Developing instructional devices of general physics practicum integrated with Al-Quran for department of physics education IAIN Batusangkar

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Abstract. This study aims to produce a general physics practicum integrated with Al-Quran for the department of physics education at IAIN Batusangkar are valid and practical. This research includes research development, using ADDIE model consisting of five stages: 1) analysis phase, 2) design stage, 3) development stage, 4) implementation stage, and 5) evaluation stage. Based on the results of data analysis that has been done can be summarized as follows: The validation results of the basic physics lab course integrated with Al-Quran for department of physic education IAIN Batusangkar categorized very valid, with the percentage of validity guiding basic physics lab I integration Al-Quran 89%, and percentage validity RPS 85%. The result of the practicality of basic physics lecture I with integrated Al-Quran based on a questionnaire of categorical student response is very practical, with the percentage of practicality is 84%.

1. Introduction

Physical science as a branch of natural science is essentially viewed as a scientific process, product and attitude. Therefore, physics learning should not neglect the process of finding the concepts. One possibility to acquire and develop someone’s knowledge is through practicum/experiment. National Training Laboratories found the fact that students only can remember 5% to 10% of what they have read in the textbook, but they can remember up to 80% of what they have experienced [1].

Practical activities are suitable activities to support students in remembering and understanding more subjects through direct experience. The advantage of practicum activities according to Taranto is to make students more confident in the truth or conclusion based on their experiments, make new breakthroughs with the findings of the results of experiments, the results of experiments that are valuable for human life. With the many benefits that can be taken from practicum activities, it is important for Lecturers to be able to design, prepare practicum activities as well as possible [2].

The stronger the dominance of science and technology (IPTEK) in human life, it can change what human needs for the benefit of their life. So the dominance of Science and Technology slowly shifts the values of humanity, culture, and religion. As mentioned by Ahmad Barizi in his book that almost the majority of social and religious observers agree that globalization and technology cause a shift in the value of the good in society [3]. Therefore the role of Lecturer as one of the next generation of suppliers is to restore their vision, concept, and orientation of mastery and also the use of science and technology on something valuable so that the book is one of the supporting educational curricula.
If we observe the books or learning modules that have been developed, those more focused on enrichment of science that lack of values especially on religious perspectives. The book or module is only in the form of scientific concepts, notions and mathematical formulas without linking the concept of science with religious values or its relation to the Qur'an. Therefore now we see many people who are smart reaching their success by any means necessary.

Referring to the Vision of the Department of Physics is "Being an excellent major in the field of physics education and learning and can produce graduates of professional physics educator based on Al-Quran and Hadith". According to this vision, it appears that the learning of physics must be integrated with Al-Quran and hadith. This means that the tools of recovery used in the tadris of physics must also be integrated with Al-Quran and Hadith.

To overcome the above problems, it is necessary to have a lecture device (semester program plan, module teaching materials, assessment instruments) courses that integrate with the Al-Quran, especially in the basic physics practicum courses of the IAIN Batusangkar Physics education department. This is expected to be able to answer the vision of the Department of IAIN Batusangkar Physics education and meet the needs of students towards teaching materials. So the author conducts a research development that aims to produce a basic physics practicum lecture device that integrates the Qur'an for students of valid and practical IAIN Batusangkar education majors. The development of lecture devices is expected to provide guidance for Lecturers of Basic Physics practicum courses in carrying out lectures that integrate the Koran and become a guide for students to understand the basic physics that integrates with the Al-Quran.

2. Methodology

2.1. Research Design

This research is designed by using development research. This development research uses the ADDIE model through 5 stages, ie 1) analysis, 2) design, 3) development, 4) implementation, 5) evaluation [4].

2.2. Research Procedure

Development stages in this research are: (1) Stage analysis is to analyze the need for development. At this stage, needs analysis and literature study on the need for basic physics lab course are done to integrate the Qur'an for physics majors student of IAIN Batusangkar. (2) Planning stage, This activity is a systematic process that starts from setting goals, designing scenarios or activities, designing devices, designing materials, and evaluation tools. The conceptual model/method design underlies the next development process. At this stage, the product planning and drafting of the basic physics lab lecture are integrated with the Qur'an, (3) Development phase contains activities of product design realization. In this phase, a conceptual framework is carried on to be a product that is ready to be implemented. Moreover, some improvements are undertaken on the lecture draft that has been prepared in the previous step, revision based on expert suggestion, then testing product validation by the expert. As the result, it becomes a product that is ready to be implemented. (4) Implementation phase: this activity is a field trial activity that uses basic physics lab equipment on the lecture activity of IAIN Batusangkar Physics Department students. (5) Evaluation stage; after the use of lecture tools in real activities in the field, further evaluation of product needs to be done. It is supposed to identify whether the lectures that have been created can be used for further lectures.

