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Development of Learning Resources for Nearpod-Based Remote Sensing Materials for Class X High School Students

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Abstract: The current learning process needs to utilize technology, one of which is the use of interactive learning resources. This research aims to determine the feasibility of Nearpod-based geography learning resources on remote sensing material. This research is included in development research with the ADDIE model. The feasibility test was obtained from expert validators and the media. Product trials were given to class X students using a Likert scale questionnaire. The results of the feasibility test from material expert validators showed an average score of 91.67% and a score from media experts of 92%. Both are in the Very Good category and suitable for use. The results of the trial on class X students obtained an average score of 88.4% in the small group and a score of 88.8% in the large group. Both are included in the Very Good category, which means the learning resources can be used.

Keywords: Learning Resources, Remote Sensing Materials, Nearpod

I. INTRODUCTION

Education is a process of developing knowledge, skills, creativity and attitudes to prepare for life in the future. Education plays an important role in developing students' potential[1]. Students can develop better character, intelligence and skills to advance the education of the Indonesian nation [2]. Education, especially schools, must have a learning system that emphasizes dynamic processes based on efforts to foster students' curiosity[3]. The learning process will run effectively if students are actively involved in the learning process (student centered learning) and the teacher has the role of facilitator. The most important thing in teaching and learning activities in the classroom is that teachers use learning resources that are able to stimulate students' curiosity in delivering learning material[4]. The use of appropriate learning resources not only increases students' understanding of the material provided by the teacher, but can also develop students' scientific communication skills, because the use of appropriate learning resources is a communication tool that can facilitate the process of transferring knowledge in learning activities [5].

Learning resources can be defined as something or tools that can store and present stored messages as learning materials [6]. Learning resources in the learning process can come from existing sources (such as YouTube videos and other internet-based information) or be designed by the teacher according to learning needs based on objectives, strategies and class conditions. Technology-based learning resources can be e-books, e-modules, learning videos, other web-based learning resources, and so on. The use of learning resources in the learning process must be chosen appropriately to support the atmosphere and smooth learning activities in the classroom. Technology-based innovative learning resources can make students more active and communicative in the learning process, making learning more interesting and not boring, and students can understand the material provided by the teacher. Appropriate learning resources must be used at the learning orientation stage because they really help the effectiveness of learning and delivery of lesson material.

Based on the results of an initial survey regarding student and teacher needs for learning resources for remote sensing material in geography subjects, it was found that teachers need technology-assisted learning resources that make it easier to deliver material to students. Based on the results of filling out the questionnaire, it is known that during the learning process the teacher has not maximized the use of technology as a learning resource in the classroom. Currently, secondary school students are given the freedom to bring devices to school, but the use of electronic devices is not optimal in learning activities. Teachers stated the need to implement technology-based interactive learning resources that are able to attract students' attention so that students can learn independently.

Learning resources can be anything designed by the teacher or utilize existing resources to help students during the learning process[6]. Adequate learning resources will not only make it easier for students to understand learning material but also enrich students' scientific knowledge and improve students' communication skills. The use of technology in developing learning resources will make it easier for students to access them, especially if the learning resources provide various material sources, which not only contain explanatory descriptions but also related videos and evaluations. Learning resources that can be accessed via the

web are an added value because they are close to the daily lives of students who often use cell phones in their daily activities.

Nearpod-based learning resources are one learning resource that can be presented via a website so that it can be accessed by students for learning purposes. Several related relevant studies that have been carried out include research by [7] that internet technology can be used as a source of student learning which then has an impact on increasing the knowledge and information obtained by the students themselves. Another research related to the use of Nearpod was conducted by [8], where the development of Nearpod E-Media was proven to be effective in improving students' critical thinking skills. The difference that can be drawn from the three previous studies above is that in this research Nearpod will be used as a learning resource for the development of Remote Sensing material in Geography subjects and its application for class X high school students.

