

Validity of “Number Game” as Instructional Edutainment Media based-Android to Improve Conceptual Understanding and Interest

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Abstract: Number Game is an instructional media-based learning mathematics on material numbers app for Android. The purpose of this research is to (a) illustrate the display of "Number Game" that will be used in Junior High School, and (b) describe the validity of Number Game. Number Game is a learning medium developed in collaboration with innovative learning models and current technological advancements to assist students in understanding mathematical concepts and pique their interest in learning. This study is part of a development research project that uses the ADDIE model, which stands for (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. The instrument made use of a media quality validation sheet as well as the material from Number Game. Number Game has been approved by two experts. A material and media evaluation is used to validate the product. Number Game on material aspects received an average rating of 4.17 out of 5, indicating that it is in the Good or valid category. The evaluation of media aspects yielded an average score of 4.49, indicating that Number Game is excellent or very valid. Number Game was determined to be suitable for use as instructional media in junior high school.


1 INTRODUCTION


As technology advances, ethical concerns such as equal access to resources become more pressing. Technologists in education (Mayes et al., 2015). The use of media should be the part that should receive the attention of the teacher/facilitator in every learning activity (Sukardi et al., 2017). The utilization of technology, especially in the field of education, is increasingly being used in this digital era, but if you look at the applicative use of mobile-Android-based learning media, it has not been widely used in everyday life in the classroom. (Bahar & Soegiarto, 2020). The role of learning media is not only as a support or complement in the learning process, but can also be a source of learning information for students in learning, which affects learning outcomes


or achievement. (Saputro et al., 2020). This new paradigm of using technology is more than just machines and their interconnected software, but it can embody a constructive way of thinking that guides one's approach to learning about the world. Computers require ways of thinking that are primarily technical in today's educational environment. The more new technology molds the classroom into its own image, the more technical logic takes the place of critical, political, and ethical understanding (Okan, 2003), included in the process of learning mathematics.


Playing video games in learning mathematics and innovating learning technologies for learning mathematics have great potential to enhance student learning and motivation while demonstrating how different modes of user engagement can influence the

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instructional design of games.(Plass et al., 2013) and can help student in phase of abstracting and concretising in math (Heugl, 2004) .

One of the instructional media that can be developed in mathematics learning is video games (McLaren et al., 2017)(Saprudin et al., 2019). The use of video games among students has great potential. Nearly 60% of the world's population uses the internet and 80% of internet users in the productive age range say they actively play video games (Lete et al., 2022)(ESA, 2017). Integrating technology in the classroom is supported by the findings of Ardani, Salsabila, Handican, &Setyaningrum, where it was found that 65% of 134 teachers said that they did not use technology-based learning media in class and 72.65% of 223 students stated that the teacher taught Mathematics only relies on textbooks so that learning seems monotonous and conventional(Setyaningrum, 2016). Seeing this data, the need for learning media in the form of video games to be used in edutainment is very important (Rusliah et al., 2021).

According to Aksakalthat edutainment as a technology-based learning media can facilitate learning and teaching(Aksakal, 2015)and edutainment is a program that makes student-centered activities(Anikina & Yakimenko, 2015) and the empirical research presented in this paper demonstrates that a mathematics educational game can provide superior learning opportunities while also being more engaging (McLaren et al., 2017). Therefore, it is important to see how the quality of the learning media in the form of games is and accurately measuring media use in children and adolescents is therefore of great importance (Scherer et al., 2015), because the advancement of ICT in education has a positive impact and produces noticeable results(Yeni et al., 2019).

Concepts understanding is an important aspect to improve because it is the main goal and function in mathematics (Heugl, 2004). Several findings reveal the importance of students' mathematical understanding abilities. Novita Saristated that the ability to understand concepts in mathematics is important because mathematics studies concepts that are connected and mutually sustainable (Novitasari, 2016) and also stated that understanding mathematical concepts is an important basis for thinking in solving mathematical problems and everyday problems (Mawaddah & Maryanti, 2016).

Some empirical findings show that the use of instructional media can improve understanding of mathematical concepts (Novitasari, 2016), (Bahar & Soegiarto, 2020), (Gusmania & Wulandari, 2018), (Ariyanto et al., 2019), (Lestari et al., 2019), (Futri

Basya et al., 2019). To realize this goal in the Number Game video game, this research will discuss the validation of this instructional media in terms of the material carried and the overall quality of the media.

2 METHOD

This research is part of research development or Research and Development (R&D) where the purpose of this research is to assess the validity of the Android-based Number Game edutainment media which was developed to facilitate students' ability to understand concepts and interest in learning mathematics. The development mode used is the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model (Sweller, 2021) . Evaluation of the validity of Number Game instructional edutainment media was carried out in the third stage, namely "development". The instrument used in the validation is a validation instrument in the form of a validation questionnaire sheet, both material validation and media quality validation based on indicators compiled by researchers.