2.3. Research instruments

The instruments used in this research are: (1) The validation sheet. The validation sheet contains items that reveal the validity of content and constructs. Content validity contains whether the basic physics lab course lecture integrated with the Quran has been designed in accordance with the curriculum. While the validity of the construct is the suitability of components of basic physics lecture unit integrated with the elements of Alquran development that have been established. (2) Observation
sheet. Observation sheets are used to see the practicability of basic physics lab course lectures integrated with the Qur'an. (3) Students’ questionnaire responses. The questionnaire was used to get a response/response of the students about the use of basic physics lab course integrated with the Qur'an in the learning process.

2.4. Data analysis techniques
Data analysis technique is done quantitatively and qualitatively. Data analysis techniques of each instrument are:

- **The validation sheet.** The result data of the collected validation sheet then tabulated, then searched the percentage, by the equation (1).

  \[ P = \frac{\sum \text{item score}}{\text{maximum score}} \times 100 \% \]  

  \( \text{(1)} \)

  | (%)  | Category          |
  |------|-------------------|
  | 0-20 | Not Valid         |
  | 20-40| Not Quite valid   |
  | 40-60| Enough valid      |
  | 60-80| Valid             |
  | 80-100| Very Valid       |

- **Questionnaire.** Data of students’ response through collected questionnaire is later being tabulated. The percentage is carried out from the results of tabulation by using the equation (1).

  | (%)  | Category          |
  |------|-------------------|
  | 0-20 | Not Practical     |
  | 21-40| Not Quite Practical|
  | 41-60| Enough Practical  |
  | 61-80| Practical         |
  | 81-100| Not Practical   |

3. Result and Discussion

3.1 Stages analysis
Stages analysis consist of:

- **Needs analysis.**
  Physics students should be able to do research by applying scientific methods. In fact, students in the department of Physics education who are a future physics teacher candidate, as well as a candidate of Islamic scientists, is still not accustomed the in obtain observation, thinking by principle and critically.

  In order for the experiment, there should be a guiding module for practicum activities. As one of the Islamic universities, IAIN Batusangkar is expected to produce graduates who are able to associate science with the Qur'an and Sunnah in classroom learning activities as a lecturer in the future. Therefore, it is necessary to provide lecture tools that integrated with the Qur'an.
• The importance of the basic physics lab integrated with the Qur'an for physics major students of IAIN Batusangkar.

Physics as a basic science is used to understand other science and applied sciences as a foundation of technological development. As a component of the curriculum to educate students in achieving certain qualities, the subject of physics is meaningful in fostering intellectual facets, attitudes, interests, skills, and creativity for learners. To build students’ intellectual, observation and thinking by principles can train learners to think critically. With the understanding of the natural surroundings, analyzing and solving related problems, and utilizing them in everyday life, students are prepared to work and continue their study.

The student's department of physics education in IAIN Batusangkar are being prepared to become a physics teacher. Therefore, it is necessary to prepare teacher candidates who are emotionally and socially intelligent as well as their intellectual and kinesthetic. Therefore, the basic physics lab tool is required to integrate with Qur’an on Department of Physics IAIN Batusangkar. With this lecture tool, students are expected to realize the greatness of God through the discovery of scientific truth with experimental activities. These teacher candidates will be accustomed to associate science sciences with the Qur'an and Al-Sunnah after they are qualified to school taught.

3.2 Stages of Planning (Design)

3.2.1 Formulation of Goals. Basic physics lab course aims to equip teacher candidates to perform activities of Physical practicum that are relevant to basic physics materials 1. The activity includes exercises using basic measurement tools, exercises follow the practicum procedure, practicum activities report practices, analyzing the data of the lab result to compile a conclusion, and conducting scientific communication in the form of presentation activity based on results of practicum.

