Development of Cognitive Ability Test Instrument Based on Revision Bloom Taxonomy on Dynamic Electricity Materials For Students of Senior High School

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Submission date: 06-May-2023 08:42AM (UTC+0700)
Submission ID: 2085580507
File name: velopment_of_interactive_learning_on_electric_charge_s2_JPFI.pdf (435.37K)
Word count: 3869
Character count: 20908

P-ISSN: 1693-1246
E-ISSN: 2355-3812
December 2022

Jurnal Pendidikan Fisika Indonesia 18 (2) (2022) 174-181
DOI: 10.15294/jpfi.v18i2.28332

http://jjournal.unnes.ac.id/nju/index.php/jpfi

Development of Interactive Learning on Electric Charge Materials for Deaf Students

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Received: 7 January 2022. Accepted: 14 October 2022. Published: 31 December 2022

Abstract

This study aims to develop learning media in the form of interactive videos and analyze the effectiveness of interactive science videos for deaf students. The method used is Research and Development by Sugiono, 2009. The subjects of this research trial were SMALB N Tegal students consisting of 8 students for small-scale trials and large-scale trials 10 students at SMALB N Semarang and SMALB Swadaya Semarang. the feasibility of the overall display as well as the content of the material and questions to measure the effectiveness of the learning media. The data analysis used was qualitative descriptive analysis and validated as well as video effectiveness analysis.Based on the data analysis of the validation results, it was shown that 73.75% was categorized as feasible and could be used in learning. The effectiveness data were analyzed using effect size and obtained a score of 2.16 on a small scale and 2.09 on a wide scale in the large category. Based on the results of the study, the media developed was suitable for use in the SMALB science learning process for deaf students.

Keywords: Development, Interactive Learning, Deaf

INTRODUCTION

Deaf children at the SMALB level need meaningful science knowledge and hands-on learning experiences to develop scientific thinking skills and solve problems in everyday life. Children who experience barriers or retardation of intelligence or intellectual function, as well as delays in these physical functions require special education services in order to develop their abilities optimally (Mafltuhatin, 2014). Children with special needs receive different treatment in terms of educational services, because they are seen as having obstacles in several dimensions of life, so that in their education services they must be separated from normal children so that the learning process is not disrupted (Haryono, Syaifudin & Widiastuti, 2015).

IPA application needs to be done wisely so as not to have a negative impact on the environment. As is the case at the SDLB and SMPLB levels, at the SMALB level it is hoped that there will be an emphasis on learning Salingtemas (Science, environment, technology and society) which is directed at learning experiences to design and create works through the wise application of science concepts and the competence of scientific workers.

Children with special needs include children who experience physical (blind, deaf, quadriplegic), intellectual barriers (mentally impaired), mental barriers (handicapped), speech barriers (mute disabled), or double handicaps and children with special needs. special temporary ones such as children with learning disabilities, children with slow learning, children with special talents (CIBI) etc. (Filina, 2013).

Based on the weaknesses in verbal understanding for deaf students, learning should be carried out by prioritizing a visual approach, so students' ability to analyze and describe learning material will help make it easier for students to understand the concepts being taught (Ningrum, Susanto, & Mindiyarto, 2018). Therefore, deaf students need learning media that is more

dominated by images or animations that can help think abstractly in learning.

Media is not only a learning aid, but rather functions as a means of conveying messages from the sender of the message (teacher) to the recipient of the message (students) so that the message conveyed can be well received by the recipient of the message. One of the learning media is interactive video, Permana (2014) explains that interactive media is a tool that packages information that can provide a response back to the end user (students) of what has been received. Without media the teacher tends to talk "one way" to students. but with the media the teacher can organize the class so that students are more active. Interactive media can foster student activity in learning which is reflected in student feedback or responses triggered by interactive media by the teacher.

According to Salsabila & Wagino (2018) Innovative, interesting and suitable learning media to help children support their speaking skills in the aspect of pronouncing words, namely using interactive videos that are specifically modified for deaf students. Learning media is an important component of learning resources and also determines the success of a lesson. Technological developments make it easy to access learning media, making learning media is also easier. Various softwares are available to make learning media. This software support can make learning media more interesting and can be easily produced (Astuti, Sumarni, & Sararwati, 2017).

