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# The Development of an Integrated Physics Module with Augmented-Assisted-Qur'an for Measurement Material

**Fitria Handayani[1*], Hadiyati Idrus[1], Artha Nesa Chandra[1], Frans Rizal Agustiyanto[1]**

[1]Physics Education Department, UIN Mahmud Yunus Batusangkar, Indonesia
*Corresponding author: handayani14fitria@gmail.com

**ABSTRACT**
The main problems of current research are the limited measuring tools, handout-based teaching materials and 2D illustrated textbooks that are less varied, and the lack of integration of Al-Qur'an material with technology-based applications. In the educational field, one of the technological advancements is Augmented Reality (AR) which provides a shifting experience from 2D images to 3D. Therefore, technological integration is important to realize a physics module about measurement material and the Al-Qur'an to make students interested in learning by associating the teaching material and the everyday life context. This R&D applied the 4D model (Define, Design, Development, Dissemination). However, this research is limited to the practical development stage. The researchers used validation sheets from 3 aspects: material and media validation by 3 validators, and interpretation validation by 2 validators. The researchers distributed the practicality sheets to 2 teachers and 28 students The results of data analysis of material validation, media validation and expert interpretation obtained percentages consecutive percentages of 94.5%, 83.3%, and 91.6% with the category of very valid. Meanwhile, the practicality of the module based on the educators and students was 98.6% and 86.4% with the category of very practical.

**INTISARI**
Permasalahan utama penelitian saat ini adalah terbatasnya alat ukur, bahan ajar berbasis handout dan buku ajar bergambar 2D yang kurang variatif, dan belum terintegrasinya materi Al-Qur'an dengan penerapan berbasis teknologi. Dalam bidang pendidikan, salah satu kemajuan teknologi adalah Augmented Reality (AR) yang memberikan pengalaman peralihan dari gambar 2D ke 3D. Oleh karena itu, integrasi teknologi penting untuk mewujudkan modul fisika tentang materi pengukuran dan Al-Qur'an agar siswa tertarik belajar dengan mengaitkan bahan ajar dan konteks kehidupan sehari-hari. Penelitian dan pengembangan ini menerapkan model 4D (*Define, Design, Development, Dissemination*). Namun, penelitian ini dibatasi pada tahap pengembangan kepraktisan. Peneliti menggunakan lembar validasi dari 3 aspek yaitu validasi materi dan media oleh 3 validator, dan validasi tafsir oleh 2 validator. Peneliti membagikan lembar praktikalitas kepada 2 guru dan 28 siswa. Hasil analisis data validasi materi, validasi media, dan tafsir ahli memperoleh persentase berturut-turut sebesar 94,5%, 83,3%, dan 91,6% dengan kategori sangat valid. Sedangkan kepraktisan

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* Corresponding author:
Fitria Handayani, Physics Education Department, UIN Mahmud Yunus Batusangkar, Indonesia
✉ handayani14fitria@gmail.com

modul menurut pendidik dan siswa sebesar 98,6% dan 86,4% dengan kategori sangat praktis.

## A. Introduction

The underlying background of this research includes a lack of student interest in learning physics lessons and the negative perceptions of the students about physics lessons as full-formula and conceptual memorization lessons. The absence of an accurate measuring instrument becomes the reason for educators do not reveal the instrument during learning. Most educators find this procedure will interrupt the students' attention and hinder the classroom learning time allotment. On the other hand, students unfamiliar with the studied measuring instruments may not understand the procedure to calculate with the measuring instruments.

Another research focus as the factor is – less material or learning source variations. Many teachers rely on library textbooks or summaries of material made directly by teachers. This book and summary of the material certainly do not maximize learning outcomes and require students to learn. These teaching materials also have some weaknesses for example the library books are only accessible during class time before being returned to the library once the class is up. This book package also still has a 2D image display which may fade in the future. The existing textbooks usually contain a collection of material that students will study for 1 year. Therefore, most library books are thick and heavy for the students. In addition, textbooks only focus on explaining the material rather than encouraging the students to understand. Likewise, with the summary of the material created by the teacher no matter how concise it is, only educators will understand the conclusion of the material. Thus, the absence of educator assistance makes students unable to understand the summary of the material. This material summary or book package is certainly not integrated with the Al-Qur'an or technology-based.