3.2.2 Material Analysis of Basic Physics Lab 1. The Physics Materials that become the material of Basic Physics Lab 1 are the materials that are in accordance with the Basic Physics 1 material such as Table 3.

| The Physics Materials | The Title of Basic Physics Lab 1 |
|-----------------------|---------------------------------|
| Magnitude, measurement, and vector quantity | How to report measurement results in quantity |
| Particle kinematics | determine the characteristic and regular straight motion speed |
| Particle dynamics | determine the physical quantity of vibration of pendulum harmonics |
| | determine the spring constant |
| Fluid | proving the law of Archimedes |
| Temperature and heat | determine the viscosity coefficient of liquids |
| | application of black principles on calorie meters |

3.2.3 Identifying the Quranic verses that are relevant to the Basic Physics Practicum Material 1. The basic physics material I that has been established as the basic physics lab material I identified in relation to the verses contained in the Qur'an. Results of identification of Quranic verses relevant to the material such as Table 4.
Table 4. Results of identification of Quranic verses relevant with materials of the Basic Physics practicum

| The Title of Basic Physics Lab 1 | Identification of Qur'an verses relevant with Physics Materials |
|----------------------------------|---------------------------------------------------------------|
| 1. How to report measurement results | - QS Al Qomar ayah 49  
- QS Maryam ayah 84  
- QS Al- Anbiya ayah 47  
- QS Al Mukminun ayah 18  
- QS Maryam ayah 94 |
| 2. Determine regular straight motion characteristics | - QS Ar-Rahman ayah 17-20  
- QS AL-Anbiya’ ayah 33  
- QS Yasin Ayah 38 |
| 3. Determine the physical quantity of the pendulum harmonic vibration | - QS Al-Kahfi ayah 54  
- QS Az-Zukhruf ayah 32  
- QS Azzumar ayah 8  
- QS Al-Mulk ayah 3  
- QS Al-Baqarah ayah 201 |
| 4. Determine the spring coefficient | - QS Arrahman ayah 7-9 |
| 5. Proving the law of Archimedes | - QS Al-Fatir ayah 12  
- QS An-Nahl ayah 79  
- QS Al-Furqon ayah 2  
- QS Al-Mujaadalah ayah 11 |
| 6. Determining the viscosity coefficient of liquids | - QS Ar-Rahman ayah 19-20  
- QS Al-Furqon ayah 53 |
| 7. Application of black principles on calorie meters | - QS Al-Quraisy ayah 2  
- QS Al-Kahfi ayah 96  
- QS An-Nahl ayah 13 |

3.3 Development Stages

In the development stage, a conceptual framework is realized into a product that is ready to be implemented. The development phase was carried out by designing the basic physics practicum course 1 integrated Qur'an such as 1) Making Semester Programs Plan (RPS) Basic Physics practicum 1 course, 2) Designing basic physics practicum guide module 1, 3) Making practicum assessment instruments. At this stage, improvements were made to the draft device of the basic Qur’an integrated physics lecture that had been prepared in the previous step. Then the revision is carried out based on advice from experts. Some revisions made are:

- Substitution of the module so that the module title can function as a label that accurately reflects the core contained in the practicum module. For example, module 6 was originally titled "calorie meter", the title was changed to "application of the principle of black on calorie meters". Module 7 originally titled "viscosity" based on the validator's suggestion changed its title to, "determine the liquid viscosity coefficient".

- Originally, the author wrote all the quotations of the Qur’an verses that were in accordance with the relevant practicum material in the practical guide. Based on the advice of the validator, the author only wrote one or two examples of the relevant Qur’an verses, so that students are accustomed to making the Qur'an a source of reference in learning physics, so in the preliminary assignment the author shows the Qur’an letters and verses relevant to the material, then they are assigned to write quotations verse along with its meaning, then asked to explain the meaning of the contents of the verse in connection with the related practicum material.
After the lecture on the basic physics lab course 1 which is integrated with the Quran is completed, then the product validation test is assessed by the validator. Validation is done by 2 people: an expert in physics education department of physics FMIPA UNP, and an expert of the Qur'an interpretation from IAIN Batusangkar.

Based on the validation sheet that has been assessed by the validator, then the analysis is conducted towards the lecture tools of basic physics lab 1 integrated with the Qur'an which consists of the semester program plan validation and validation of the basic physics in guiding the integrated with Qur'an. The result of RPS validation analysis can be seen in Table 5. Recap of validation analysis of basic physics lab 1 manual integrated with the Qur'an, as in Table 6.

