

Development of Learning Media Metaverse Ijen Geopark Culture Site Bondowoso for Grade V Elementary School Students

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Abstract: This study aims to develop metaverse learning media Ijen Geopark Culture site Bondowoso for grade V students of SDN Dabasah 03 Bondowoso using the independent curriculum in the subject of Science Chapter 7 and to produce valid and effective learning media. The type of research used in this study is Research and Development (R&D) with the ADDIE Dick and Carry model consisting of five stages. The research sample consisted of 30 grade VA students of SDN Dabasah 03 Bondowoso with a one group pretest-post test design. The results of the research on the development of metaverse learning media Ijen Geopark Culture site Bondowoso produced a value by three validators obtained a value of 84.6 asked very worthy. The effectiveness of the product was obtained from the results of the t-test with $t_{count} > t_{table}$ ($6.329 > 2.042$) indicating effective and continued with the product effectiveness analysis test with the results of the media effectiveness level of 73% which was stated in the effective category. Thus, the learning media developed is declared valid and effective in improving student learning outcomes.

Keywords: learning media, metaverse, cultural diversity

I. INTRODUCTION

Progress technology has become part not inseparable from various aspect life, including in the field education. Previous learning limited to the method conventional which tends to focused to the teacher as source main knowledge, now experience change with use technology that enables creation experience learn more interactive, interesting and effective [1]. Along with progress of science and technology, institutions education in Indonesia begins first formulated policy for integrate digital innovation in education namely the digitalization program school since 2019 [12]. This step done use increase quality and grade education as response to challenge development technology in the era of globalization [10].

School digitalization is one form of implementing a new learning model designed to face the challenges of the industrial revolution 5.0 era, through the use of the internet which aims to increase inspiration, improve efficiency, and an approach that is tailored based on student needs [5]. The main characteristic of modern learning lies in student learning activities that are independent, building student understanding by emphasizing knowledge exploration using modern technology support based on interactive multimedia to hone critical thinking skills with activities to gather information and collaborate with friends [6]. Through the school digitalization program, it is hoped that it will be able to provide a positive influence on the learning process, especially in balancing digital technology management skills and the use of internet-based learning devices in learning activities [22].

Learning media plays an important role in supporting the implementation of school digitalization, especially at the elementary school level. According to [17] stated that the use of digital technology such as educational platforms is expected to be able to facilitate learning that is not only limited to space class, but functioning as tool for teachers to build effective interaction with student during the learning process. The use of technology is carried out in the educational aspect because it has become a necessity along with the development of the times. Students are already able to recognize technology, especially devices such as smartphones, and students can do many things using these devices [25]. In line with Jean Piaget's opinion [14] states that students aged 6 to 12 years have concrete operational cognitive abilities. According to Edgar Gale [21] states that students at concrete operational age can understand learning materials concretely based on direct experience with objects and people, this is similar to Edgar Dale's cone of experience theory. The more a media provides students with the opportunity to have direct experience, the more meaningful the stimulation given will be in maximizing learning outcomes.

Specifically, learning media is designed based on considerations of student competencies and learning achievements. Learning media is used as one of the tools used by teachers to convey material, ideas or ideas from teachers to students. According to Nurrita [4], learning media is a tool or means used in the learning process to convey material more interactively, efficiently, and effectively. In line with the opinion Roulina [7], instructional Media is all tools that can utilized For support achievement of activity process effective learning.

The learning process must be carried out optimally according to the level of education, in this case including the subject of Natural and Social Sciences (IPAS) in elementary schools. According to Kemendikbud Number 033/H/KR/2022, it explains that IPAS is a branch of science that studies living things and inanimate objects in the universe, along with the interactions between the two. Through IPAS subjects, students gain knowledge about how to understand human life, both as individuals and as social beings related to their surroundings and take actions to maintain, preserve and appreciate nature [9]. Learning activities that utilize the use of learning media are needed to support the process and realize learning objectives.