Based on this background, science learning is needed which provides opportunities for students to develop the academic skills needed by deaf students to gain experience in learning, so it is necessary to develop interactive videos for deaf students. In this study the aim was to develop interactive science learning video media for deaf students.

METHOD

The design applied in this research is research and development R&D is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2009). The research and development designs used are modified as needed. Research and development design can be seen in Figure 1

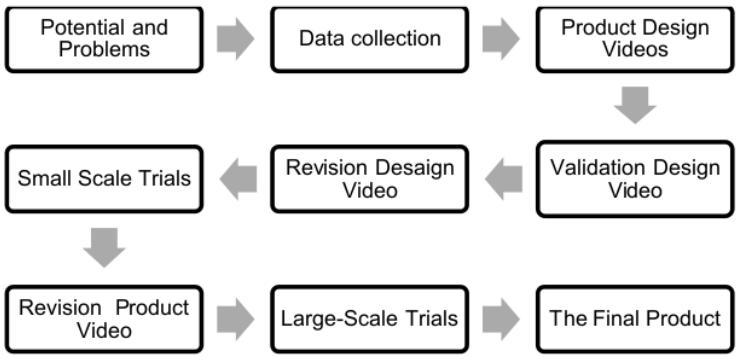

Figure 1. Research and Development Design

The test subjects consisted of 8 deaf students at Tegal City Public High School. And 10 deaf students at SMALB N Semarang and SMALB Swadaya Semarang. The video is validated by science teachers and lecturers to determine the feasibility of the video being developed. The research phase was divided into 2 stages, namely: preliminary study and development stage. So it can be explained for each stage, namely as follows: 1. Preliminary Study, At this stage it is the initial stage for development which includes literature study, field surveys. 2. Development Stage. At this stage, product preparation is carried out, namely the development of an interactive video on electric charge material for deaf class X students at deaf SMALB by combining material and sign language. 3. Data Collection Stage, at this stage the researcher validates the video by media experts taken through the questionnaire method using a validation questionnaire that refers to the eligibility standard of video media through an assessment of a. Language Aspect, b. Presentation Aspect, c. Aspects of Media Effects on Learning, d. Full View Feasibility, and pretest and posttest scores are taken through tests in the form of electrical charge material questions.

Expert validation data evaluating the validity of interactive videos includes three components, namely: content, language, and presentation. Validation score data in Sugiyono (2016) is calculated by the formula

$$P = \frac{\sum x}{\sum xi}\ x\ 100\% \qquad (1)$$

Where

p : Persentase
∑x : Respondents' answers
∑xi : Max score

Then analyzed and interpreted with the validity criteria table in Table 1.

Table 1. Validity Criteria

Persentase(%)	Criteria
80< Score ≤ 100	Very Valid
66< Score ≤ 79	Valid
56< Score ≤ 65	Valid Enough
40< Score ≤ 55	Invalid
Score ≤ 39	Tidak Valid

The data that has been obtained is then calculated using the effect size formula Cohen (2007) to determine the increase in student understanding, calculated using the formula

$$d = \frac{<Mpost> - <Mpre>}{\frac{\sqrt{SD^2\ Posstest + SD^2\ Pretest}}{2}} \qquad (2)$$

keterangan

d : Effect
Mpost : Average score *posttest*
Mpre : Average score *pretest*
SD : Standar deviasi

Table 2. Criteria for Determining Improvement

Size	Category
d ≥ 0,80	Big
d > 0,5, d < 0,8	currently
d < 0,5	small

RESULTS AND DISCUSSION

Product Validation

Before conducting the trial, the interactive learning media that had been designed was then validated by the validator. The validation was carried out by 4 validators, namely 3 teachers from SMALB and 1 Lecturer from FMIPA Semarang State University. The content validity test of this interactive learning media is divided into four main aspects . The four aspects are: (1) Expert validation based on feasibility and language, in this case it will be related to the grammar used in learning media, especially for deaf students who have limitations in speaking and hearing. (2) Expert validation based on the presentation aspect, what is meant in the presentation aspect is the alignment of the material in accordance with the learning and presentation of images and videos for deaf students who understand better through visuals. (3) Expert validation based on media aspects of learning strategies, in this case media can be used not only in class but can be used anywhere and can increase students' ability to understand physics learning. (4) Expert validation based on the appearance aspect of the program, what is meant by the appearance aspect

of the program is how attractive the presented interface design is. The interface design in question is the suitability of animation, coloring, graphics, language use and others that concern the physical appearance of the learning media.