Many religion-based schools [1] emphasize the obligation to integrate the Al-Qur'an with learning for excellent value realizations of value, intelligence, nationalism, and independence. Therefore, these schools must instill religious values into learning materials [2] which has many positive effects. The absence of technology-based books and summaries of existing material makes the students not interested in physics. One of the applicable technologies to manage this situation is Augmented Reality (AR) with the capability to shift the 2D images into 3D [3], visualize the measuring instruments to students, and make the students interested. AR can also stimulate students' mindsets to think critically about problems in everyday life [4]. Learning modules are teaching materials with systematic and interesting arrangements, including materials, methods, and evaluations to be used independently by students [5]. A learning module is the smallest learning program unit that students can study independently [6]. In conclusion, a learning module is a form of independent teaching material for students, containing the studied material and the applicable methods in learning and evaluation. Thus, an integration of learning modules between Al-Qur'an and technology is possible.

Most educators explain the material in a lecture while the students pay attention and take notes without having time to understand the explanation. Therefore, students need an appropriate approach to improve student learning outcomes. One of the applicable approaches is a contextual approach with a focus on the student's activeness in finding related knowledge about the studied material. The contextual approach also begins with real examples from everyday life matter [7]. Another definition states that the contextual learning approach associates the discussed material and the real conditions for the students to earn and directly relate the newly acquired knowledge for further real-life implementation [8]. By implementing this approach, the learning experience will be meaningful and students could retain the information due to the discovery process of the students to construct their knowledge [9]. Based on the previous explanation, a learning module with a contextual approach assisted by Augmented Reality in measurement material could be an excellent solution for schools.

Many previous studies applied this type of integration. The first study developed an integrated module between Al-Qur'an and a CTL model of optical material [10]. The developed module integration, based on all aspects, was valid and practical. Another study found that a similar module development could overcome the learning difficulties about the material of fluid with AR-based Al-Qur'an [11]. The developed module was highly valid and practical because the students were also very interested in using the module during the learning process. A similar product was also developed in the form of an AR-based learning module that integrated the Al-Qur'an. The developed module could improve the student learning motivation. The developed module was also valid and practical to improve the student's scientific literacy [12][13].

From the literature review and the background, most developed modules with the mentioned integration have excellent results. However, those developed modules could not answer the current problems. Therefore, the researchers attempted to create an integrated module of the Al-Qur'an and technology-based with a relevant approach. The researchers attempted to maximize all aspects in overcoming the problems such as developing a module to overcome the difficult material to understand, following regional regulations by integrating them with the Al-Qur'an, providing appropriate approaches to improve learning outcomes, and applying the Augmented Reality technology to produce 2D images into 3D. These efforts are essential to a physics module for tenth graders about measurement material with the integration between Al-Qur'an and contextual approach by AR.

## B. Method

This R&D research applies the 4D model: defining, designing, developing, and designing stages [14]. However, the researchers only conducted three stages: the defining, designing, and developing stages to produce a valid and practical module.

The validity of the module is divided into three aspects starting from validation of material, media, and interpretation by experts, the expert lecturers in the given fields. This validation aims to obtain useful suggestions for module revision purposes. Then, the researchers converted the obtained data with the following formula into quantitative data with a range of 1-5 To determine the level of eligibility, assessment criteria based on Table 1 are used [17] and the data will be processed using the equation (1).