Based on the background that has been explained, researchers will develop a product through development research. This development research produced a product in the form of an innovative learning resource based on Nearpod on the subject of geography, remote sensing material. The formulation of the problem in this research is the feasibility/validity of developing Nearpod-based learning resources on remote sensing material. The aim of this research is to test the feasibility/validity of developing Nearpod-based learning resources on remote sensing material for class X high school students.

II. RESEARCH METHODOLOGY

The research method used is the Research and Development (R&D) method. This method is used to produce certain products and test the effectiveness of these products. The development model that will be applied is ADDIE (Analyze, Design, Development, Implementation, and Evaluation) in this research. According to[9] the ADDIE model is a product development model which consists of five stages, namely Analysis, Design, Development, Implementation and Evaluation [10]). The research stages carried out were as follows: (1) data collection/needs analysis stage; (2) learning resource product design stage; (3) learning resource product development stage; (4) media and material feasibility test stage; (5) revision stage of validation results; (6) final feasibility test stage of learning resource products; (7) product refinement stage resulting from validation tests; (8) product trial stage in small groups and large groups; and (9) final product revision stage.

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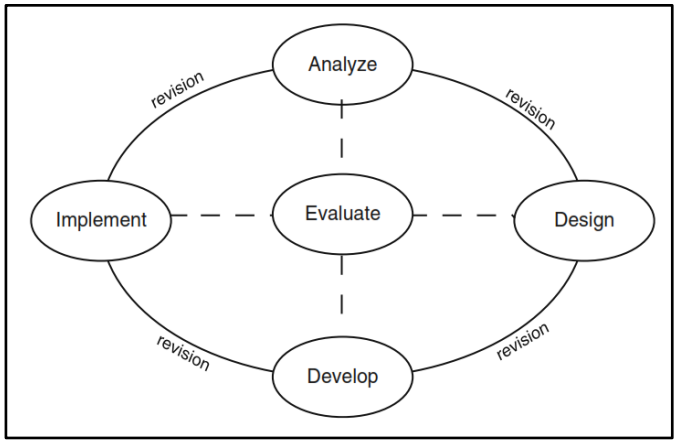


The selection of research locations for the development of Nearpod Based Learning Resources used the Purposive Sampling Area technique, namely by selecting 2 schools located in the Jember City area and 1 school located outside the Jember City area. In this regard, this research will be carried out at MAN 1 Jember and SMA Muhammadiyah 3 Jember. Research on the development of Nearpod-based learning resources will be tested in class X in each school. Class X was chosen in connection with the material used in this research, namely Remote Sensing material. Data collection methods in this research were obtained from interviews and questionnaires. Interviews were conducted directly during the initial research and student opinion data was carried out through questionnaires. The questionnaire given by the researcher was an expert validation questionnaire and student responses. The questionnaire is used as a validation tool to measure or assess the feasibility of the Nearpod-based learning resources that have been created. Validation calculations use the equation below [12].

$$V - ah = \frac{TSe}{TSh} x\ 100\%$$

Description:
V-ah: Expert Validation
Tse: Total Emprical Score of Validator
Tsh: Total Maximum Score

The calculation results are grouped into categories based on the percentage of scores obtained, as in the table below.

Table 1. Validation result categories

Score	Validity Level
85,01% - 100%	Very Good, can be used without revision
70,01% - 85%	Appropriate, can be used but needs minor revisions
50,01% - 70%	Inappropriate, recommended not to be used because it needs major revisions
01,00% - 50%	Inappropriate, or should not be used

Source: (Akbar, 2013)

After a validation test was carried out and declared valid, this Nearpod-based geography learning resource entered the implementation stage. The trial was carried out on class X SMA/MA students with 2 target groups. A trial was carried out to determine students' responses to the Nearpod-based geography learning resources that had been developed. In addition, to check whether the Nearpod-based geography learning resources developed can be operated, read and worked on according to the initial design. Trial data is presented in the form of a questionnaire using a Likert scale. The Likert scale in this student response questionnaire refers to[13].

