showed that interactive E-book media built flat side space had a validity level of 96.67% and the material presented had a validity level of 86.67%. This media is also considered very practical with a level of practicality reaching 100%. In addition, this media proved effective with a significant result of 0.000 (less than 0.05). This shows that this interactive E-book learning media is a valid, practical, and effective means of learning for students.

Keywords: Development; Instagram filters; Interactive E-book; Build flat side space.

1. Introduction

Education has an important role in life and is a place for the development of 21st century skills that are increasingly prioritized in Indonesia. Some skills of the 21st century are not far from the pillars of life, that is, learning to know, learning to do things, learning to be human, and learning to live together (Zubaiddah, 2016). Among the four pillars, there are several higher-order thinking skills that students are expected to master, including critical thinking skills, communication, reasoning, literacy, problem solving and so on.

21st century skills include learning and innovation abilities that are increasingly recognized as skills that distinguish learners who are ready to face the complexities of life and work environments in the 21st century era (Literacy, 2014). A focus on creativity, critical thinking, communication and collaboration is essential in preparing learners for the future. Every form of education is also oriented towards 21st century abilities. In this context, mathematics learning has also begun to develop by emphasizing several higher-order thinking skills such as critical thinking, creative, problem-solving, reasoning, connection and communication skills.
Mathematics has an important role in life as one of the fields of education that refers to higher-order thinking skills. Unfortunately, some students often think mathematics is only related to numbers and is considered irrelevant in everyday life. Though almost all social activities use mathematical calculations, such as in the process of buying and selling, calculating speed, weight of objects, distances and others (Dirgantoro & Soesanto, 2021). The purpose of learning mathematics is to provide reasoning and shape the attitudes of learners as well as improve skills in the application of mathematics (Dewi, 2013). Therefore, it is important for students to learn mathematics well, especially in the face of 21st century opposition.

Based on the results of PISA (Program for International Student Assessment) in 2018, it shows that Indonesia is ranked at the bottom of the world, which is ranked 10th from the bottom (Purnomo & Sari, 2021). This indicates that the ability of Indonesian students in the field of mathematics is relatively low and still inadequate (Afriyanti, 2021). PISA merupakan salah satu internasional tes yang digunakan untuk mengukur keterampilan matematika. PISA is one of the international tests used to measure math skills. This PISA test is conducted every three years. In its pattern, PISA was supposed to be held in 2021, but due to the outbreak of the COVID-19 pandemic, the event was postponed and held in 2022 (Wuryanto & Abduh, 2022). As it should be, the results of the PISA test will only be released a year after the test is held, namely in 2023.

PISA test results show that students' learning outcomes and their mathematical abilities are still less than optimal. In increasing the interest and success of learning students, one of the steps that can be taken is the use of learning media. Briggs and Hujaier AH. Sananky explained that learning media acts as a tool to create a learning atmosphere that can increase student motivation (Widyastuti et al., 2022).

Learning media plays an important role in the learning process because it helps teachers in conveying material, making abstract material to concrete, and difficult material becomes easy to understand (Sidik et al., 2021). The use of learning media has many benefits such as clarifying the content in the material, increasing the focus and attention of learners, overcoming space and time limitations, and providing the same experience as events in the environment around learners (Arsyad, 2014).

The development of learning media is currently taking place rapidly, especially learning media that use technology as the basis for its development (Pakpahan et al., 2020). The learning media is presented in modern and unique ways, both in the form of hardware such as student worksheets, as well as software such as applications and interactive E-books that can be accessed via smartphones and computers. Research on interactive E-books has been carried out several times (Suprapto et al., 2019) including by interactive E-books with row and series material aimed at showing that interactive E-Book media that uses animations, images, and games can encourage student independence in learning. In research (Shiyamsyah & Yuliani, 2022), interactive E-books with cellular respiration material tend to aim to train digital literacy skills with images, animations, videos, text and hyperlinks. While research by (Puspaningrum, 2021) is more focused on building flat side space cubes and blocks, and interactive E-books developed aim to improve the mathematical spatial ability of learners.