Table 1. Validation Category

| % | Category |
|---|---|
| 0-20 | Invalid |
| 21-40 | Less Valid |
| 41-60 | Fairly Valid |
| 61-80 | Legitimate |
| 81-100 | Very Valid |

$$P = \frac{\sum \text{score of each item}}{\text{maximum score}} \text{ x } 100\% \quad (1)$$

These percentage results are then organized into several categories [15]. The researchers analyzed the educator and student responses about the practicability of the developed module with the following formula (2). The results of the data presentation are organized into several categories based on Table 2 [15].

Table 2. Validation Category

| % | Category |
|---|---|
| 0-20 | Impractical |
| 21-40 | Less Practical |
| 41-60 | Quite Practical |
| 61-80 | Practical |
| 81-100 | Very Practical |

$$P = \frac{\sum \text{score of each item}}{\text{maximum score}} \text{ x } 100\% \quad (2)$$

## C. Result and Discussion

### Result

The questionnaire results found half of the students encountered difficulty with the measurement material due to various influential factors. They never used

measuring instruments such as micrometers, calipers, and various scales for the measurement material. Therefore, they encountered difficulties while calculating the measurement results from the given tools. On the other hand, the implementation of printed books and handouts, containing basic material, was not understandable for the students. However, they received this teaching material frequently during the learning process. Figure 1 shows the results of the questionnaire distribution.

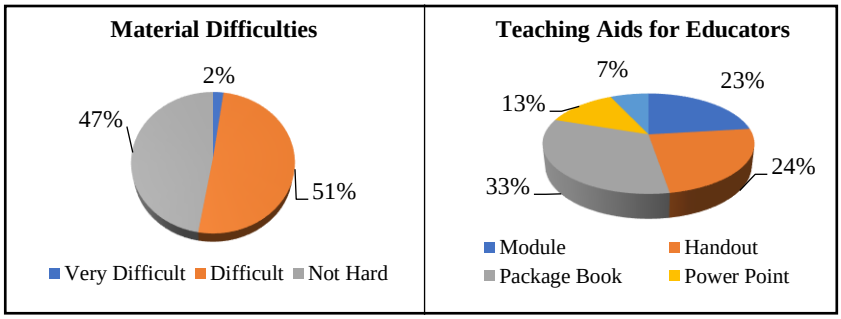


Figure 1. Student Questionnaire Results

Generally, the research participants preferred new things, for example, the technology implementation, to the conventional ones. Therefore, the development of this learning module as the teaching material could enrich students' learning resources and encourage students to understand the measurement material. This developed module could also manage the shortcomings or drawbacks found in handouts and textbooks. Figure 2 shows the student interests.

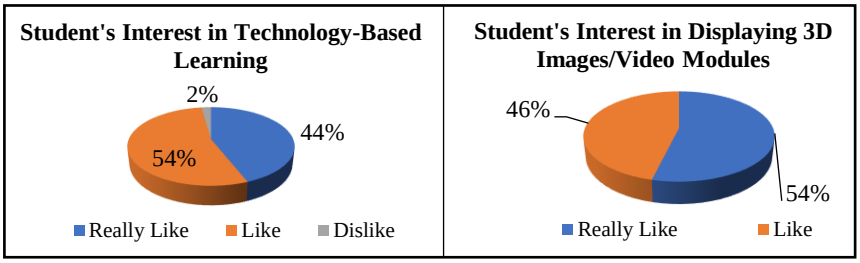


Figure 2.Student Questionnaire Results

The identification of the AR program for the designed module includes the efforts of determining the title, goal, objective, and material maintenance. Then, the process continued with creating the flow chart, from the opening until the closing parts. After that, the researchers revised the design based on the storyboard.

After completing the design, the researchers collected the material from various textbook sources. The researchers also collected various images and videos from several websites and YouTube channels. In the process of creating a QR code, the researchers utilized an application that could be downloaded from the Play Store or directly visited from the website called "Assemblr Edu". After collecting all materials,

the researchers combined all materials based on the specified design. Eventually, the researchers tested the module, especially the AR part. Figure 3 shows the results of AR testing.