Table 2. Student Response Assessment Score

Score	Description
4	Very good
3	Good
2	Less good
1	Not good

Source: (Andriani *et al.*, 2021)

The student response questionnaire data is then processed to obtain questionnaire results for developing Nearpod-based geography learning resource products. Calculation of questionnaire results uses the following equation.

$$P = \frac{F}{N} X\ 100\%$$

Description:
P: Percentage
F: Number of rater scores
N: Total maximum score

The percentage of questionnaire calculation results is calculated, then classified based on the criteria in the following table.

Table 3. Category percentage of Student Response Questionnaire Score

Score	Description
86% - 100%	Very Good
61% - 85,99%	Good
41% - 60,99%	Fair
21% - 40,99%	Deficient
< 20,99%	Very Poor

Source: (Palupi *et al.*, 2023)

III. RESULT AND DISCUSSION

The results of this research refer to the ADDIE development model with 5 main stages. At the analysis stage, a needs analysis was carried out on geography subject teachers and class X SMA/MA students. This needs analysis is measured using a questionnaire, the results of which are shown in Figures 2 and Figures 3 above. Based on the results of filling out the questionnaire, it is known that during the learning process teachers have not maximized the use of technology as a learning resource in the classroom (Figure 2). Teachers stated the need to implement technology-based interactive learning resources that are able to attract students' attention and allow students to learn independently, such as using the Nearpod application as a geography learning resource. 65 students were involved in this needs analysis survey by filling out a questionnaire. Based on survey results as in Figure 3, 90.77% of students said they liked learning activities that used technology in class, and 100% of students were interested in using Nearpod as a learning resource in Geography subjects.