The media validation stage is carried out so that the eligibility of the developed interactive learning media can be determined based on the assessment of material experts and media experts. The validation assessment data can be presented in Table 3.

Table 3. Learning Media Validation Criteria

Validators	Persentase	Criteria
Validators 1	70%	Valid
Validators 2	84%	Very Valid
Validators 3	70,5%	Valid
Validators 4	71%	Valid
Rata-rata	73,75%	Valid

Revision Product

Phase 1 Revision

The first revision was carried out referring to suggestions, comments and validation results from material and media experts. The revisions made in the first revision were: (1) Changing fonts in learning media. The fonts used in learning media are less comfortable to look at because they don't contrast too much with the background color, especially at the beginning of the learning video. The fonts used are replaced with colors and sizes that are comfortable for students to see. (2) Word Selection. The choice of words used in learning media ensures that they do not cause misconceptions among students who study learning media. (3) The phenomenon of static electricity. In the display of learning media the phenomenon of static electricity in everyday life needs to be added again, because the learning media does not show the phenomenon of static electricity. (4) Add animation to learning media. In the display of learning media, it is necessary to add animations that support the media to be more attractive to deaf students because the students' focus is only on visuals or what students see.

Phase 2 revision

Phase 2 revisions were carried out referring to the time of small-scale trials at SMALB N Tegal City. The media product that has been validated is then revised and then the test phase is carried out. The trial phase uses the Tegal State SMALB, carried out online, namely by sharing a link on Google Drive with students.

Before the link on Google Drive is distributed, students first get a link to work on the pretest questions, then the posttest link is given after students see the learning media and is used to determine the effectiveness of the learning media developed.

Table 4 validation results obtained a validation value of 73.75% which is categorized as valid and suitable for use according to revisions or suggestions from the validator, then small-scale trials were carried out.

After testing the product, the researchers measured the effectiveness of the product, using data analysis techniques in the form of an effect size on students' understanding through the pretest and posttest. The results can be seen in Tables 4 and 5.

Table 4. Small Scale Trials

Responden	Pretest	Posttest
Trials K 1	24	78
Trials K 2	36	78
Trials K 3	84	84
Trials K 4	54	66
Trials K 5	36	78
Trials K 6	42	78
Trials K 7	24	72
Trials K 8	48	60
Amount	348	594
Average	43	74

Responden	Pretest	Posttest
d	2.16	
Category	Big	

Table 5. Wide Scale Trials

Responden	Pretest	Posttest
Trials B 1	45	90
Trials B 2	18	72
Trials B 3	54	72
Trials B 4	18	81
Trials B 5	18	90
Trials B 6	36	81
Trials B 7	36	72
Trials B 8	72	90
Trials B 9	9	72
Trials B 10	36	54
Amount	342	774
Average	34	77
d	2,09	
Category	Big	

Data from tables 4 and 5 show an effect size of 2.16 in small-scale trials and 2.09 in large-scale trials which are included in the large category.

After designing the product, the researcher carried out product validation which included the assessment stage carried out by material experts and media experts and obtained a validation value showing 73.75% which was categorized as valid and according to the learning media validator it was suitable for use according to notes or worthy of revision.

The design revision stage was validated through discussions with experts and experts where in the design revision there were several shortcomings, namely the use of fonts and font sizes that were still too small, the use of animation that was still lacking, the application or application of static electricity in everyday life. From the validator's input, the researcher fixes all deficiencies in learning media which aim to produce quality learning media. After the product revision was carried out, the researcher carried out a small-scale trial and showed several deficiencies in the learning media developed, namely the learning media that was uploaded to Google Drive was less effective because not all students downloaded it on time. This happens for several reasons, namely limited quota for downloading and lack of understanding how to download on Google Drive. The next step that the researcher carried out was to revise the product according to the deficiencies in the small-scale trial, namely uploading learning media developed on a YouTube account which aims to make it easier for students to access learning media.