### Table 5. The result of semester program plan validation analysis

| No | Indicator   | Validator Value | Sum | Max Score | %  | Category  |
|----|-------------|-----------------|-----|-----------|----|-----------|
|    |             | 1   | 2   |           |    |           |
| 1  | Purpose     | 6   | 7   | 13        | 16 | 81%       | Very Valid |
| 2  | Rational    | 12  | 11  | 23        | 24 | 96%       | Very Valid |
| 3  | Content     | 19  | 17  | 36        | 40 | 90%       | Very Valid |
| 4  | Relevance   | 12  | 11  | 23        | 24 | 96%       | Very Valid |
| 5  | Language    | 15  | 18  | 33        | 40 | 83%       | Very Valid |
| 6  | Flexibility | 4   | 3   | 7         | 8  | 88%       | Very Valid |
|    | **Sum**     | 135 |     |           |    |           |
|    | **Maximum Score** | 152 |     |           |    |           |
|    | **% validity**       | 89% |     |           |    |           |
|    | **Category**          | Very Valid |     |           |    |           |

### Table 6. Recap of Validation Analysis of Basic Physic Lab 1 Manual

| NO  | Indicator   | Validator Value | Sum | Max score | %  | Category  |
|-----|-------------|-----------------|-----|-----------|----|-----------|
|     |             | 1   | 2   |           |    |           |
| 1   | Purpose     | 3   | 3   | 6         | 8  | 75%       | Valid     |
| 2   | Rational    | 10  | 11  | 21        | 24 | 88%       | Very Valid |
| 3   | Contents    | 45  | 43  | 88        | 104| 85%       | Very Valid |
| 4   | Relevance   | 20  | 23  | 43        | 48 | 90%       | Very Valid |
| 5   | Construct   | 37  | 36  | 73        | 88 | 83%       | Very Valid |
| 6   | Language    | 30  | 31  | 61        | 72 | 85%       | Very Valid |
| 7   | Flexibility | 3   | 3   | 6         | 8  | 75%       | Valid     |
|     | **Summary** | 298 |     |           |    |           |
|     | **Maximum score** | 352 |     |           |    |           |
|     | **% validity**       | 85% |     |           |    |           |
|     | **Category**          | Very Valid |     |           |    |           |

Based on the results of the research at the development stage contained in section 5 and Table 6, it can be seen that the percentage of validity of the lecture device that the researcher developed (Semester Lecture Plan, and basic physics practicum guide 1) is greater than 85 %, with very valid categories according to the expert judgment. Thus, it can be stated that the lecture device that has been
developed can already be used, and may be tested for use in the next research phase (implementation phase).

3.4 Implementation Stages

After the validation with the expert is completed, then a limited trial of the use of the device is done on the students participating in the Basic Physics Practicum 1, Odd Semester 2017/2018 academic year. Trials are carried out to see the practicality of the implementation of the device or the realization of the use of lecture devices that have been designed. The practicum was carried out by 21 students, this practicum was assisted by 2 practicum assistants.

After the student completes the practicum, the author distributes the student response questionnaire regarding the use of the basic physics practicum 1 guide to integrating with the Qur'an at the basic physics practicum 1 activities at IAIN Batusangkar. Based on the student response questionnaire, it was obtained the practicality results of using the basic physics practicum guidelines which integrated Qur'an. The practical guidance of basic physics lab 1 integrated with the Qur'an, as in Table 7.