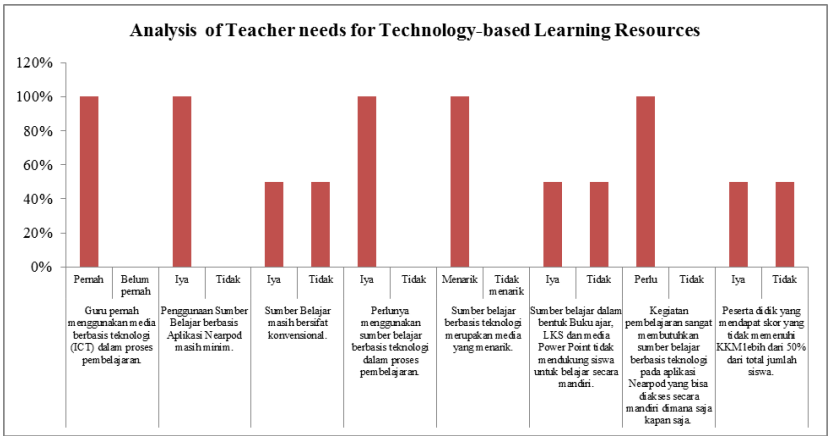


Fig.2 Graph of analysis of teacher needs for technology-based learning resources

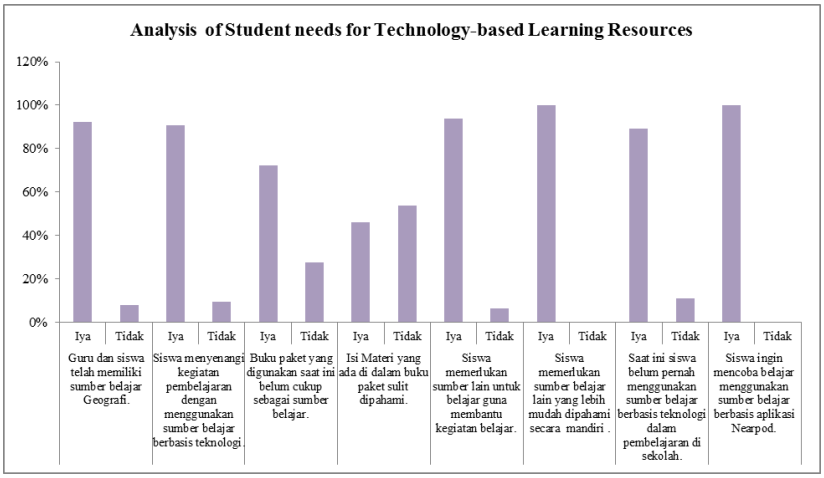
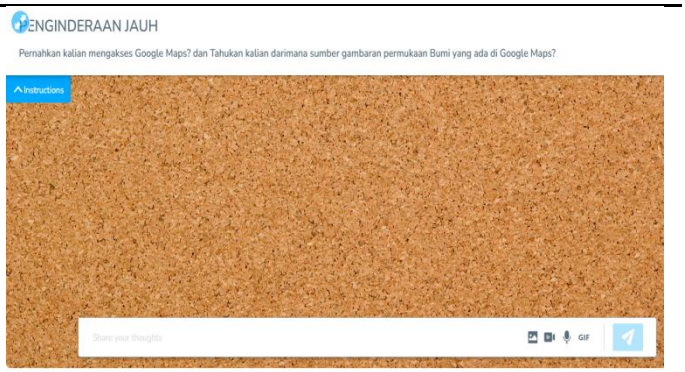
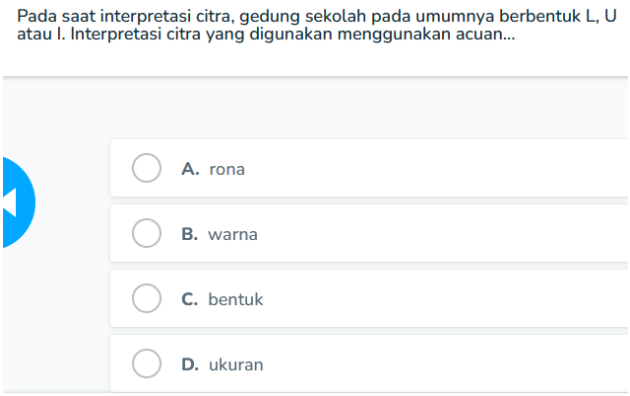
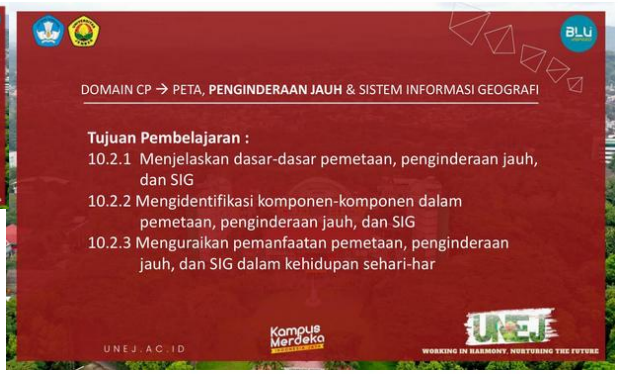
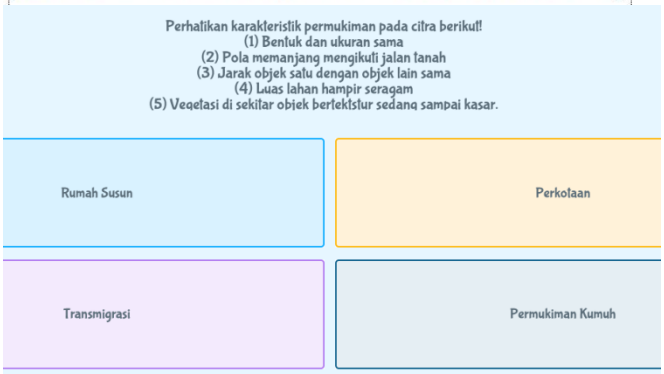


