

Wondershare Quiz Media Development in Learning Building Space Materials for Deaf Class X SMALB Students

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Abstract: Students with hearing impairment (deaf) who have obstacles in processing mathematical concepts can experience this anxiety and fear, which causes them to dislike mathematics. The purpose of this research is to develop a game media of mathematics on geometry materials for tenth grade students with hearing impairment in high school special education. This research refers to the steps developed by Borg and Gall 1989 modified into 9 steps. The main field test subjects were 2 people with hearing impairment. The subjects of the operational field test were 12 people with hearing impairment. The results showed that multimedia according to content experts was very valid with a percentage of 87,5%. According to the media expert it was valid with a percentage of 76,67%, and the results of the SMALB teacher validation of 90,91% means very valid. The main field test is very valid with a percentage of 88,33%. The operational field test is very valid with a percentage of 85,83%. It was proven that 66,67% of the trial assessors considered the developed media to be very valid to use and the remaining 33,33% assessed that the developed media was valid to use.

Keywords: hearing impairment; media; mathematics; geometry

INTRODUCTION

Preparations for the new era of Industry 4.0, which will bring about major changes in the physical world such as virtual facilitation made possible by digital connections to reduce distances, eliminate differences, and transfer real knowledge and transfer materials globally. Preparation in terms of technology, of course, requires sufficient time to encourage the education system to change, where lost time will hinder the economy and the young generation from being able to compete in facing the global world. Since the 90's when the internet was first discovered, it is a historical point that has had a profound impact on human life. The development of the digital world with the internet has now reached all aspects, one of which is in terms of education. From the aspect of education, various countries have developed a digital culture where the value of convenience allows it to have an influence on the media industry and users. Public concern and government participation are needed in recording and archiving material. Digitizing learning materials is one way to protect assets so that they can be used for a long time and for the next generation.

Educational institutions such as schools play an important role in preparing human resources who are ready to transfer knowledge and face the challenges of the times, including for children with special needs. The mandate for the right to education for people with disabilities or disabilities is stipulated in Law No. 20 of 2003 concerning the National Education System Article

32 states that: "special education (special education) is education for students who have a difficulty level in following the learning process because of physical, emotional, mental, social disorders".

Currently, world activities are being disrupted by the presence of Covid-19, a disease that attacks the respiratory tract, caused by a virus that is transmitted through droplets for which a cure and vaccine has not been found. The case of Covid-19 in Indonesia has been identified since March 2, 2020. WHO has designated Covid-19 (Coronavirus Disease 2019) as a public health emergency of international concern (Public health Emergency of International Concern) which is at risk of transmission between countries.

With this virus, activities related to joint activities or gathering are severely restricted or even eliminated, including educational activities in the school environment. Since March 16, 2020 students are encouraged to study at home. Following the appeal about Work From Home (WFH) which makes teachers work from home to provide learning materials, assignments, and practice questions / practices to students while still prioritizing learning comfort. Based on a preliminary study in March 2020 regarding distance learning carried out by teachers and students with hearing impairments at SMALB at SLB Negeri 1 Jakarta using material or practice questions sent in the form of Ms. Word.

SMALB students are generally in the formal operational phase. This means that children are able to think abstractly and master reasoning. He can

draw conclusions from the available information. He can understand abstract concepts. However, for deaf students who experience obstacles in communicating, this is an obstacle that affects the learning process. Deafness is a general term that indicates a hearing disability from mild to severe which is classified as deaf and hearing impaired (Wardani, 2007). Deaf students have the same intelligence as normal students, but their verbal abilities experience obstacles so that they interfere with the mathematics learning process in the form of symbols and abstract concepts.

According to Ashcraft in Katmada (2014), students with math learning difficulties exhibit high math anxiety, which is defined as “a feeling of tension, apprehension, or fear that interferes with math performance”. When interpreted loosely, students with learning difficulties show high math anxiety, which is defined as “feelings of tension, anxiety, or fear that interfere with math performance”. Deaf students who have obstacles in processing mathematical concepts can experience this anxiety and fear, which causes them to dislike mathematics. Students are required to be able to relate previous concepts to new concepts that will be studied using teaching aids or media as a form of manipulation of abstract mathematical concepts. That way the abstract concept of mathematics is easily understood by students.

Based on the preliminary study above, the researcher tries to develop alternative problem solving for mathematics material using interactive multimedia quizzes. Through a multimedia game, it is hoped that students can get pleasure in learning without coercion and foster a competitive attitude between friends even without being in class. Games allow active participation of students in learning. In line with the opinion of Nuria, et al. (in Harahap & Surya, 2017, p. 2), learning is a component of games, and playing is a component of learning. Learning and play are aspects of epistemology, and they suggest that “a richer understanding of science can be obtained through play. Creating interesting learning media can make students careful in learning”.