Referring to several previous studies, an interactive E-book will be developed to build a software-based flat side room which is presented in the form of a concise presentation of material so that it is easily understood by students, in which an explanation of the material to build a flat side room will be added, let's observe activities and ice breaking related to daily life, as well as the addition of questions in the form of Instagram filters to increase student interest in learning. With this research, it is expected to create an interactive E-book-based learning media specifically for mathematics learning, especially in building flat side space materials. Researchers are interested in taking flat-sided space building material because several journals show the difficulties experienced by students in determining formulas, difficulties in determining the characteristics of building space, and difficulties in grouping nets. (Amriarto & Hidayati, 2022; Nursyamsiah et al., 2020; Syafi’ah, 2022).

2. Method

This study uses the Research and Development method that tests the effectiveness of media in producing certain media (Sugiyono, 2018). This study seeks to test the validity, practicality and...
effectiveness of the product by considering the needs of Junior High School students with adequate facilities and infrastructure. The development model used is ADDIE (Analyze, Design, Development, Implementation, and Evaluation) (Alodwan & Almosa, 2018). The research began by identifying the needs of junior high school students in understanding the material of building a flat side room. The next step involves a development process that aims to create a medium in the form of an interactive E-book, followed by a product testing stage. Product trials include validation by experts and assessment of practicality. The validation process by experts covers aspects of media and material, which is carried out by validators who are lecturers of Mathematics Education at Satya Wacana Christian University and mathematics teachers of SMP Negeri 1 Salatiga. After the media was declared feasible, the media implementation was carried out on 25 students of SMP Negeri 1 Salatiga.

2.1 Research Procedure

1. Analysis Phase
   This stage is the initial stage of analyzing the work in making media to be developed. At this stage it is divided into needs analysis and performance analysis:
   a. Needs analysis, by finding out how students know the material and whether there are errors in the process of working. This analysis was conducted in a junior high school by interviewing several students and looking for information in several journals about the difficulties of students in learning the material to build a flat side room to get data to find solutions to overcome existing problems.
   b. Performance analysis, by developing media in the form of interactive e-books to overcome problems and find out whether the media is needed in the learning process of students in Junior High School.

2. Design Phase
   This second stage aims to design media using needs and performance analysis. Starting with the preparation of tests tailored to the cognitive of learners, the selection of appropriate media, the selection of formats for designing learning e-books and the Instagram filters that will be generated, then designing learning e-books and Instagram filters.

3. Development Phase
   The next stage is expert validation and development trials. Before the media is tested, it must first be tested for the level of validity both in terms of material and in terms of media. As proof that interactive e-book media can be used, the level of product validity can be taken by providing validation sheets to validators as consideration for revising the product. In the validation sheet, there are score and comment columns as an assessment sheet whether the product is valid or not. The development trial involves junior high school students, this stage aims to determine the effectiveness of the interactive learning e-book developed.

4. Implementation Phase
   This fourth stage is an introduction to interactive e-books for learners and teachers in schools identified as learning targets. After the media is created, validated for its usefulness and effectiveness, and found suitable for use in the field, the next step is to pilot it to students in designated schools. After implementing the media to students and teachers see students using the interactive e-book, then teachers and students can evaluate the media by filling out the assessment sheet that has been prepared. It aims to evaluate whether interactive e-books are practical, and learners and teachers who have used this medium can provide suggestions or comments about interactive e-books.

5. Evaluation Phase
   The final stage is evaluation. Evaluation is carried out through pretest material build a flat side room and final posttest after the use of interactive e-book media. Based on the values obtained from the pretest and posttest, these values will be compared to conclude whether interactive e-book media can improve or decrease student learning outcomes. In addition to assessing learning outcomes, learners can use the advice sheets that have been provided to submit suggestions and comments to interactive e-book media to further develop the media. In this evaluation stage using different testing instruments from the design stage, this stage uses...
suggestion sheet, pretest and posttest instruments. This is because researchers want to focus on differences in student learning outcomes after media use.