Fig.3 Graph of analysis of student needs for technology-based learning resources

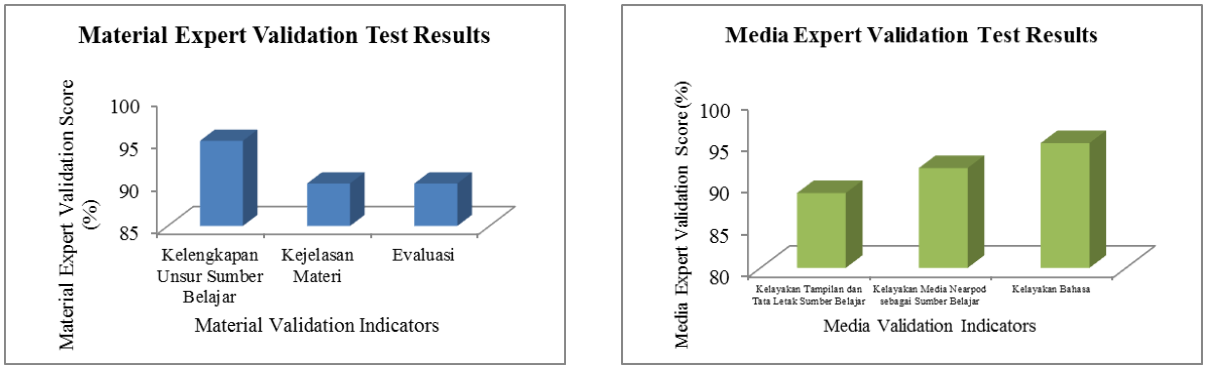
The design stage is carried out based on the results of the needs analysis and material analysis stages. At this design stage, the sequence of learning resources that will be displayed in the Nearpod application is determined. The following is the sequence of stages for delivering material in the learning resources developed in this research.

Table 4. Sequence of Material in Nearpod-based Learning Resources for Remote Sensing material

Learning Resources Stages	Material presented	Design on Nearpod
Apperception. The teacher reviews the previous material and provides opening questions to enter the material on Remote Sensing.	Sparking question "Have you ever accessed Google Maps? and do you know where the image of the Earth's surface on Google Maps comes from?"	
Pre-test. The teacher gives a pre-test to determine the students' initial abilities.	Students are given a pre-test in the form of a multiple choice quiz, with a total of 10 questions.	
The teacher delivers material about Remote Sensing to students.		
The teacher gives examples of the use of Remote Sensing data in daily life.	Examples of the use of remote sensing data are shown in video form.	

Learning Resources Stages	Material presented	Design on Nearpod
The teacher forms small groups so that students can interpret objects using Remote Sensing data.	The teacher provides discussion material, students interpret remote sensing image objects.	
Post-test. The teacher gives evaluation questions at the end of the lesson.	The post-test questions are the same as the questions in the pre-test stage.	

At the development stage, the development of Nearpod-based learning resource products is a continuation of the Design stage by carrying out material validation tests and media validation tests on learning resources by competent validators. At this stage the product development achievement is 80% which is then submitted for validation with several evaluations from validators so that the product is suitable to enter the implementation stage. The following are the results of the validation test for material and media parameters used by validators to measure the level of validity of the development of this learning resource.



(a) material validation (b) media validation

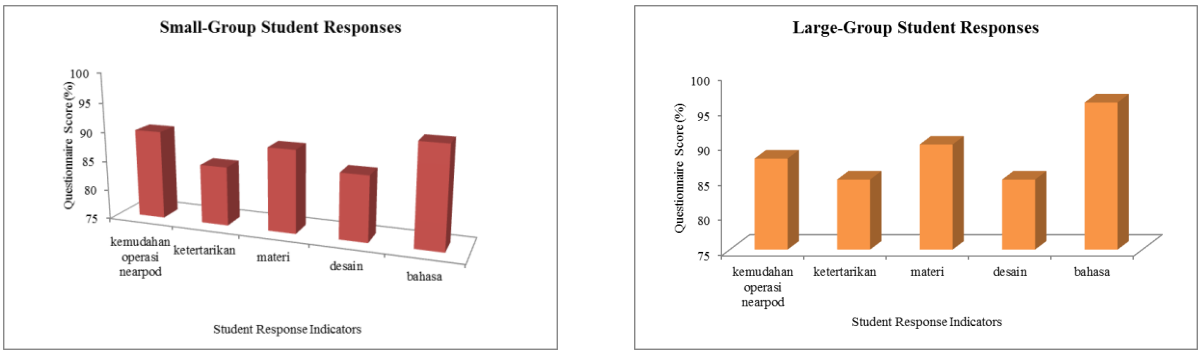
Fig.4 Validation Test Results

Based on the calculation results of validators from media experts and material experts, the final scores for each category were obtained, namely 91.67% and 92%. Referring to the Validation Results Category in Table 1 [12]. Nearpod-based Geography Learning Resources on Remote Sensing material are in the Very Good category, and suitable for use in the classroom learning. More details are in Table 5 below.