The use of multimedia in learning can increase student interest in learning, increase student understanding, and improve student memory (Gilakjani, 2012, p. 57-66). Multimedia according to Fouda (in Aloraini, 2012, p. 77), namely those that represent the consolidation of all technological elements when they combine sound, images, video, drawing & text with high quality in an interactive environment. The purpose of this research is that students can get pleasure in learning without coercion and foster a competitive attitude between friends through a multimedia game. Games allow active participation of students in learning.

Interactive quiz multimedia is developed based on the abilities of deaf grade X students. Game-based

learning is a form of student-centered learning that places problem-solving scenarios in the context of a game (Ebner & Holzinger in Carolyn Yang, YT, & Chang, CH, 2013, p. 334- 335), encourages active learning and generates greater engagement and satisfaction. Digital game-based learning involves refined media narratives to create interest and encourage student engagement, provides clear direction for task completion, direct interaction and feedback from digital environments, offers potential for adaptive learning based on student abilities, and has the potential to enhance problem solving and creativity. By learning using interactive multimedia quizzes, students are expected to hone their abilities in counting, reading or understanding commands, and operating existing software.

METHODS

This research and development adapted from the 1989 Borg and Gall development model (in Sukmadinata, 2009, p. 169), namely (1) research and data collection, (2) planning, (3) product draft development, (4) initial field trials, (5) revision of trial results, (6) field trials, (7) refinement of field test results products, (8) field implementation tests, and (9) refinement of final products. This development model was chosen because the stages are very systematic and in accordance with the characteristics of the media to be developed. Product revisions are carried out at the end of each validation or trial, to avoid negligence in correcting media deficiencies. So that the resulting media is really suitable for use.

Media development results were tested through 3 stages. These stages include (1) initial field trials (expert validation) to obtain data in the form of evaluations, opinions, and suggestions on the content and appearance of the media developed with the test subjects of cultural arts education expert lecturers, instructional media expert lecturers, and special high school teachers. deaf class X; (2) field trials to obtain data in the form of evaluations and opinions on the developed media, as well as testing the quality of the media / media usability with the test subjects 2 deaf students of class X SMALB; (3) field testing to obtain more valid data and to assess the effectiveness of the media in a broader scope with 12 deaf students of class X SMALB as the trial subject.

The tools used in data collection in this research and development are documentation and questionnaires. Documentation to obtain information / data about the subject of the trial, concerning the number of students, age and gender, this data is taken at the beginning of development. In addition, documentation is also in the form of photos of activities during the trial implementation.

Table 1. Data from Content Expert Validation

No	Aspect	X ₁		%
CONTENT/MATERIAL COMPATIBILITY				
1	Conformity with KI, KD	4	4	100
2	Compliance with indicators	4	4	100
3	Suitability with learning objectives	4	4	100
4	The truth of the substance of the material conceptually and procedurally	3	4	75
5	Conformity to the needs/intellectual development of students	3	4	75
6	Conformity to the student learning environment/contextual	4	4	100
LANGUAGE				
7	Clarity of language according to the level of intellectual development of students / communicative	4	4	100
8	Clarity of language according to the level of intellectual development of students / communicative	4	4	100
SERVICE				
9	The accuracy of the media title on the opening page with the material	3	4	75
10	Clarity of instructions for using media for teachers	4	4	100
11	The suitability of the material presented	4	4	100
12	Clarity of instructions for each section of the media for students	4	4	100
13	Learning materials are packaged into small units/sections	3	4	75
14	Giving motivation in writing through praise and pictures	4	4	100
15	Questions are easy for students to understand	3	4	75
16	Media section equipment	3	4	75
GRAPHICS				
17	Clarity of using fonts (type and size)	3	4	75
18	Layout suitability, media layout	3	4	75
19	Illustration of the image supporting the material	3	4	75
20	The attractiveness of media display design	3	4	75
Total		70	80	87,5

The questionnaire used consists of two parts, namely part I in the form of an evaluation questionnaire and part II in the form of comments and suggestions from the validator. The questionnaire used is a Likert scale with 4 evaluation scales, namely very suitable / very good, appropriate / good, quite appropriate / good enough, and not suitable / not good. Data analysis was performed by qualitative descriptive analysis and quantitative descriptive analysis.

FINDINGS AND DISCUSSION

Findings

In accordance with the determined development stages, the activities carried out include compiling outlines of media content and describing them into media designs and collecting components used in the development of learning media.