2.2 Data Collection Instruments

Data collection techniques in this interactive E-book research include observation, questionnaires and tests to assess the validity of media and material, practicality, and effectiveness of interactive E-books build flat side spaces. In analyzing the assessment of validity, practicality and effectiveness of the media the formula formula used is as follows:

\[ P(s) = \frac{S}{N} \times 100\% \]  

where \( P(s) \) represents the percentage of sub variables, \( S \) represents the sum of scores for each sub variable and \( N \) represents the maximum total score. The percentage of media assessment results is categorized in table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Interval</th>
<th>Evaluation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81% ≤ score of ≤ 100%</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>61% ≤ score of ≤ 80%</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>41% ≤ score ≤ 60%</td>
<td>Good enough</td>
</tr>
<tr>
<td>4</td>
<td>21% ≤ score of ≤ 40%</td>
<td>Bad</td>
</tr>
</tbody>
</table>

(Source: Sugiyono, 2015: 145)

3. Results and Discussion

3.1 Results

Interactive e-book media build a flat side room as a learning tool containing materials, questions, and games based on Instagram filters, shown for Junior High School grade VIII. There are several tools in collecting data or research instruments, including: media practicality instruments, media validity instruments, material validity instruments, student opinion sheets, pre-test results and post-test media use by students. Data from these instruments will then be analyzed quantitatively and qualitatively. The results and discussion are as follows.

3.1.1 Analyze

At the analysis stage, a needs analysis and performance analysis are carried out. The results of interviews related to needs analysis indicate that some students who have difficulty understanding the material build a flat side room due to poor internet network constraints. Other findings show that learners are saturated with online learning that is less engaging and less interactive. They show a desire for a learning medium that is more dynamic, contains elements of games or ice breaking, but still supports the understanding of the material provided. There are learning media that can support student understanding, as a learning tool that attracts students in learning while playing. One of them is with interactive e-book media in which there are materials, ice breaking, practice questions and games in the form of Instagram filters.

3.1.2 Design

This interactive E-book learning medium was designed using Canva, while Instagram’s filters section was developed through the Canva app and Spark AR Studio. This interactive e-book has the flexibility to be accessed through various devices such as smartphones, laptops or computers. This interactive e-book includes material to build a flat side room in accordance with the 2013 curriculum for grade VIII Junior High School students. Interactive E-book cover design, can be seen in Figure 1.
Instructions for use An interactive E-book is also included. On the first page of the E-book, instructions are given on how to use interactive E-books to make it easier for students to use E-books and provide an understanding of the components in interactive E-books. Design instructions for use, can be seen in Figure 2.

Figure 1. Interactive E-book Cover

In the content section of the interactive E-book consists of material, let's observe activities, ice breaking, multiple choice questions, fill-in-the-blank questions and scan Instagram filters quizzes build a flat side space. In the material section, there is brief material about the introduction of building space, shape sorter activities to support the ability of students to distinguish between building flat side space and those that are not building flat side space, and material about building flat side space equipped with let's observe activities. Let's observe this activity aims to make the material provided not only informative but also constructivist. As for the picture regarding the content of the interactive E-book, it can be seen in Figure 3.

Figure 2. Interactive E-book Usage Guide
Figure 3. Interactive eBook Content Design

To build student creativity and create an atmosphere of learning while playing, in this interactive E-book added ice breaking activities to make geometry castles from building flat side rooms and quizzes in the form of Instagram filters. Instagram filter creation, the quiz, build a flat side space, was designed using the Canva app and Spark AR Studio. Ice breaking design, multiple choice questions, fill-in-the-blank questions and Instagram filter scan quizzes build a flat side space can be seen in Figure 4.
Figure 4. Ice breaking design, Instagram filter scan, multiple choice questions and filling.