Table 5. Category of Material and Media Validation Test Results

Expert Validators	Average Score (%)	Description
Media	92	Very Good, can be used without revision
Material	91,67	Very Good, can be used without revision

The Implementation Stage is the stage of testing the product on students directly in class. In this research, the product that has been developed and has gone through a feasibility test by 2 expert validators, namely Nearpod-based Geography Learning Resources, will be tested on class X SMA/MA students. This product trial was carried out on 2 groups, namely a Small Group of 15 students and a Large Group of 32 students. The trial stage was applied directly to students in Geography learning activities with Remote Sensing material. From the start of learning activities, students are given access to the Nearpod application and together with their colleagues in class can access learning resources. After carrying out the trial, at the end of the lesson students were asked to fill out a student response questionnaire to see responses after using learning resources. The following are the results of calculating small group and large group student questionnaire responses.



(a) Small-Group (b) Large-Group

Fig.5 Student Response Questionnaire Score

Figure 5 above is a graph that shows the percentage of student response scores in small groups and large groups through questionnaire measurements with 5 parameters. Based on the results of the questionnaire calculations, both groups showed quite high score percentages and could be used during the learning process. A large group of 32 students showed interest when using Nearpod-based learning resources in class. Below are presented the final results of the Nearpod-based learning resource product trial and student response categories based on percentage score values. Referring to Table 3 above [14], the final calculation results of student response scores are included in the Very Good category, which means students can use Nearpod-based learning resources well during the learning process in class.

Table 6. Category of Student Response Results

Trial Group	Average Score (%)	Description
Small-Group	88,4	Very Good
Large-Group	88,8	Very Good

In the ADDIE development model, the evaluation stage is placed at the end to evaluate the 4 previous stages that have been carried out. However, in this research the evaluation stages were carried out simultaneously at the Development and Implementation stages. When the product is validated by a material expert and media expert validator, the notes and corrections provided by the two validators are used as an evaluation to improve learning resources before being tested on students. Meanwhile, at the Implementation stage, evaluation of learning resource products is obtained when students fill in the suggestions and input columns on the questionnaire sheet. After testing the product on students, the students' notes are used as evaluation material to improve the NerPod-based learning resource product. The following are evaluation notes from validators and students regarding the development of Nearpod-based learning resource products.

Based on the validation results with material experts and media experts, the final score percentages were 91.67% and 92% respectively. Both categories fall into the valid category and the product is suitable for use. Material expert validators and media experts carry out 2x assessments with 1x evaluation. Improvements were made according to the comments provided.

Material expert validators assess using 3 indicators, namely Completeness of learning resources, Clarity of Material, and Evaluation. The percentage scores of the three levels are 95%, 90%, and 90% respectively. Indicators of Completeness of Learning Resources include suitability of material with ATP, delivery of learning objectives and achievements from the start of learning activities, fulfillment of learning resource components in the form of media, and evaluation tools. Material Clarity Indicators include the flow of material delivered by core competencies, the material reflects the student's character in the P5 profile, the material presented is unbiased and easy for students to understand, and provides reflections and examples of phenomena in everyday life. Evaluation indicators refer to the content of the pre-test and post-test questions displayed in the development of learning resource products, namely the quality of the questions by the HOTS (Higher Order Thinking Skills) cognitive level.

Media expert validators assess 3 indicators, namely the appropriateness of the appearance and layout of learning resources, the appropriateness of Nearpod media as a learning resource, and the appropriateness of language. Each indicator has an average score percentage of 89%, 92% and 95%. These three indicators fall into the final category that Nearpod-based learning resource products are valid and suitable for use as learning resources.