The results of preliminary observations on the implementation of home learning, found several potential problems as follows. First, the teaching materials used by the teacher are limited due to the incomplete source books from the government, which causes learning to still seem rigid and less varied.

Second, teachers have not integrated multimedia in learning, only in the form of written assignments in Ms. Word. Teacher knowledge is still lacking in using supporting applications to produce good multimedia. Third, there is no media specifically designed for home learning.

The plan for solving these problems is to develop distance learning multimedia that is able to make mathematics learning more interesting and to facilitate students learning independently at home. The developed multimedia is an interactive multimedia quiz specifically designed for learning mathematics.

The software created is called "We Love Mathematics". This software provides material on learning mathematics using simple language in a quiz format. Each question is accompanied by a picture and / or video. In addition, this software is also equipped with a thematic system of brain teasers, which combines several subjects in a series, for example material on spatial shapes in mathematics with color recognition or you can also use story questions to increase vocabulary for deaf students. This thematic system will benefit students so that learning can be combined with other materials that support each other.

Table 2. Data from Media Expert Validation

No	Aspect	X ₁		%
1	The suitability of the media design with the subject matter	3	4	75
2	The suitability of the media with the characteristics of students	3	4	75
3	The suitability of the material in developing media	3	4	75
4	Media ability in developing student motivation	4	4	100
5	The ability of the media to aid in understanding and remembering information	3	4	75
6	The suitability of the media to create a sense of pleasure in students	3	4	75
7	The ability of the media as a learning stimulus	3	4	75
8	The ability of the media to repeat what has been learned	3	4	75
9	Clarity of text on media	3	4	75
10	Media serving color composition	2	4	50
11	Ease of media operation	3	4	75
12	Learning media efficiency is related to time	3	4	75
13	Efficiency of learning media is related to energy	3	4	75
14	Media safety in use	4	4	100
15	Quality of learning media	3	4	75
Total		46	60	76,67

Table 3. Data from Special Education Teacher Validation

No	Aspect	X ₁		%
RELEVANCE				
1	The suitability of the material with KI, KD	4	4	100
2	The suitability of the material with the learning objectives	3	4	75
3	The suitability of the questions with the learning objectives	3	4	75
4	The suitability of the depth of media content with the level of student development	3	4	75
5	Compatibility of the illustration with the material	3	4	75
ACCURACY				
6	The suitability of the material with scientific truth	4	4	100
7	The suitability of the material presented in everyday life	4	4	100
8	Conformity of packaging material with conceptual and procedural	3	4	75
9	The accuracy of the answer key for each question	3	4	75
SERVING SYSTEMS				
10	The material description follows the flow of simple to complex thinking	4	4	100
11	Clarity of media content illustrations	4	4	100
12	Complete learning resources for teachers and students	4	4	100
13	Completeness and clarity of student work instructions	3	4	75
14	Clarity of evaluation that must be done by the teacher	3	4	75
SERVING COMPATIBILITY WITH STUDENT-CENTERED LEARNING				
15	Encourage student curiosity	4	4	100
16	Encourage students to build their own knowledge	4	4	100
17	Encouraging student interaction with learning resources	4	4	100
18	Active student involvement in learning activities	4	4	100
KETERBACAAN				
19	Communicative language according to the level of intellectual development of students / communicative	4	4	100
20	Use of appropriate and appropriate fonts/letters	4	4	100
21	Ease of understanding the language used	4	4	100
22	Conformity with Indonesian language rules referring to Enhanced Spelling (EYD)	4	4	100
Total		80	88	90,91

Table 4. Data Comments / Suggestions on Expert Validation Results

Validator	Comments/Suggestions
Content Expert	It will be more meaningful if there is a tested mindset about media and its use
Media Expert	Display colors are more varied, both from fonts and images
Teacher SMALB	Good for high school deaf students to: Make it easier for children to understand the material of building space With interactive quizzes children become happy to learn math Familiarize children to learn orderly by following the instructions of each question The tools used are safe for students

Table 5. Percentage of Expert Validation Results and Media Success Qualifications

No.	Validator	Persentase	Kualifikasi	Keterangan
1	Ahli Isi	87,5%	Sangat Valid	Tidak Revisi
2	Ahli Media	76,67%	Valid	Revisi Sedikit
3	Guru SMALB	90,91%	Sangat Valid	Tidak Revisi
	Rata-rata	85,03%	Sangat Valid	Tidak Revisi

Table 6. Percentage of Questionnaire Evaluation Results and Media Success Qualifications

