The development of audiobook interactive physics based on integrating Qur’an with demonstration tools for blind students

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Abstract. One of the teaching material for blind students is a textbook in braille. Carrying a thick braille’s book lead to be burdensome for students. Digitization like an audiobook became the key for disability students to read an information in a book form. The study aims to develop an interactive audiobook based on the integration of science and Quranic values for blind students. Research and development method with Purposive Sampling technique used in this research. Data collecting conducted from three Senior High Schools of Inclusion (Sekolah Menengah Pendidikan Luar Biasa) that are Pembina Tingkat Jakarta School of Inclusion (Sekolah Luar Biasa Pembina Tingkat Nasional Jakarta), A Tan Miat Bekasi School of Inclusion (Sekolah Luar Biasa A Tan Miat Bekasi) and Mekar Sari Bogor School of Inclusion (Sekolah Luar Biasa Mekar Sari Bogor). Validity level was measured by validity expert and the effectiveness was measured by student response during learning activities. The results indicate that the implementation of interactive audiobook based on the Quran integrating increase the level of student comprehension. Therefore, this research has added practical media that is considered necessary in physical learning for students with disabilities, however the utilization has to be frequently.

1. Introduction
Physics is a difficult lesson, visual help was needed to fully understand the material [1]. Learning will be very hard for blind students compared to normal students[2]. Ministries of Health (2014) stated that 2.45% of Indonesian population are people with disabilities, with the highest percentage of blind people [3]. The need of blind students has to provided with special services, such as learning materials, media and technology to facilitate them to be easy to learn [4]. One that helps them to experience the visual learning through other learning media is by hearing and textual (groping and touching) [2]. That is the main problem for blind students to easily access the information. Even though there are plenty written information, the recording one is still limited [5].

One of the sources that can be recorded is audiobook. Audiobook indeed aimed to help them whom cannot read lettering, especially for them with limited eyesight (blind) [6]. The book can be used without attaching to place and support of other people. Audiobook was made to provide the information, guidance and learn independently [7]. Audiobook that was developed by Ozgur (2007) really help blind student to learn independently. Audiobook was made because the book for blind student is not available. Every education institute has to give a same chance and treatment. Fairness and right equality should be implemented, including for the availability of learning materials that can be accessed for blind students [8].
It had to be a must to provide the media that can become the learning support for blind people is a main focus in this research, expected that blind student can be optimally understand the learning material. To develop the media to help students to understand physics material and teacher explanation during the learning process is by maximizing their hearing and touching senses, which is using the audiobook with modelling tools [9]. The advantages of this audiobook are that it can facilitate and minimize school expenses on the physical book availability. The difference is the audiobook in this research had been developing with Quran integration and equipped with model tools for blind students.

The development of Quran integration was based on the Act of the Republic of Indonesia number 20 of 2003 on article 3 about National Education System state that the National Education functions is aimed to developing learner’s potentials so that they become persons imbued with human values who are faithful and pious to one and only God, who possessed morals and noble character, knowledgeable, competent, creative, independent, and as citizens, are democratic and responsible [10]. One of the effort that was made by government to achieve the goal is to make spiritual dimension as a core competency (KI) on 2013 Curriculum that is spiritual behavior of KI. Integration of Islamic values in the learning process can be made by relating the Quran verse with learning concept [11]. To make student not only thinking about what is already there and what is happening, but also can make the student to contemplate and understand that there is The Great beyond every nature or physical event which become the object in natural science. There are a lot of Quran verses that explain nature phenomena which can be integrated to audiobook. Audiobook that was made is an interactive audiobook, which contains model tools and conversation using simple vocabulary for every chapter, supported by music and audio effect with a duration length of 2 – 15 minutes. The aim of audiobook making is to make students to control their learning rate and can be presented repeatedly.

2. Experimental Method
The method used in this research is development research, according to Akker [12]. The research development used is a model development study development that aims to produce a useful product in solving problems in the learning process in class. The stages of research in the model development study development, namely the analysis of needs, design, and evaluation summative.

The first stage is the needs analysis. The purpose of this stage is to find out the problems that occur during the learning process and explore the lack of existing learning media to developed into better media. The second stage designs, where the researcher begins to design and make products to develop. The product developed is an interactive physics audiobook based on the integration of the Quran with demonstration tools for blind students. At this stage, researchers have produced prototyping one which will be evaluated by media experts and material experts. Besides, prototyping one was also evaluated by students and teachers in terms of their feasibility. The evaluation is carried out through three steps, namely, one-to-one evaluation, small group evaluation, and field tests. After being evaluated by experts, teachers, and students, the researchers then revised.

The third stage is the evaluation Summative, where prototyping has revised, then evaluated the effectiveness and practicality by students and teachers. Students are given a matter of pretest-posttest and fill in a questionnaire of responses regarding the practicality of teaching aids that have developed. The teacher fills in a questionnaire on the effectiveness and practicality of the teaching aids that have developed. Furthermore, the results of the pretest-posttest, questionnaire responses of teachers and students will be processed and analyzed their effectiveness and practicality.