The validation sheet uses a Likert scale (1 to 5) in its assessment which then analyzes the results by converting to the table of instructional validity criteria for edutainment media as shown in the following table.

Table 1: Classification of Validity Assessment.

Score Interval	Criteria
$\bar{x} \geq 4,2$	Very Good
$3,4 \leq \bar{x} < 4,2$	Good
$2,3 \leq \bar{x} < 3,4$	Passable
$1,8 \leq \bar{x} < 2,3$	Deficient
$\bar{x} < 1,8$	Not Good

Contentquality, alignmentoflearning objectives, feedbackandadaptation, motivation, presentation design, interactionusability, accessibility, reusability, and standardscompliance are all assessed as part of the instructional media quality assessment.(Leacock & Nesbit, 2007). As for the assessment of the material using 2 indicators, namely the quality of the content and objectives as well as the quality of the instructional (Handican & Setyaningrum, 2021).

3 FINDING AND DISCUSSION

3.1 Display of Number Game

Number Game is a learning media that can be run on Android-based mobile phones, so it is included in mobile learning. Number Game, using scientific methods, can teach students to be active anywhere and at any time. This is in accordance with the opinion about the characteristics of good mobile learning where mobile learning devices are devices that make it easy for users to access, updated, interactive, contextually appropriate, flexible to use in learning, can be used anywhere and anytime, and ensure more students are involved because mobile learning is based on modern technology that students use every day (Qamariah et al., 2017).

Number Game has a 15.4 Mega Bite in size (MB). Except for the sections containing students' homework and uploading the results of student discussions, this application is designed to be used offline. Number Game is made with Construct2 software and built with the help of Android Studio as software to create apk. In addition, the Photoshop application is also used to design the appearance and attributes in this learning media, including such as background, character creation (players, enemies, and icons), button initiation, menu display, and so on. the results of making the Number Game display can be seen in Figure 1 which illustrates the Number Game display on a smartphone or mobile phone.



Figure 1: Number_Game in Mobile Learning (Smartphone).

The learning materials chosen for this application are Number for Junior High School. Number Game is intended to help students understand the concept of number material, which includes several topics such as integers, fractions, and number material. Furthermore, this media is designed to increase interest in learning mathematics based on data on student needs derived from the first phase of analysis.

Multimedia learning can increase learning motivation by using good composition in terms of color, sound, graphics, game music, character animation, and proper video explanation (Setyaningrum & Waryanto, 2018), the display of the initial menu (loading) and the main menu can be seen in Figures 2 and 3



Figure 2: Number-Game's Loading Bar.



Figure 3: Main Menu of Number_Game.

After the page has finished loading, the main menu for users will appear, with options such as about the developer, learning activities at home, KD formulation, how to use, information, and so on. If you don't want to open this menu, you can close it. Figure 3 depicts the Number Game instruction menu. There are several menus that can be accessed on the main menu including; 1) about the developer, 2) study at home 3) KD (Basic Competency), and 4) scientific approach, and 5) including: sound button, navigation, setting, bibliography, and exit button.

The learning process can begin after students selecting the let's play menu in the main menu which will then be directed to choose the game levels, each level must be completed systematically and sequentially and adapted to the learning material. The initial material that can be selected by the user is "knowing integers". The display can be seen in Figure 4 and Figure 5.



Figure 4: Menu for Selecting Learning Materials.



Figure 5: Choose a Discussion Topic.

The type of game used in this edutainment instructional media is the type of platform where it is in accordance with the results of the analysis of student needs regarding the type of game they like. The learning process as Figure 6 shows begins by providing a learning flow, apperception material, and then learning with a scientific approach, namely: observing, asking questions, reasoning, associating, and building networks.



Figure 6: Playing Page of Number_Game.



Figure 7: Scientific Approach on Number_Game.

Activities to develop the ability to understand concepts are carried out by developing learning according to a scientific approach, in Figure 9 students are directed to observe a problem about numbers which are then directed to ask questions (Figure 9), then solve the problem in Figure 10.



Figure 8: Presentation of Number Problem Material.

Number Game is designed so that users understand the material being taught before heading to the real mission. Each level has a mission to answer questions in order to advance to the next level. The mission is presented in the form of questions as in Figure 10 & 11.



Figure 9: Presentation of Number Problem Material.



Figure 10: Increasing Understanding of Concepts Through a Mission.

The material on Number Game can only be continued when the learning process can be completed by answering questions correctly. In addition to test questions for each level, test questions are also given for independent learning reflection on the home study menu as shown in Figure 10.



Figure 11: Display of Missions and Tasks on Number_Game.

Learning to understand students' mathematical concepts is also carried out at each level by providing a choice of examples and non-examples in the material presented which will train students' problem solving skills (Mawaddah & Maryanti, 2016), (Ariyanto et al., 2019; Gusmania & Wulandari, 2018; Lestari et al., 2019).