No.	Uji Coba	Persentase	Kualifikasi	Keterangan
1	Produk	88,33%	Sangat Valid	Tidak Revisi
2	Pemakaian	85,83%	Sangat Valid	Tidak Revisi
	Rata-rata	87,08%	Sangat Valid	Tidak Revisi

Table 7. Percentage of Trial Questionnaire Evaluation Results

No.	Subjek Uji Coba	Persentase	Kualifikasi
1	K	88,33%	Sangat Layak
2	L ₁	79,17%	Layak
3	L ₂	92,5%	Sangat Layak

The minimum hardware required to run Pentium III PC products, 64 MB RAM, 100 MB hard drive, 24X CD ROM, VGA, 640x480 High Color Monitor, Keyboard, Mouse, Speaker. Meanwhile, the minimum software needed to run the product is Microsoft Windows 98, Macromedia Flash MX, All Recorder for voice recording, Microsoft Word for the question database, and Quiz creator as the application used.

Several series of trials were carried out to determine the correctness of the content and appearance of the media using validation sheets. The feasibility of the media in learning was tested using a media evaluation questionnaire. The effectiveness of the media in facilitating students' distance learning was tested by field trials and field trials. Based on the data obtained during the study, it shows that the media is suitable for use in learning and can facilitate students' distance learning. Before the media is tested, first the media design is validated by 3 validators including content experts, media experts, and special high school teachers. The presentation of quantitative data obtained during expert validation can be seen in Table 1, Table 2 and Table 3.

The presentation of qualitative data obtained during expert validation can be seen in Table 4. The percentage of expert validation results to determine the level of success of the media based on the success criteria for

product development (Arikunto, 2003: 245) is presented in Table 5.

Referring to Table 5 above, in general the media developed has very valid qualifications, which means that the media does not need to be revised. However, the media expert validator still needs to do a little revision because there is still a value of 2 in 1 aspect. The value of 2 is given to the aspect of the color composition of the media presentation. To improve the media, this aspect was revised so that the Draft I media was obtained which would be used in field trials. Furthermore, the media is used for field trials and field trials. To assess the effectiveness, efficiency, and attractiveness of the media, an evaluation was carried out through a questionnaire in a trial. The percentage of questionnaire evaluation results to determine the level of success of the media based on the Development Product Success Criteria Table (Arikunto, 2003, p.245) is presented in Table 6.

Based on Table 6 above, in general the media for development results obtain very valid qualifications so that the media does not need revision and is suitable for use in learning for deaf students of class X. This is supported by exposure to the feasibility of evaluating the questionnaire by each trial subject presented in Table 7.

Noted:

K : field trial assessor

L₁-L₂ : field implementation test assessor

Referring to Table 7 above, it shows that the media developed can be used by the test subjects well. It is proven that 66.67% of the test evaluators rated the media developed as very suitable for use and the remaining 33.33% considered that the media developed was suitable for use.

Discussion

After conducting a series of trials, it was found that for learning using interactive multimedia quizzes on deaf students of class X SMALB students could fully learn independently. Especially for students who are accustomed to IT-based learning where the teacher becomes a facilitator, not a learning center. In terms of media, the drawback is that the use should be done with a synopsis of the media so that students and parents can understand information about multimedia used, especially students with moderate to low abilities.

Revisions made to the media are based on input from validators, product trial evaluators, and use trial assessors. One of the validators' suggestions is to add background music that can provide a calming effect as a user and provide a sound space for deaf students.

Experimental data of students working on the questions revealed 75% of the correct answers when listening to soft or instrumental music than other fast music (Kumar, et al., 2016). The positive findings obtained from this study are relevant to justify the current trend of listening to music while studying because it may not have an adverse effect on student concentration. In fact, it can also improve students' performance in their academic perspective. This also applies to students with hearing impairments according to research conducted by Darrow (1993), musical activities enjoyed most by deaf individuals are singing / signing songs, listening to music, and moving or dancing to music. Thus, presenting a sound space is very important for deaf students.

This hearing and communication barrier problem causes deaf children to experience difficulty in mastering various academic subjects that require a lot of abstract concepts. Therefore, for students with hearing impairment, interesting learning and using supporting media are very much needed. One of the learning methods that are being used today is through multimedia applications, such as learning languages, counting, and so on. Multimedia is a combination of digital text, graphics, animation, audio, images and video. Through a combination of these components, the learning experience becomes something interactive that reflects an experience in everyday life (Aloraini,

2005; Vaughan, 2011 in Diputra 2016). This method is considered effective, because with this method the user becomes active in it and can be done outside school hours.