| No | Statement                                                                 | Sum | Max | %  | Category |
|----|---------------------------------------------------------------------------|-----|-----|----|----------|
| 1  | Basic physics practicum guide integrated Al-Quran has never been used before in physics practicum activities | 77  | 84  | 91.67 | Very Practical |
| 2  | Integrated practicum guide to basic physics the Al-Quran is interesting to learn. | 78  | 84  | 92.86 | Very Practical |
| 3  | The purpose of the practicum in the module is clear and easy to understand | 71  | 84  | 84.52 | Very Practical |
| 4  | The material in the basic physics practicum guidelines integrating the Al-Quran is not complicated and easy to understand | 69  | 84  | 82.14 | Very Practical |
| 5  | Practicum Procedures on the basic physics practicum guidelines for integrated Al-Quran help me do the practicum | 70  | 84  | 83.33 | Very Practical |
| 6  | Questions on preliminary assignments and final assignments in the basic physics integration guide the Al-Quran leads me to discover the concept of Physics | 70  | 84  | 83.33 | Very Practical |
| 7  | The integration of Al-Quran verses is easy for me to understand | 68  | 84  | 80.95 | Practical |
| 8  | The integration of the Al-Quran verse, in my opinion, is in accordance with the material of the basic physics practicum | 70  | 84  | 83.33 | Very Practical |
| 9  | The integration of the Al-Quran in the basic physics practicum guide opens up my thinking horizons towards the power of Allah SWT | 75  | 84  | 89.29 | Very Practical |
| 10 | The integration of the Al-Quran in the basic physics practicum guide adds to my belief in the power of Allah SWT | 77  | 84  | 91.67 | Very Practical |
| 11 | The integration of the Al-Quran verses given motivated me to study further. | 71  | 84  | 84.52 | Very Practical |
| 12 | The colors used are interesting to me | 61  | 84  | 72.62 | Practical |
The display design is simple and attractive to me so it does not cause boredom in reading 59 84 70.24 Practical
I was able to work with groups in practicing activities 74 84 88.10 Very Practical
I am honest in reporting practicum data obtained and always earnestly in practicum activities 73 84 86.90 Very Practical

| Summary | Maximum Score | % Practical | Category |
|---------|---------------|-------------|----------|
| 1063 | 1260 | 84.37 | Very Practical |

From Table 7 it can be seen that the Basic Physics Practicum Guide I is categorized as Very Practical with a practical percentage of 84.37%. Almost all indicators are considered very practical by students, except for indicators number 12 and 13 concerning the attractiveness of color choices and display designs used in the practicum guidelines. The choice of colors and display design in the practicum guidelines are rated by students as 70 with a practical category. Based on this questionnaire data, it is deemed necessary for the writer to beautify the combination of colors and design the appearance of practicum guidelines, so as not to cause boredom in reading.

3.5 Evaluation Stages
After testing the use of the Qur’an integrated basic physics practicum lecture device in real activities in the field, then an evaluation of the suitability of the lecture equipment was carried out. This is intended to find out whether the lecture device that has been made can be used for the next lecture. Based on observations of basic physics practicum activities that integrate the Qur’an, it is seen that: all students can complete practicum activities on time.

The results of the student response questionnaire after the practical activity found that around 89.29% of students agreed that the Integration of the Koran in the Basic Physics Practicum Guide opened the horizons of thinking about the power of Allah SWT. 91.67 % of students agree that the integration of the Qur’an in the basic physics practicum guide adds confidence to the power of Allah SWT. The fact that the Qur’an can be used as a basis for humans to think, and can be used as a guide for mankind, has been conveyed by the word of God in the Qur’an surah Az-zumar ayah 27 which means: "and indeed we have told humans the knowledge of symbols/parables collected in the Qur’an, so that they are inspired" [6]. From the open questionnaire, it was also found that all students agreed that this module of integrated Qur’an practicum was used for the basic physical practicum activities of IAIN Batusangkar in the future. Thus, it can be concluded that the basic Physics Practicum 1 course that has been developed by the Qur’an that has been developed can be used as a guide and a guide for lecturers and students in the Basic Physics 1 Practicum course at IAIN Batusangkar.

4. Conclusion
Based on the results of the development and test that have been done, the following conclusions are obtained.

- Lecture tools of basic physics lab 1 integrated with Al-Quran have been developed with the of Semester lecture plan, basic physics practicum guide I and Assessment Instrument. Stage of research conducted is the stage of analysis, planning, development, implementation, and evaluation. After those stages above, the basic physics practicum to integrated with Qur’an is generated.
- The validation result on the basic physics lab course integrated with the Qur’an is very valid with the percentage for the guidance of basic physics lab I integrated with Al-Quran about 89% and RPS 85% validity percentage. The result of the practicality of basic physics lecture I integrated
with Al-Quran based on a questionnaire of categorical student response is very practical with practicality percentage that is about 84.37%.

Acknowledgement
Based on the research that has been conducted, the writer suggests the tools of basic physics lab course 1 integrated with Qur'an that has been developed, can be used as a guide. Therefore, the guide for lecturer and student in a lecture of basic physics Lab can be applied 1 at IAIN Batusangkar.

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