The process of learning science, especially in social studies subject matter, generally still uses conventional learning methods such as lectures, which focus on the teacher as a source of knowledge [3]. In this case, the teacher will explain the material in front of the class with simple learning media, then students copy the material notes written by the teacher, thus students only play a passive role in learning activities. The limitations of teaching aids that are less varied and cannot meet students' needs create a less effective learning atmosphere, thus affecting the learning outcomes obtained by students which are less than optimal. This statement is supported by the results of a needs analysis based on observations and interviews conducted at SDN Dabasah 03 Bondowoso.

Based on the results of the interview on August 13, 2024 with the resource person of the fifth grade teacher of SDN Dabasah 03 Bondowoso, it was stated that during the process of learning science in the subject of social studies in elementary schools, namely chapter 7 "My Region, My Pride" sub-chapter 1 "What is My Regional Culture Like?" with learning outcomes (CP), namely, students recognize the diversity of national culture which is linked to the context of diversity based on students' understanding of the values of local wisdom in their area, teachers still rarely utilize learning media that utilize technology, instead teachers only develop simple learning media in the form of banners that are linked to the diversity of tangible and intangible culture of Ijen Geopark Culturesite Bondowoso and using student books. As a result, learning outcomes in understanding science in the subject matter of chapter 7 sub chapter 1 with existing learning outcomes have not been achieved based on the initial student diagnostics. Therefore, in order for learning to be optimal and varied, technology-based learning media are needed to support the learning process.

Based on this background, the researcher made an innovation in learning science in chapter 7 sub-chapter 1, namely by developing learning media entitled metaverse learning media Ijen Geopark Culturesite Bondowoso for grade V elementary school students which can be used in the learning process, especially in recognizing cultural diversity in the student's area.

Metaverse is a virtual world that integrates aspects of online games and social media consisting of various types of environments, forms, and digital interactions [24]. In line with the opinion [23] that metaverse is a platform space virtual in the metaverse that can create an interactive environment with each other that can be accessed through devices such as computers, smartphones, and other immersive devices. According to [8] stating that the purpose of building the metaverse is to find out how effective the metaverse can help students achieve the desired competencies. In addition, the metaverse can be developed starting from the devices used, the applications used, to the content contained in the metaverse. The use of metaverse learning media has the advantage that it can be loaded through one of its applications such as spatial.io and accessed through devices such as smartphones, so that it can provide an interesting, interactive, effective and real-time learning experience through various 3D elements and learning material content that is adjusted based on the desired competencies and learning achievements.

The content of the material in the metaverse learning media is associated with the cultural diversity of the Ijen Geopark Culturesite Bondowoso. Ijen Geopark is a single or combined geographical area that has a heritage site that includes three main pillars, namely Geosite, Biosite, Culturesite which is approved as part of the heritage authorized by UNESCO Global Geopark (UGG) in 2020 [5]. Ijen Geopark Culturesite in the Regency area Bondowoso consists of three tangible cultural heritages, namely the Maskuning Kulon Megalithic Site, ButhaCermee Cave, and Butha Sumber Canting Cave, while the intangible cultural heritage consists of the Petik Kopi Dance, Konah Mask Dance, and Singo Ulung [2].

II. METHODS

This research is a type of Research and Development (R&D) development research which refers to research using the ADDIE model developed by Dick and Carey which consists of five stages. [16]. The purpose of development research is to produce a certain product, then test the validity and effectiveness of a product that is developed [20]. The research design uses pre-experimental, namely, one group pretest-posttest design. This research design conducts learning evaluations before and after treatment is given to one group only, without a comparison group [15]. The research was conducted at SDN Dabasah 03 Bondowoso in the even semester of the 2024/2025 academic year. The subjects in the study were 30 students of class VA SDN Dabasah 03 Bondowoso.

III. RESULTS AND DISCUSSION

Researcher develop learning media namely learning media metaverse Ijen Geopark Culturesite Bondowoso for fifth grade elementary school students. The media produced can be declared feasible if it meets the validity and effectiveness after going through the validation stage and media effectiveness test. The research stages carried out by the researcher include five stages based on the ADDIE model by Dick and Carey, namely as follows.