Large-scale trials were carried out to produce learning media that could be used effectively. In the small-scale trial the effectiveness results obtained were a score of 2.16 which was categorized as large, while in the large-scale trial the effectiveness obtained was 2.09 which was categorized as large. This shows that there are differences in the effectiveness of learning media scores during small-scale trials and large-scale trials. These differences are constrained when downloading or viewing learning media.

The interactive video developed consists of a combination of videos, animations, pictures and sign language to help students understand electric charge material in abstract science learning. The video is also equipped with a simple experiment about electric charges. Interactive video display can be seen in Figure 2.

Figure 2. Interactive Video Display

According to Gazali & Nahdatain (2019) The delivery of material in learning videos must be interesting, the language used in learning videos must be simple and easy for students to understand. Learning videos make students more enthusiastic about learning, with learning videos can make deaf students not get bored learning science. The sentences and material used in this learning video are clear and easy to understand, the letters used are simple and easy to read, the language used in this learning video is simple and easy to understand.

According to Rusilowati, Sulhadi, Purwaningtyas & Perwitasari (2020) learning videos can change student learning outcomes for the better because they make it easier for students to understand the material. In this study, learning videos were able to change the level of student understanding or learning outcomes with an average score of 43 to 74 on a small scale and 34 to 77 on a large scale, where deaf students have hearing limitations. Even though the deaf have limitations in academics, learning can still be optimized, one of which is learning science about electric charge by using video media. Diani, Yuberti, & Syafitri (2016) argue that the media chosen for use in learning is video. Learning video media in the form of video/animation media is important because each student's learning type is very heterogeneous, there are students who have auditory, visual and kinesthetic learning types. This is in line with the ability of deaf students who have abilities in visual forms.

Fajrianto & Irawan (2012) argue that children with special needs such as deaf children also need learning media, even though the need for this media is very high, various obstacles experienced by students must be overcome with appropriate media according to student needs. Therefore, children with special needs must using special media, which is appropriate and according to the characteristics of deaf students.

The role of this learning video is important in realizing a meaningful learning process. Through learning videos, students can focus their attention on receiving lessons and being able to explain material through visualization. This question is supported by Huda, Prasetyo, & Widiyatmoko (2015) who state that learning videos can be used in guiding students to understand a material through visualization. Resta, Fauzi, & Yulkifli (2013) said that learning videos have several benefits including, they can increase learning motivation so that material is easy to understand, change students' behavior to concentrate more, bring excitement, more meaningful learning outcomes, provide feedback, add experience, and adding insight.

This research has developed interactive video media that can be used in science learning for deaf students containing real images, movements, sounds and object shapes, so that they are interested and video media can provide a real picture for deaf children. This is because deaf students have hearing limitations which cause impaired communication. Thus it is easier for deaf students to remember and understand the material they learn through videos.

SMALB electric charge material is an abstract concept so that the curriculum content requires it to be taught through experimental activities. Therefore, to obtain the expected results, it is necessary to carry out real practicum or virtual (virtual) practicum via video.

According to Siedel, Tina, & Prenzel (2016) video must be used efficiently, clearly, and has the potential structure of learning situations for student learning processes, because video learning media focuses on student vision.

Media suitable for use as learning media is video which can be used in class, in small groups, or individually. It is not only given to normal children but also to children with special needs, one of which is a deaf child. Another function of the video is that it can attract students' interest, attention, clarify presentation of ideas, understand concrete examples of material and illustrate so that children don't quickly forget. This was clarified by Zahroh, Habibi, & Herowati (2017) that interactive science video media can help deaf students understand science subject matter because there are pictures or videos. Economically, video includes media that is relatively cheaper, both in price and in operation.

Furthermore, learning media developed into final products can be used by students by opening YouTube and can be seen anytime and anywhere.

CONCLUSION

The results of the validation of learning media as a whole show that the developed interactive learning media for the deaf obtains a validation of 73.75%. Several minor revisions were made for perfection in the developed media, the results of the effectiveness of learning media obtained a score of 2.16 on a small scale and 2.09 on a broad scale categorized as a strong effect on students' level of understanding so that it can be used for learning both at home and at school.

The suggestions that the authors give in this study are the addition of better pictures and animations and clearer sign language and further trials are urgently needed for the development of this learning media in order to obtain more optimal results.

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