The design of this Instagram filter template quiz build a flat side space was designed using the Canva app. The design consists of three parts, namely the cover template design, the question template design and the answer template design. After the three designs are completed, then use the Spark Ar Studio application and coding to create the quiz Instagram filter. The three-part design of the Instagram filter quiz build a flat side space can be seen in Figure 5.

Figure 5. Instagram Filter Template Design Quiz

3.1.3 Development

After the media has been successfully developed, the next step is to conduct a feasibility test, namely media validation. Feasibility tests are carried out with three types, namely validity tests, practicality tests and assessment of student opinions. The validity test consists of a material validity test and a media validity test. The material validity test and media validity test were carried out by mathematics education experts who are lecturers of Mathematics Education at Satya Wacana Christian University and mathematics teachers at SMP Negeri 1 Salatiga. The results of media validity can be seen in Table 2.
Data in Table 2. shows the average result of media validity with a percentage reaching 96.67\% in the very good category. Based on these results, it can be stated that interactive E-book learning media build flat side space can be said to be \textit{Valid} in the media aspect. The results of the material validity test can be seen in Table 3.

\begin{table}[h]
\centering
\begin{tabular}{lcc}
\hline
Assessment & Aspects & Category \\
\hline
Fill & 80 & Excellent \\
Language & 93,33 & Excellent \\
Average & 86,67 & Excellent \\
\hline
\end{tabular}
\caption{Material Validity Test Results}
\end{table}

The data in Table 3. shows the average result of material validity with a percentage reaching 86.67\% with a very good category. Based on these results, it can be stated that interactive E-book learning media build flat side space can be said to be \textit{Valid} in the aspect of material. The results of the practicality test can be seen in Table 4.

\begin{table}[h]
\centering
\begin{tabular}{lcc}
\hline
Assessment & Aspects & Category \\
\hline
Fill & 100 & Excellent \\
Language & 100 & Excellent \\
Average & 100 & Excellent \\
\hline
\end{tabular}
\caption{Media Practicality Test Results}
\end{table}

The data in Table 4. shows the average results of media practicality with a percentage reaching 100\% with a very good category. Based on these results, it can be stated that interactive E-book learning media build a flat side room can be said to be \textit{Practical}.

During the media validation, a number of inputs have been provided by validators regarding interactive E-book media. These inputs will be taken into consideration by researchers to make revisions, so that interactive E-book media can meet the appropriate standards for use in research. Here are validators' suggestions regarding interactive E-book media:

a. The design is adapted to the E-book for junior high school so that it does not resemble the E-book for elementary school.

b. The surface area of the prism is made in a generalized form (applicable to all prism trimmings)

c. Insert question sentences that stimulate students to think critically.

The opinions of validators are taken into consideration in improving the media. After the media is fixed according to the advice of the validator so that there is a comparison of the media before and after it is fixed. The comparison of learning media before and after improvement can be seen in table 5.
Table 5. Interactive E-book Media Comparison Results Before and After Revision

<table>
<thead>
<tr>
<th>Media Before Revision</th>
<th>Media After Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BANGUN RUANG</strong></td>
<td><strong>MENGENAL BANGUN RUANG</strong></td>
</tr>
<tr>
<td>Bangun ruang adalah suatu bangun tiga dimensi yang memiliki volume atau isi. Perhatikan gambar berikut ini.</td>
<td></td>
</tr>
<tr>
<td>Banyak bentuk bangun ruang yang telah disampaikan dan disajikan di atas. Nama-nama bangun ruang adalah:</td>
<td></td>
</tr>
<tr>
<td>1. Kubus</td>
<td>1. Kubus</td>
</tr>
<tr>
<td>2. Balok</td>
<td>2. Balok</td>
</tr>
<tr>
<td>3. Selimut</td>
<td>3. Selimut</td>
</tr>
<tr>
<td>4. Prisma</td>
<td>5. Prisma</td>
</tr>
<tr>
<td>6. Limas</td>
<td>7. Limas</td>
</tr>
</tbody>
</table>

Based on the picture above before the revision of the E-book design as for elementary students and less suitable for E-book for junior high school. As per validator's suggestion the cover was changed and adjusted for E-book junior high school students.