The test subjects in this study consisted of three SMPLBs, namely the Jakarta National Level Board of Trustees, A Tan Miyat Bekasi SLB, and Bogor Mekarsari SLB. The sampling technique used was purposive sampling. Please follow these instructions as carefully as possible so all articles within a conference have the same style to the title page. This paragraph follows a section title so it should not be indented.
3. Result and Discussion

3.1. Requirement Analysis Phase Needs
The analysis is carried out through interviews and learning observations in three schools, including Jakarta National Level Board of Trustees, A Tan Miyat Bekasi Special School, and Bogor Mekarsari Special School.

The current curriculum is the revised 2013 curriculum. Special Schools, especially the blind, have their problems in implementing the curriculum. The steps of the scientific approach consist of observing, questioning, gathering information, associating and communicating. Observing activities are felt to be the most difficult to implement for blind students. Because blind students have a limited sense of sight to observe a phenomenon, for example, the concept of refraction, students will not understand what refraction is only by listening to the teacher's verbal explanation. Students must use their senses to understand the concept. In science subjects, there are many abstract concepts. Besides, interviews concluded that science practicum activities were seldom carried out, except for the practice of human organs using props of mannequins. This due to the unavailability of laboratory equipment, and the absence of teaching aids that match characteristics of the blind student. Therefore, teaching aids as media for students are needed to understand science better.

Blind students use braille books in their learning. One package a book when translated into braille into dozens of volumes. It will burden students in bringing the book to school. Besides, because there are not many braille books available at school, students are only allowed to bring one volume of braille books home. It will affect student learning outcomes. An audiobook is expected to be the solution to the weaknesses of the braille book. However, unfortunately, the government does not provide audiobooks for blind students. So, we need an audiobook as a substitute for Braille books which are more practical for students to carry.

Based on the results of the needs analysis, the researcher felt the need to develop an interactive physics audiobook based on the integration of the Quran with demonstration tools for blind students.

3.2. Design Stage

3.2.1. Interactive Audiobook
Audiobooks recorded textbooks that are read by voice actors. The audiobook in this study is interactive, so blind students easily understand it. The method in delivering the material was made like an interactive conversation dialogue. Audiobook material integrates science concepts and the Quran. So that it is expected to further enhance students' faith and piety to God through science learning, this interactive audiobook explains the concept of the solar system for class VIII students of SMPLB.

The process of making an interactive audiobook consists of several stages, including the creation of an audiobook script, the recording process, and the editing process.

3.2.2. Solar System Demonstration Tool
Planet audio props are three-dimensional props that explain the concept of the solar system. This teaching aid is made using capacitive sensing for the sensor's working system so that if one planet is touched, an audio explanation will be heard. Blind students have limitations in their sense of sight, so it is challenging to understand visual concepts. Instead, they use other senses such as hearing, smell, and touch. Through these visual aids, they can use the sense of hearing as well as the sense of touch in understanding the concept of the solar system. A description of the materials and steps for making audio planet props is presented in Table 1 and 2.
| No | Component                        | Material       | Image | Function                                                                 |
|----|----------------------------------|----------------|-------|--------------------------------------------------------------------------|
| 1  | Miniature Planet                 | 3D Printed PLA | ![Image](image1.jpg) | Miniature planet                                                        |
| 2  | Arduino Nano v3 Microcontroller  | Electronic Component | ![Image](image2.jpg) | To control the sensor reading of the audio being played                 |
| 3  | 3Watt Speaker                    |                | ![Image](image3.jpg) | audio output device                                                     |
| 4  | DFSerial mini audio player       |                | ![Image](image4.jpg) | As a media reader of audio files on the SD card by sending a serial signal from the microcontroller |
| 5  | Jumper Cable                     |                | ![Image](image5.jpg) | Connecting each electronic component                                    |
| 6  | Hard paper board                 | Paper          | ![Image](image6.jpg) | The primary material, chosen because it is natural in handling trials and errors |
| No | Component          | Material  | Image | Function                                                                                                                                                                                                 |
|----|--------------------|-----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7  | SD Card            |           | ![SD Card Image](https://via.placeholder.com/150) | Storage place for audio files in the .mp3 format and the order of file names 0001 ... 0002 ... so on.                                                                                                  |
| 8  | Capacitive Sensor  | Copper    | ![Capacitive Sensor Image](https://via.placeholder.com/150) | Only in the form of a cable that is peeled and connected to a microcontroller                                                             |
| 9  | Resistor 10M ohm   |           | ![Resistor 10M ohm Image](https://via.placeholder.com/150) | As a determinant component of sensor sensitivity                                                                                          |