3.2 The Results of the Number Game Validation

The validation of Number Game consists of two parts: materials and media. Table 2 shows the validation results for the materials aspect.

Table 2: The Results of Number_Game Media Quality Aspect Validation.

Aspect	Expert 1	Expert 2	Average
Content Quality	4.16	3.83	4
Learning Goal Alignment	4	4.25	4.12
Feedback and adaptation	5	4.5	4.75
Motivation	4.5	5	4.75
Presentationdesign	4.56	4.68	4.62
Interaction usability	4.5	4.75	4.62
Accessibility	4.6	4.6	4.6
Reusability	4	4	4
Standardscompliance	5	5	5
Average			4.49

Table 2 shows the validation score of the Number Game media quality aspect based on the LORI indicator. LORI indicators are used as indicators in assessing the quality of media used in learning that has met the validity and reliability aspects of the instrument. It means that the Intructional Media Edutainment, Number Game shows media quality according LORI Indicators (Leacock & Nesbit, 2007). Based on table 2 it can also be seen that 1) the quality of the content in Number_game meets the criteria of Good (4/5), 2) Learning goal alignment has the criteria of Good (4.12/5), 3) Feedback and adaptation has the criteria of Very Good (4.75/5), 4) Motivation meets the criteria of Very Good (4.75/5), 5) Presentation design has the criteria of Very Good (4.62/5), 6) Interaction usability has the criteria of Very Good (4.62/5), 7) Accessibility is Very Good (4.6/ 5), 8) Reusability is Good (4/5), and 9) Standards compliance meets the Very Good criteria (5/5).

As we can see from the results of the validation of the learning media experts above, the total average score is 4.49. So, the results of the assessment are included in the category, then the edutainment game Number_Game is included in the category "Very Good Validity".

Assessment of the material used in the media was carried out by 2 experts by analyzing the media based on the aspects determined and given in the form of a

material validation questionnaire. The following are the results of the material assessment by material experts in Table 3.

Table 3: The Results Number_Game Materials Aspect Validation.

Aspect	Expert 1	Expert 2	Average
Content Quality and Purpose	4.18	4.37	4.28
Instructional Quality	4	4.14	4.07
Overall Average			4.17
Criteria			Good

Based on Table 5, the results of the validation of learning material experts for the feasibility of learning materials in the edutainment game Number-Game obtained a total score of 4.17. so, the results of the assessment are included in the "valid" category in terms of the material used. The validity of product development shows that instructional media are developed on the basis of theories that are used as guidelines in formulating and compiling learning media. In this case the guideline used to see the validity of the media is the LORI (Learning Object Review Instrument) indicator (Leacock & Nesbit, 2007).

The main objective of LORI is to balance the validity of the assessment with the efficiency of the product evaluation process. Based on the data obtained from the media and material validation questionnaire, it can be concluded that the product developed is valid and feasible to use because it is in accordance with the indicators evaluating the validity of a media. This is in accordance with the research results of Ariyanto, et.al (Ariyanto et al., 2019), Lestari, et.al (Lestari et al., 2019), Futri, et.al (Futri Basya et al., 2019) where instructional media such as mobile games can be considered valid if the expert conducts an assessment with a valid category and it corresponds to the opinion expressed by Charsky where a product is said to be valid if the product developed is based on strong theoretical rationale and there is internal consistency between the components of the product being developed (Charsky, 2010). This matter according to the opinion of Djamas et al. (Djamas et al., 2018) and Nieveen(Nieveen, 1999) who say if material experts and media experts assess the product in minimal good category, then the product has validity quality.

Number Game has the potential to be used as a learning media in junior high schools, especially in Sungai Penuh City, Jambi. According to preliminary research results from distributing questionnaires in several schools, 92.31% of students have

smartphones, with 84.38% of these smartphones being Android. This large percentage makes the optimization of the use of this media very large. The data was taken from the high school category. 81.10% of students in the middle school category own smartphones, with Android accounting for 88.81% of all smartphones. According to data from low-income schools, 50.69% of students own smartphones, with 92.35% using Android. This means that Number Game can be used in junior high schools in Sungai Penuh City. This application is expected to actively involve students in learning mathematical concepts, thus allowing all students' abilities to be maximized(Qamariah et al., 2017). This is in accordance with the belief that good learning is learning that gives students freedom and choice in constructing their knowledge and can involve the role of students collaboratively in learning groups, able to solve problems individually that produce a project in meeting individual needs (Mehdipour&Zerehkafi, 2013).

4 CONCLUSIONS

Number Game is an android-based instructional edutainment media in learning Mathematics. Number Game is used in this study to aid in the understanding of mathematical concepts and interests. The validation of material and media aspects yielded very good and good results. It is concluded that Number Game is a "valid" instructional edutainment media that can be used in junior high schools.

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