1. Analysis

Based on the results of pre-research at SDN Dabasah 03 Bondowoso on class VA teachers. The results of the analysis that have been carried out are used as guidelines in considering the preparation of learning media in the subject of Social Sciences, chapter 7, sub-chapter 1. After conducting a needs analysis based on the results of interviews and observations, it is known that the learning media used so far in the subject of Social Sciences, chapter 7, sub-chapter 1 is a banner associated with the cultural heritage of Ijen Geopark Culturesite Bondowoso on learning outcomes, namely understanding Social Sciences. The design of learning media using banners to convey material is only in the form of images and brief explanations of the material.

2. Design

Based on the analysis results that have been collected, the next step is to create a metaverse learning media development design in terms of the initial display format by completing the opening intro consisting of attendance, learning achievements, instructions for using the media, an introduction to the material content, and a metaverse room menu assisted by the website. lynx.id.

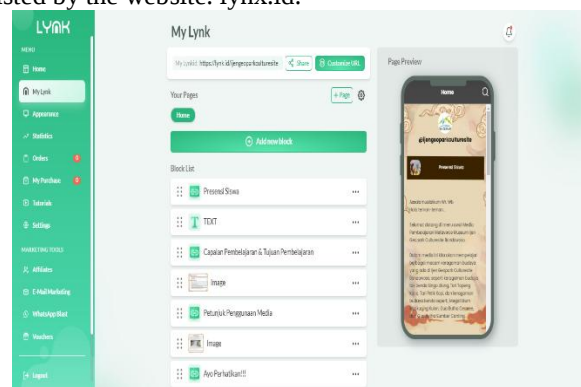


Figure 1 Initial Display Format Design

Design the content format for metaverse learning media on the spatial.io platform by adding content illustrations, text, and images with the help of the website. canva.

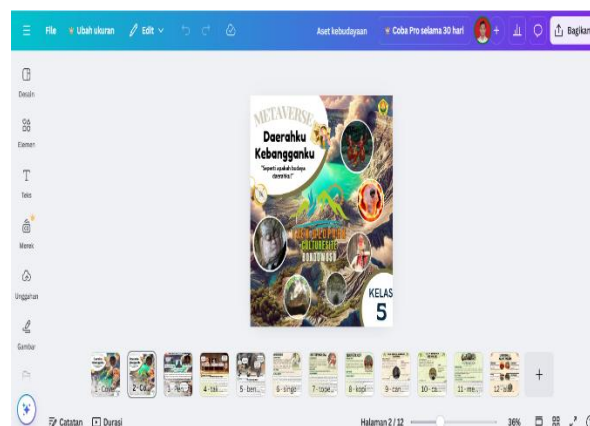


Figure 2 Content Format Design

Next, to create 3D elements in metaverse learning media using the monstermash. zone website.

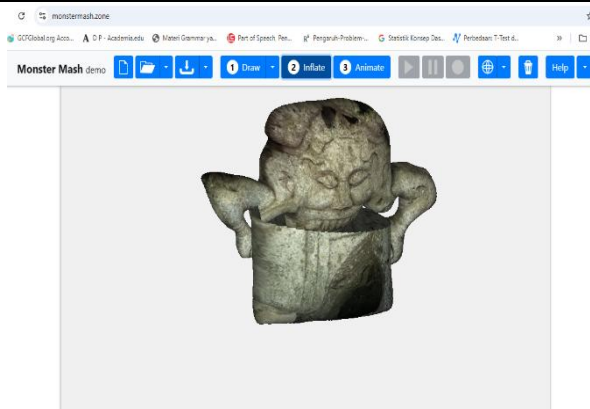


Figure 3: 3D Element Design

After design content illustrations, images, texts and 3D elements have been created. Next, the results of the design are uploaded to the spatial.io platform by clicking "Add Content" in the upper right corner and then selecting "Upload". The last step, set the position of the design that has been created, as shown in the following image.