Media expert validators focus on assessing Nearpod as a learning resource. The development of this product uses the Web version of Nearpod, but in its development researchers are free to use the features on the Nearpod Web. Media indicators for appropriateness of appearance and layout of learning resources highlight the appearance and placement of each component of learning resources, both material in the form of learning media and layout of evaluation tools presented in the form of pre-test and post-test. Indicators of the Feasibility of Nearpod Media as a Learning Resource as a whole are considered very feasible because of the features and ease of access of the Nearpod application itself. Language Suitability Indicators generally highlight the use of Bahasa Indonesia as the language of instruction for the content of the learning resources being developed, the suitability of the discussion with the material, and the ease of understanding the material as well as the evaluation delivered in the Nearpod-based learning resource products being developed.

Student responses are student responses obtained after students act as users of this Nearpod-based learning resource product. Student responses were carried out in 2 separate groups, namely a small group of 15 people and a large group of 32 people. In this study, the small group and large group came from 2 different schools. This was done to determine the level of response and response from each group based on the conditions and environment of the student's school. Based on the results of calculating student responses in small groups, the score percentage was 88.4%; while the calculation of the percentage score in the large group was 88.8%. These two figures indicate a Good response category for Nearpod-based learning resource products, and these learning resources can be used in learning activities.

Student responses were determined by administering a questionnaire after students gained experience in accessing Nearpod-based geography learning resources. The student response questionnaire has 5 assessment indicators, namely ease of operation of Nearpod, interest in Nearpod-based learning resources, material presented, design of learning resources, and language of instruction in these learning resources. Both small groups and large groups showed quite large score gains for each indicator, this shows that students can operate and are interested in the presence of technology-based learning resources in the learning process.

Trials carried out on small groups showed that the average percentage score on the Ease of Nearpod Access indicator and the language used obtained scores of 90% and 92%. Meanwhile, the indicators of Interest in the material, Content of the material, and Design of the material obtained an average percentage score of 85%, 89%, and 86%. Overall, the score is in a Good category, which means students can surf and explore material on Nearpod-based geography learning resources on Remote Sensing material. In small group trial classes, students independently own and bring electronic devices that are capable of downloading data (material), the internet network available at school is quite stable and smooth. During the trial process, students looked enthusiastic in understanding the Remote Sensing material further, and students were also enthusiastic when answering evaluations, both pre-test and post-test.

Another trial was applied to a large group, with a larger number of students. This was done to find out responses and feedback from students and to find out how to apply this learning resource if this Nearpod-based geography learning resource was applied to learning activities with the full number of students (generally 32 students). Based on trials carried out in large group classes, challenges arise mainly from the stability of the internet network, so it takes longer to load data. This internet connection instability also occurs unevenly, meaning that between one student and another, the speed of loading data from each device is different, so that when students start accessing learning resources on Nearpod it is not at the same time. Overall, learning activities assisted by the Nearpod application in large group classes ran smoothly and effectively. Students can access learning resources on their respective mobile devices so that learning activities take place effectively and efficiently. Students are also enthusiastic when doing pre-test and post-test evaluations. After implementing

learning resources in large group classes, students are asked to fill out a student response questionnaire with the results of the average percentage score for each indicator, namely the Nearpod ease of operation indicator at 88%, the Interest indicator for Nearpod-based learning resources at 85%, the Material indicator presented was 90%, the learning resource design indicator was 85%, and the language of instruction indicator was 96%.

IV. CONCLUSION

a. The feasibility test results from material expert validators on Nearpod-based geography learning resources show an average percentage score of 91.67%, while the feasibility test results from media expert validators on Nearpod-based geography learning resources show an average percentage score of 92%. Both feasibility test results are in the valid category and Nearpod-based Geography Learning Resources on Remote Sensing material are suitable for use.
b. The results of the student response test in the small group showed an average percentage score of 88.4% for the Small Group and 88.8% for the Large Group, which means that Learning Resources in Nearpod-based Remote Sensing material received a good response and can be used in the learning process.

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