Table 2. Steps for Making Audio Planet Props

| No | Steps for Making         | Images | Remarks                                                                                                                                                                                                 |
|----|--------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Print the planet miniature | ![Print the planet miniature Image](https://via.placeholder.com/150) | Drawn using Autodesk fusion 360 and printed with 3D printer ender three pros, the size of each planet can be said to be sufficient to represent the "large" of each planet, because mercury is no bigger than Venus and mars, the earth is no bigger than Jupiter or Saturn |
| 2  | Cutting Hardboard        | ![Cutting Hardboard Image](https://via.placeholder.com/150) | Hardboard cut and shaped cubic with plot size, 50cm x 12cm x 8cm, according to the total planet length if aligned.                                                                                     |
No  | Steps for Making                  | Images | Remarks                                                                                                                                                                                                 |
----|----------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
3   | Sensor Installation Sensor       |        | in the form of 1 bar of copper cable peeled at the end and then inserted into the planetary buffer tube, a part of the peeled copper is ejected through a small hole in the planet, because the sensor will work if an object with 'sufficient' resistance such as human skin touches the chipped copper and will send a signal to the microcontroller |
4   | Planning and assembling planets  |        | Planets have arranged like a picture (with sensors installed)                                                                                                                                               |
5   | The arrangement of electronic components |        | as shown                                                                                                                                                                                                  |
6   | Final results of solar system demonstration tools |        | This demonstration device has connected to electricity. If one planet is touched, an audio explanation will appear about the planet.                                                                      |

3.2.3. Evaluation Phase
The results of the real feasibility test obtained a percentage of 88.62% with very decent criteria. Besides, there are suggestions from material experts that are used as a reference to improve interactive physics audiobooks based on the integration of the Quran with demonstration tools. Advice from mater experts is that the concept of the solar system discussed in the audiobook is too broad in scope, so it needs to be summarized.

The results of the media feasibility test obtained a percentage of 89.50% with very decent criteria. Besides, there are suggestions from material experts that are used as a reference to improve interactive physics audiobooks based on the integration of the quran with demonstration tools.

According to media experts: (a) the voice intonation in the audiobook is very interesting, but there are some parts whose tempo is too fast. So, the tempo needs to be slowed down so that it is easier for blind students to understand. (b) A volume control menu should be added to the solar system demonstration tool so that the teacher is free to adjust the audio volume contained in the solar system demonstration tool. (c) The display of props is impressive, but the application of the paint is not neat. Product trials were conducted using a pre-experimental method with One-Group Pretest-Posttest Design. The pretest has given before learning, then the learning phase is carried out by implementing
an interactive physics audiobook based on the integration of the Quran with demonstration tools, and ends with a posttest. The pretest and posttest questions played in audio form. After being analyzed, the data of the improvement of student learning outcomes with the help of physics-based interactive audiobook based on the integration of the Quran with demonstration tools are included in the high category with a gain of 0.8. Thus, showing that using an interactive physics audiobook based on the integration of the Quran with demonstration tools can improve student learning outcomes. An interactive physics audiobook makes it easy for students to remember concepts because they can play repeatedly. The ability to remember well will make it easier for students to understand the contents of the material. This shows that the use of media in learning can foster student understanding. These results are by the opinion of Sudjana & Rivai (2007), which states that learning media can enhance student learning processes which in turn are expected to enhance understanding and learning outcomes achieved [13].

The data obtained next is the students' response to physics interactive audiobooks based on the integration of the Quran with demonstration tools. Based on the analysis of the data that has done, it gives an average response rate of physics interactive audiobooks based on Al-Quran integration (88.58%) with excellent criteria, while the percentage of standard responses to demonstration tools (87.64%) with criteria very good too. At this stage, students show pleasure in the audiobook teaching material that has developed. Although it requires are adjustments to audiobook teaching materials. Demonstration tools provide opportunities for blind students to maximize their sense of touch, so students better understand concepts through these visual aids. It by research Apriiyanti et al. (2015) which states that the use of teaching aids used in learning is proven to make it easier for students to understand the material because students feel happier and interested in learning to use teaching aids [14].

There are several obstacles in the application of physics interactive audiobooks based on the integration of the Quran with demonstration tools, including: (1) Blind students are not accustomed to using interactive audiobooks, so it takes time to get students used to using these interactive audiobooks. (2) Blind students with a blind state have less experience than children with low vision. Blind children with a totally blind state do not yet have an initial perception of the sun and moon, so it is necessary to build children's perceptions through the concrete principle of enabling blind children to get real experience of what they learn, and the principle of totality, which allows blind children to gain total experience of objects or situations or overall [15]. This perception is built by inviting students to feel the miniatures of the sun and moon directly and describe them in an easily understood language.

4. Conclusion
The product developed is an integrated physics audiobook of the Quran on the solar system concept. Planetary audio demonstration tools assist this form of teaching material visualization. Planet Audio is a three-dimensional replica of the solar system using sensor technology so that if one member of the solar system is touched, there will be an audio explanation. (2) Interactive Audiobook physics integrated Al-Quran with this demonstration device is very suitable for use for blind students, evidenced by the percentage of material eligibility was (88.62%), and media eligibility was (89.50%). (3) Interactive physics audiobook integrated the Quran with this demonstration tool is useful for increasing mastery of matter on the concept of the solar system. The results of the analysis of material mastery showed an increase of (0.8) with a high category. Therefore, this research has added practical media that is considered necessary in physical learning for students with disabilities, however the utilization has to be frequently.

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