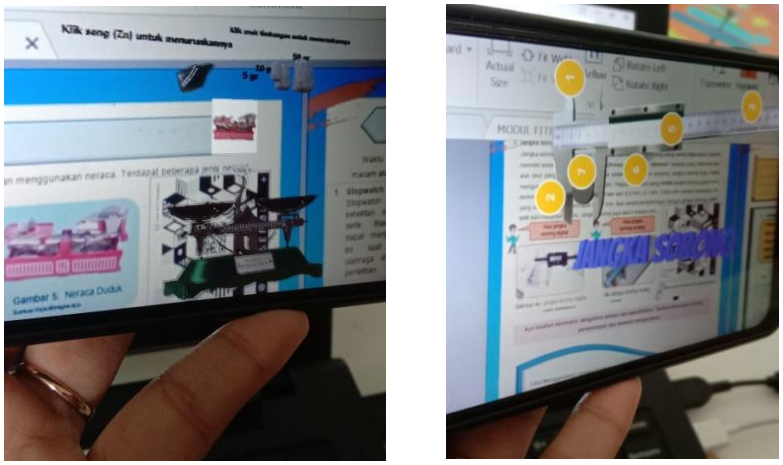


Figure 3. AR Trial

After designing the product, the researchers had the experts validate it. There were 3 material validators, 3 media validators, and 2 interpretation validators. Table 3 shows the validity results of the material. Table 4 shows the validity of the media while Table 5 with the interpretation.

Table 3. Material Validation Results

| Aspect | Validator | | | Total | Max score | Score (%) | Category |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | | | | |
| Content Eligibility | 49 | 53 | 52 | 154 | 168 | 91.7 | Very valid |
| Feasibility of Presentation | 19 | 20 | 18 | 57 | 60 | 95 | Very valid |
| Language Eligibility | 23 | 22 | 22 | 67 | 72 | 93.0 | Very valid |
| Average | | | | | | 93.2 | Very valid |

Table 4. Media Validation Results

| Aspect | Validator | | | Total | Max score | Score (%) | Category |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | | | | |
| Graphic Aspect | 74 | 73 | 75 | 22 | 240 | 92.5 | Very valid |
| Language Aspect | 12 | 9 | 9 | 30 | 36 | 83.3 | Very valid |
| Average | | | | | | 87.8 | Very valid |

Table 5. Interpretation Validation Results

| Aspect | Validator | | Total | Max score | Score (%) | Category |
|---|---|---|---|---|---|---|
| | 1 | 2 | | | | |
| Content Eligibility | 14 | 16 | 28 | 32 | 87.5 | Very valid |
| Aspects of Feasibility of Presentation | 7 | 7 | 14 | 16 | 87.5 | Very valid |
| Aspects of Language Quality | 22 | 20 | 42 | 48 | 87.5 | Very valid |
| Average | | | | | 87.5 | Very valid |

The validation process shows a very valid category. The results prove that the designed module is excellent [16], [17], [18]. The researchers also distributed practicality sheets to 2 physics teachers and 28 students from the tenth grade at MAN 2 Tanah Datar. The practicality results in the very practical category. This result is similar to the previous studies [19], [20]. Therefore, the module is very excellent to apply. Table 6 shows the practicability results based on the educators while Table 7 is based on the students.

Table 6. Results of Educator Practicality

| Aspect | Validator | | Total | Max score | Score (%) | Category |
|---|---|---|---|---|---|---|
| | 1 | 2 | | | | |
| Ease of use | 22 | 24 | 46 | 48 | 95.8 | Very practical |
| Benefits obtained | 24 | 24 | 48 | 48 | 100 | Very practical |
| Effectiveness of learning time | 12 | 12 | 24 | 24 | 100 | Very practical |
| Average | | | | | 98.6 | Very practical |