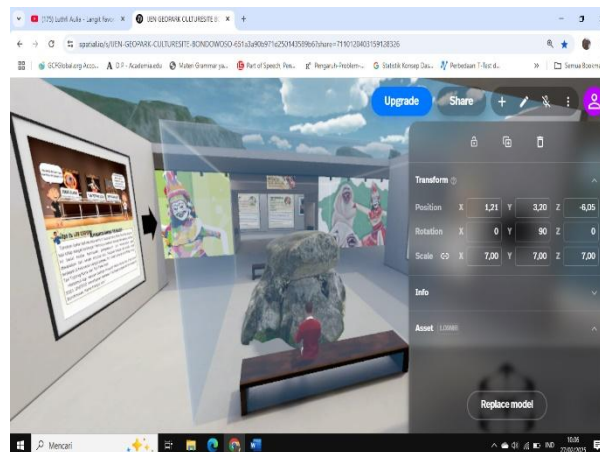


Figure 4: Uploading Design to in spatial.io platform

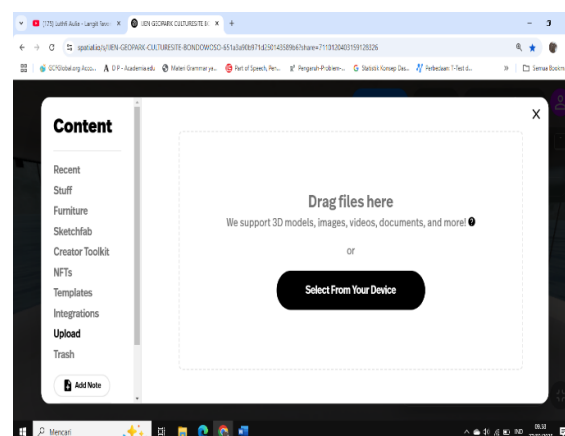


Figure 5: Settings Design Location

3. Development

The stage of validating learning media based on suggestions and assessments by expert validators of media, materials, and practitioners through formative evaluation throughout the stage for the sake of improvement and summative for assessment. The instruments used are in the form of questionnaires and the results of the feasibility assessment. The results of validation by three validators are as follows.

a. Validation media expert

Media aspects assessed based on the evaluation of the aspects of design format, content, and language based on the completed questionnaire. The results of the feasibility assessment by the media expert validator can be seen in Figure 6.

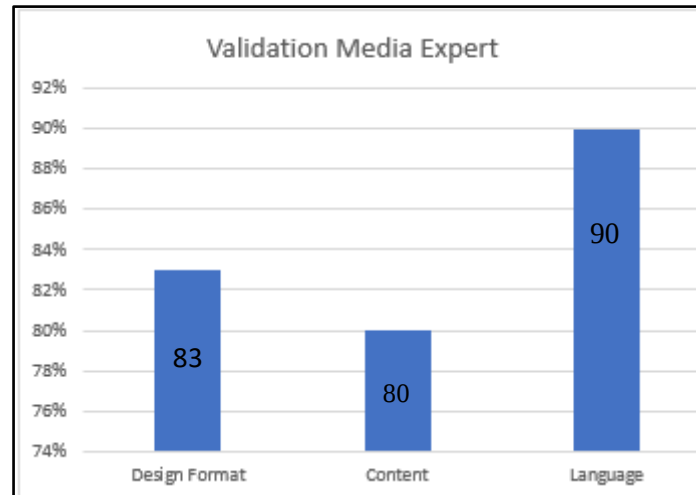


Figure 6: Media Expert Validation Results

Based on validation media experts can concluded that design format aspects to obtain percentage 83%, aspect language 80%, and aspects 90% content. With Thus, learning media can grouped in very good and very worthy category to be tested in the learning process.

b. Validation media material

Validation by material experts is carried out to see the suitability of learning materials with learning outcomes based on the introduction and learning aspects. Results The results of the feasibility assessment by the material expert validator can be seen in Figure 7.