Learning media in the form of quizzes can attract students' curiosity about existing questions with different shapes from the questions they usually face only on paper. The quiz system is the same system as children's games. Children will be challenged to achieve a higher score in order to 'win' the quiz. It is believed that students have a positive attitude towards learning with games mainly because of their interactive and challenging nature (Hays in Blumberg, Almonte, Anthony, & Hashimoto, 2013, p. 335). The attractive appearance of multimedia makes students comfortable using it.

Interactive multimedia quizzes display evaluation techniques or methods that can be used independently both at school and at home. This multimedia provides a more real learning experience through the provision of practice questions to test students' understanding of the material presented in class. The types of questions are made variously to train students in dealing with the types of questions that may be rarely encountered when students work on paper-based questions. If the student's answer is correct, feedback will appear explaining why the student's answer is correct. This is an advantage because it allows students to study independently anywhere with feedback as a deepening of the material being tested. However, if the student's answer is wrong, then the feedback received is only a statement that the student's answer is wrong. This motivates students to be able to try again on the quiz because the answers they enter are not correct. The process continues until the student completes 20 items and gets the results of the quiz. Does he succeed in exceeding the 75% passing rate as a KKM or needs to learn again as a remedial student?

Sagala (in Sudarsana, 2018, p. 8) argues that the essence of constructivism theory is that students must discover and transform complex information into other situations, and if desired, the information becomes their own. Thus the role of the teacher as a facilitator is to provide facilities and facilities that allow students to learn independently. Motivating students to be active, of course, by presenting methods, learning resources and media that support the construction of knowledge. In addition to the constructivism-based learning process, learning using sophisticated media is also carried out as a whole and integrated. This is in line with Rusman's (2011, p. 252) opinion, which states that integration means seeing something that is learned as a whole and integrated. Integrated learning begins with student-centered change that focuses on student needs and interests.

By using the developed media, students can work independently as needed. Based on the suitability between theory and application that occurs in the field during this research process, students' cognitive development becomes the basis. One form of improving learning outcomes is seen in student learning outcomes tests for the use of developed media. Improving student learning outcomes also shows that the learning process using interactive multimedia designed by researchers has an important impact. Apart from being seen from the learning outcomes, after using multimedia that was developed to increase student activity in awareness of the importance of technology in this era and replanting knowledge in a fun way. Computerized views may require a higher level of interaction (navigation) to switch between items, thereby increasing cognitive load, but also lead to a greater focus on each individual item, which may be of benefit to learning.

Joshi (2012, p. 36) argues that using multimedia facilitates students to gather information through media that encourages their imagination and interests. The effect of multimedia applications on student achievement is that applications create a learning environment. With visual and auditory displays, multimedia applications can simultaneously focus on students with different learning styles. Presenting knowledge on the web environment in an attractive format suited to their cognitive development will lead to growth in academic achievement and positive attitudes towards the subject matter. Dunsworth & Atkinson (in Ercan, 2014, p. 617) determined that the multimedia learning environment used in education made a positive contribution to learning through visual and animated content.

CONCLUSION

The results of this research and development indicate that the interactive multimedia quiz "We Love Mathematics" received a positive response from the validators and test subjects. Face-to-face designs or designs that are made are validated so as to produce a finished product that is ready to be tested. Revisions are made at each stage to make it easier for researchers to produce better products. With the industrial revolution 4.0 which allows humans to become internet, technology and information literate resources, teachers have an important task to prepare the nation's sons and daughters at the school level, including students with special needs. With the combination of distance learning needs, the use of information technology, and the empowerment of students with hearing impairments, this interactive quiz learning multimedia is created.

Learning to use multimedia helps teachers to make the atmosphere interesting and fun, because the learning material, which is packaged in animation, is

more lively, easy to understand and clear so that deaf students can easily understand the learning material (Hidayat and Hidayatulloh, 2017, p. 85). This learning media should not be the only media and learning resource in mathematics learning in class X SMALB. At the end of the quiz, students should be given the opportunity to consult about things that students cannot understand independently such as the role of the teacher as a facilitator. This development product can be further developed with the appropriate materials from other basic competencies in class X. The teacher can also develop media for all material according to the class he is teaching. The use of instructional sentences and instructions in the media should be adjusted to the level of students' abilities, because the media in research and development functions as a medium as well as a source of learning evaluation which is directly used by students and the teacher only acts as a facilitator. It is necessary if research is carried out in advance regarding the language skills of students, so that the results of this research can be a basis for developers to develop sentences in the media so that they can be used by students with high to low abilities.

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