Table 7. Student Practicality Results

| Aspect | Total | Maximum score | Score (%) | Category |
|---|---|---|---|---|
| Ease of use | 688 | 784 | 87.7 | Very practical |
| Benefits obtained | 971 | 1120 | 86.7 | Very practical |
| Effectiveness of learning time | 285 | 336 | 84.8 | Very practical |
| Average | | | 86.4 | Very practical |

**Discussion**

After conducting interviews and observations with physics educators, the applied teaching materials during the learning process were still limited to library textbooks. This matter made the students could not take the books home. Other applied teaching materials were summaries of material made by the teachers without any integration with the Al-Qur'an. The available textbooks at schools and material summaries by educators only focused on discussing learning material and concepts.

From the results of interviews with teachers, the researchers found problems while applying teaching approaches such as teacher-centered learning. Based on the interview and the questionnaire results of the students, the researchers found that 33% of students argued the learning relied on textbooks; 24% of students argued the learning only used material summaries. This learning implementation made the students bored and not interested in learning due to the fixated atmosphere on the papers, written concepts, and written formulas.

Most students, 51%, experienced difficulties while learning the measurement material. This matter discouraged the students from reaching the learning goals moreover the implementation of less interesting teaching materials also contributed to this learning objective disencouragement. Based on the existing problems, the developed AR-assisted learning module is very suitable to apply. The developed learning module integrated the Al-Qur'an and contextual approach with the assistance of AR to provide a solution to existing problems.

At the next stage, the developed learning module integrated the Al-Qur'an and contextual approach with the assistance of AR has excellent design. The product collected various materials from various relevant sources about measurements in scientific work, backgrounds, videos, related verses of the Qur'an, and other supporting materials. The module design has several supporting applications such as Assemblr Edu, Canva, and Microsoft Word. Assembler Edu is useful for designing 3D designs with a QR-code output. This application can be downloaded on the Play Store. The module has a flowchart starting with the cover as the initial display of the module, the foreword, the table of contents, and the syntax of the contextual for the users to apply.

The developed module has some instructions for the teachers and students to do. The other instructions deal with AR implementation as the guide for the users in utilizing AR. After that, Learning Outcomes and Learning Objectives are also provided so that students can also know what objectives must be achieved after studying this material. The module also has a concept map and a presentation of the material. The module also provides the process of creating a storyboard with the contents of descriptions and images of the flowcharts. This learning module is designed starting from the cover, foreword, module specifications, instructions for using the module, instructions for using AR, learning outcomes and learning objectives, concept map, related Al-Qur'an verses to the material, placement of CTL syntax in the module, AR position location, material summary, competency test, self-assessment, final evaluation, and glossary.

After preparing the module, the researchers continued the process with the final stage: re-checking the errors and testing the module, especially the functionality of the AR part. After checking, the researchers printed the module and had the

supervisors share their feedback. After receiving suggestions, the researchers revised the module and disseminated the module for research purposes.

The validity of the integrated physics module with Al-Qur'an assisted AR, based on the validator, found the developed product was very valid and applicable. The obtained percentages are consecutively 83.3%-94.5%. In this process, the validators analyzed the module from the material, media, and interpretation aspects. Some previous studies also found the possibility of integrating modules with contextual approach and Qur'an with excellent product results [21] [22].

The practicability test found a practical category. Based on the teachers' responses, the obtained percentage of practicability was 98.6%, categorized as very practical. The result indicates the developed module is applicable, useful, effective, understandable, and interesting for the learners. A percentage of 86.4% of responses indicates the very practical category for learning. This result is similar to the previous studies that produced physics modules with the integration of contextual approach and AR implementation [20][23].

## D. Conclusion

Based on the results of the research, the developed learning module has a material validity level of 94.5%, media 83.3%, and interpretation 91.6% with the category of very valid. The practicality based on the educator obtained a percentage of 98.6% while the students with a percentage of 86.4%, were categorized as very practical. Thus, the developed learning module integrated the Al-Qur'an and contextual approach with the assistance of AR applies to physics learning.

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