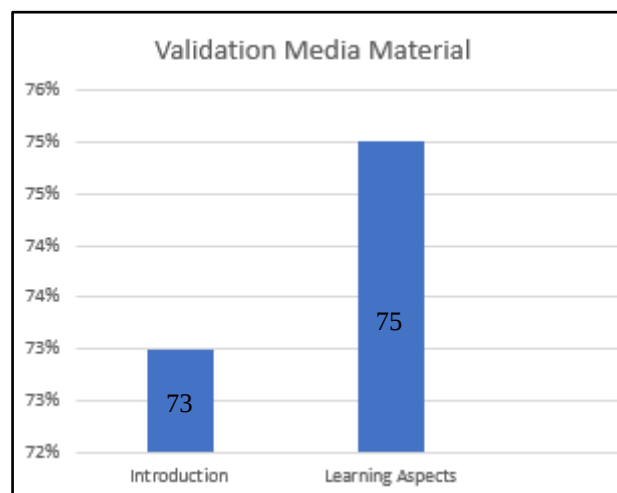


Figure 7: Results of Material Expert Validation

Based on validation expert material can concluded that aspect introduction obtained a percentage of 73% and the learning aspect 75% included in the good category. Overall in the material aspect, the learning media obtained a percentage by the validator of 74%, so that the Ijen Geopark Culturesite Bondowoso metaverse learning media can be grouped into the category of being worthy of being tested in the learning process.

c. Validation expert practitioner

Validation expert practitioner conducted by teachers of SD Dabasah 03 Bondowoso For evaluate media eligibility based on three aspects, namely aspects of design format, language, and content. The results of the feasibility assessment by the practitioner validator can be seen in Figure 8.

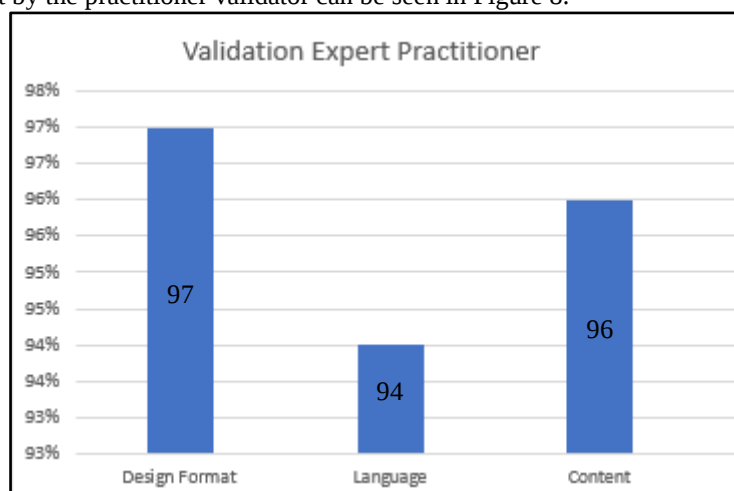


Figure 8: Expert Practitioner Validation Results

Based on validation expert practitioner can known that percentage evaluation feasibility of learning media from design format aspects get score by 97% including very good category, aspects Language get score by 94% including very good category, and aspects Contents get score 96% which includes very good category. With Thus the learning media that was developed worthy to be tested.

Based on sub-district results validation by validator obtained percentage mark eligibility amounting to 84.6% which includes very worthy category for tested based on criteria media suitability. The suggestions and input provided by the validator in effort media revision and improvement, including: 1) color design the design color and design title need to be changed and the photo/image source needs to be added; 2) add a cover to the learning media; 3) make the illustrations in the text interactive; 4) adjust the words in the text related to classical times to children's language.

4. Implementation

This step is carried out by implementing learning media in the learning process at school. Implementation is carried out through small-scale and large-scale trials involving students to determine the validity and effectiveness of the learning media that has been developed.

a. Trials scale small

The product that has been validated by experts and revised, then conducted a small-scale trial involving 18 students at SDN Curahpoh 1 Bondowoso. The trial was conducted to determine the student's response to the product developed through the responses given based on the student response questionnaire that had been filled in and analyzed using the *product moment technique* from *person* to assess the validity of the product based on the items in the questionnaire. The number of $n = 18$ is ($r_{table} = 0.468$), if the correlation (r_{count}) is high, it means the item is valid and if the item has a low correlation, the item in that aspect is revised. The following results of the feasibility assessment can be seen in Figure 9.