Based on the figure above before the revision of the formula, the surface area of the prism was not yet in general form. Then through validator suggestions the surface area of the prism is made in a general form (applicable to all types of prisms).
Based on the picture above, before being revised on the material, it is not constructivist only informative. After being revised according to the validator's suggestion, the material is changed to interactive.

3.1.4 Implementation

After the validation stage of media and material and media practicality by validators and interactive E-book learning media can be declared valid and practical. Followed by an interactive e-book media trial to 25 random grade VIII students from SMP Negeri 1 Salatiga as research subjects in January 2023. The trial was conducted through two meetings. At the first meeting, students undergo a pretest before using an interactive E-book to measure students' understanding of the material build a side room. After learning interactive E-book learning media, build a flat side room, posttest questions are carried out. When the media was piloted, students were enthusiastic when using media, especially Instagram filter quizzes, build a flat side room. Students send the results of using the Instagram filter build a flat side space to the teacher’s Instagram DM.

3.1.5 Evaluation

The final stage of the ADDIE research model is evaluation. In this interactive E-book learning media research, the level of effectiveness of media use was measured using the normality test and continued with the Wilcoxon test with data on the achievement of student learning outcomes. The results of the normality test can be seen in table 5.

<table>
<thead>
<tr>
<th>Tests of Normality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolmogorov-Smirnov</td>
</tr>
<tr>
<td>Statistic</td>
</tr>
<tr>
<td>pretest</td>
</tr>
<tr>
<td>posttest</td>
</tr>
</tbody>
</table>

From the table above, it can be observed that samples of less than 50 then obtained pretest results from the Shapiro-Wilk test with a significance of 0.042 and posttests with a significance of 0.000 or less than 0.05 indicate that the data is not normally distributed. Because the data is not normally distributed, the Wilcoxon Test is used. Results from the Wilcoxon Test can be seen in table 6.
From the Wilcoxon Test table, a significant value of 0.000 is obtained, showing a significant value close to zero or less than 0.05. This result indicates a significant difference between the average pretest score and the posttest average score of the students. So from the test results, interactive E-books build flat side space can be declared Effective. There was also a trial to assess the response of students to interactive E-book media. In this trial, students are given an assessment sheet and asked to provide an assessment of the media. The results of the analysis of student response sheets can be seen in Table 7.

Table 7. Student Response Sheet Results

<table>
<thead>
<tr>
<th>No</th>
<th>Evaluation Criteria</th>
<th>Percentage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Instructions for use easy to understand</td>
<td>81.60%</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Easy to use media</td>
<td>87.20%</td>
<td>Excellent</td>
</tr>
<tr>
<td>3</td>
<td>Media can be used anytime and anywhere</td>
<td>96%</td>
<td>Excellent</td>
</tr>
<tr>
<td>4</td>
<td>Media can be used to play while learning</td>
<td>84%</td>
<td>Excellent</td>
</tr>
<tr>
<td>5</td>
<td>Media helps to understand the material of building a flat side space</td>
<td>88.80%</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td><strong>Score Total</strong></td>
<td><strong>437.60%</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>87.52%</strong></td>
<td></td>
</tr>
</tbody>
</table>

From the results of the assessment of student response sheets on the criteria for instructions for use, a percentage of 81.60% was obtained which was included in the very good category, in the criteria of easy-to-use media, a percentage of 87.20% was obtained which was included in the very good category, in the criteria of media can be used anytime and anywhere, a percentage of 96% was obtained which was very good, in the criteria of media can be used to play while learning, a percentage of 84% was obtained which was included in the category Very good, and on the criteria of media helping to understand the material build flat side space obtained a percentage of 88.80% which is very good.