Number Questionnaire	Correlation with Factors	Correlation with Total	r-tabel N=18	Conclusion
1.	0,807	0,760	0,468	Valid
2.	0,676	0,573	0,468	Valid
3.	0,666	0,663	0,468	Valid
4.	0,808	0,743	0,468	Valid
5.	0,752	0,798	0,468	Valid
6.	0,773	0,752	0,468	Valid
7.	0,634	0,640	0,468	Valid
8.	0,691	0,663	0,468	Valid
9.	0,825	0,778	0,468	Valid
10.	0,762	0,689	0,468	Valid

Figure 9 Small Scale Trial Validation Results

b. Trials scale big

A large-scale trial was conducted to determine the effectiveness of the product developed in the learning process. The effectiveness test involved 30 students of class VA SDN Dabasah 03 Bondowoso. The trial process was carried out by conducting a learning evaluation at the beginning of learning and after the product was given. The instrument used was a multiple-choice written test. Then the results of the evaluation were analyzed using a t-test and the level of effectiveness of the product developed was analyzed.

5. Evaluation

Evaluation stage is a data collection process carried out at the end of the stage (summative) to determine the effectiveness of the product on learning outcomes based on written tests in the form of multiple choices that have been completed by students. Furthermore, the data is tested using the paired sample t-test analysis technique. The calculation results are as follows.

$$t = \frac{\bar{D}}{\left(\frac{s}{\sqrt{N}}\right)}$$

$$t = \frac{556}{\frac{16,038}{\sqrt{30}}}$$

$$t = \frac{34,667}{5,477}$$

$$t = 6,329$$

Based on the results of the analysis, the calculated t value was 6.329 when compared to the t table with a significance level of 5% with a total of $n = 30$ is ($t_{\text{table}} = 2.042$) obtained a comparison of $6.329 > 2.042$, then the Ijen Geopark Culturesite Bondowoso metaverse learning media is declared effective. Meanwhile, for the analysis of the level of product effectiveness, a percentage value of 73% was obtained, including the effective category. The calculation results are as follows.

$$E = \frac{n}{N} \times 100\%$$

$$E = \frac{22}{30} \times 100\%$$

$$E = 73\%$$

IV. CONCLUSION

Based on results research and study the theory that has been conducted by researchers can concluded that learning media *metaverse Ijen Geopark Culturesite* Bondowoso is suitable for use as a learning media to improve student learning outcomes based on the calculation of the validity and effectiveness of the media. This is supported by data on the results of media validation with the following results: (1) the validation results received criteria at 84.6% by three validators which are included in the very feasible category and can be used further; (2) the results of product validation based on small-scale media trials are said to be effective based on 10 valid question items, which means they are suitable for use in learning; (3) the results of the product effectiveness test based on the learning evaluation value and analyzed using the *paired sample t-test*, namely the calculated t value is at 6.329 and the significant value of 5% is ($t_{\text{table}} = 2.042$), so that overall the comparison of $t_{\text{calculated}} > t_{\text{table}}$ is obtained, with a product effectiveness level of 73% including the effective category, then the *Ijen Geopark Culturesite Bondowoso metaverse learning media* is said to be effective in improving student learning outcomes.

V. ACKNOWLEDGMENTS

We would like to thank some anonymous reviewers whose comments improved the early version of this manuscript's quality.

VI. DECLARATIONS**Conflict of Interest**

We declare no conflict of interest, financial or otherwise.

Ethical Approval

The research was approved by the University of Jember and conducted in accordance with its research ethics guidelines applicable to studies involving human participants.

Informed Consent

On behalf of all authors, the corresponding author confirms that all participants provided informed consent and agreed to participate in this study.

VII. DATA AVAILABILITY

Data used to support the findings of this study are available from the corresponding author upon request.

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