3.2 Discussion

Based on the results of the media test which was then averaged and categorized based on the level of conditions that had been determined, the results of the interactive E-book learning media
validity test showed an average assessment of 96.67% with a very good category assessment, then in the material validity test an average assessment of 86.67% was obtained with a very good category assessment. In addition, the average score obtained from the practicality test of interactive E-book learning media is 100% with an excellent practicality category. From the average assessment data of validity tests and practicality tests of interactive E-book learning media that have been obtained, interactive E-book media can be said to be Valid and Practical to use.

The results of trials on students related to the use of interactive E-book media showed a positive response from students to all assessment criteria given. From the assessment data of students' opinions obtained are then averaged and categorized based on a predetermined level. The average assessment of students towards interactive E-book media is 87.52%, with an excellent category assessment. These results reinforce the results of previous research (Rahmadhani, 2022) research that the media is effective in helping learners overcome the difficulty of understanding the material of building a flat side room, as well as research by which (Nastiti, 2022) shows that E-books can be used to play while learning and are flexible to be accessed anytime and anywhere. In addition to the above tests, pretest and posttest were carried out to analyze the average difference in student learning outcomes before and after the use of interactive E-book media. The results of the Wilcoxon statistical test show results with a significant value of 0.000 which indicates that the significant value is close to zero or less than 0.05. From the results of the paired sample t-test, it can be concluded that interactive E-books build flat side space proven to be Effective in use.

Learning media The interactive E-book that has been developed not only contains material to build a flat side room, but also provides opportunities for students to be actively involved in learning when using the learning media. In the developed media, there are let's observe activities and shape sorter activities. Let's observe activities that aim to stimulate students to think critically and shape sorter activities that ask students to observe and sort items in the form of building flat side spaces. The existence of let's observe and shape sorter activities makes students not only understand the material, but also observe the application of the concept of building a flat side room in everyday life. This interactive E-book media also provides question games in the form of Instagram filters that can be accessed through students' Instagram. Instagram filter game build flat side room not only increases students' interest in undergoing practice questions related to flat side room building material, but also deepens students' ability to solve sharing challenges. This is due to the question approach in the Instagram filter game which is designed to provide a good and interesting learning experience for students.

Overall the advantages of interactive E-book learning media build a flat side room are that the media is easy to use and simple in operation, flexible to use in various hardwore and software, the material presented allows students to get a different and interesting learning experience because it is more interactive, the material presented in shorter activities and let's observe allows students to observe and provide stimulus to participants. Learners in critical thinking, and practice questions presented in the form of Instagram filters provide a new experience that is more interesting for students and arouses students' interest in learning the concept of building a flat side room. However, this interactive E-book media also still has shortcomings, namely building a flat side space is still in the form of images not in the form of moving 3D, the material provided is still in written form, there is no supporting video material, and the limited number of questions in the exercises provided.

4. Conclusion

Based on the results of research in the discussion subchapter, it can be concluded that researchers produce interactive e-book learning media which contains material for building flat side rooms, filter games building flat side rooms, let's observe activities and shape sorters. The results of the interactive E-book learning media validity test showed an average assessment score of 96.67% in the very good category, the material validity test showed an average score of 86.67% in the very good category, and from the practicality test showed an average score of 100% in the very good category. The results of trials to students on interactive E-book media showed an average assessment of interactive E-book media, which was 87.52% in the very good category. In addition to the above tests, pretest and posttest were carried out with Wilcoxon test results, namely with a significant value of 0.000 which indicates that the significant value is close to zero or less than 0.05. From the interactive E-book learning media
test data that has been obtained, interactive E-book media can be said to be Valid, Practical and Effective to use. Based on these conclusions, the author hopes that interactive ebook media can be developed with wider material.

Bibliography


