

The Development of Physics Module With The Scientific Approach Based on Islamic Literacy

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The Development Of Physics Module With The Scientific Approach Based On Islamic Literacy

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Abstract. The result of observation conducted at Islamic Senior High School (MA) Da'ar Al Hikmah Seputih Mataram and Senior High School (SMA) 10 Bandar Lampung indicated that a literacy-based learning material is needed. This study aims to develop a physics literacy-based learning module using the scientific approach. This development research applies the 4D model which only consisted of three stages, namely define, design, and develop. The result of module validation shows that the developed module is in the highly feasible category. Furthermore, the response of teachers and students toward the module indicates that the developed module is in a very interesting category. Thus, the developed physics learning module with a scientific approach and Islamic literacy-based can be used as a support for learning physics in school.

1. Introduction

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The advancement of knowledge and technology proves that the role of education is very important for many aspects of human life [1]. Education is a process in human development to develop itself in order to face all the problems that arise [2]. Allah the Almighty has promised to elevate the degree of those who are given knowledge by some degree in the hereafter [3]. Allah the Almighty states in Qs. Mujadallah verse 11 which means: 'O believers! When it is said to you; make room in assemblies, then do make room; Allah will make room for you.' when it is said, 'rise up, then rise up; Allah will raise, in degree, those you who believe and those who are endowed with knowledge. And Allah is Aware of your doings. Learning is essentially a process of interaction between teachers and students, both directly such as face-to-face activities or indirectly, namely by using various learning media [4]. Modules can assist schools in realizing quality learning because modules are well constructed, independent, complete, and clear in learning output [5]. Modules are also effective teaching materials for visual, active, and reflective students [6]. In addition, the module can be used as an alternative form in presenting teaching materials used during learning, including physics learning [7].

Mainly, the presentation of the physics module is still linear in nature by containing concepts and principles, examples of questions and solutions, and practice questions [8]. Modules are less linked between religious values and science because the purpose of education is not only to produce individuals



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who only have skills in the field of science and technology but also have a high religious awareness so as not to fall prey to current global developments [9]. The learning process in schools requires students to know and understand the material presented by teachers, but also to understand that the order of the universe cannot be separated from the will of Allah [10]. Islamic values seem to be one of the most important influential forces in the needs of human life [11]. This is because Islam is a science-friendly religion. Development of scientific literacy alone cannot solve all problems that occur without the existence of good Islamic literacy skills which can form more virtuous, civilized, and progressive people. Understanding the values of uluhiyah Tawheed and rububiyah Tawheed is also a person's literacy ability to properly grateful to Allah [12]. This is in line with the objectives of the 2013 curriculum which aims to produce students with character and virtuous to God and fellow human beings [13]. The 2013 curriculum focuses on the scientific approach which emphasizes five steps in gaining knowledge (observing, asking, reasoning, experimenting, and managing) [14].

Pre-surveys were conducted to three schools. Based on the questionnaires and interviews conducted to physics teachers and students at Islamic High School Al-Kautsar Bandar Lampung in the learning process the obstacles experienced were regarding the ration of learning, while some of the material taught by the teachers could not be delivered entirely so that the learning objectives cannot be fulfilled. Teaching materials found in the textbooks are sometimes too difficult to understand by the students and there were no other teaching materials that support students to be able to learn independently. There was no teaching material for physics based on Islamic literacy that supports the learning process. This happens because of the teachers' limitation in delivering Islamic-related physics material. This problem also occurred at SMAN (Senior High School) 10 Bandar Lampung. It was found that physics teachers did not use the scientific approach in the learning process even though the school has implemented the 2013 curriculum. The learning process was centered only on teachers, so students' interest in learning and activeness is lacking. The result of pre-research conducted at the MA (Islamic Senior High School) Da'ar Al-Hikmah Seputih Mataram revealed that the students only learned through LKPD (Students' workbook) with the limited and incomplete material. Physics modules are actually available but only can only be used by the teachers. The teachers also had never linked the learning materials with Islamic literacy. The similarity between the surveyed three schools is that; they have the same vision of realizing a school that is based on faith and piety. From the description above, researchers concluded that there was a need for Islamic literacy-based physics learning modules with a scientific approach to enhance and foster the students' awareness based on intellectual, emotional, and spiritual aspects.

This research refers to the several previous studies which produced learning modules including the research conducted by Ismu Fatikhah and Nurma Izzati who developed mathematical learning modules based on emotional quotient [15]. Subsequent research was conducted by Ageng Sandiyanti and Rosida Rakhmawati who developed a pictured-bilingual module based on quantum learning on probability learning material [16]. Another research was conducted by Lasmiyati and Idris Harta about the development of learning modules to improve the Junior High School students' understanding of concepts and interests [17]. Out of the three mentioned previous research, none of them employed scientific approach or based on Islamic literacy. Another study was conducted by Sri Latifah who developed a science module integrated with the Quranic verses or water as a source of life learning material [18]. Next is research from Faiz Hamzah who developed a science learning modules based on Islamic-Science integration on the subject of reproductive systems [9]. Furthermore, research was conducted by F. Yulawati, M. A. Rokhimawan, and J. Suprihati ningrum who developed a science learning modules based on Islamic-science integration [19]. These three studies developed modules with Islamic literacy but did not use the scientific approach. Research on product development in the form of modules with a scientific approach was carried out by Yuniika Putri Sukiminiandari, Agus Setyo Budi, and Yetti Supriyati who developed a physics learning modules with scientific approach [20]. Subsequent research was conducted by Agus Susilo, Siswandari and Bandi with the development of a scientific learning-based module to improve the students' creative ability in the learning process [21]. Some other studies that use the scientific approach in learning include a research conducted by Henry Sugiyarti, Widha Sunarno and Nonoh Siti Aminah about learning physics with a scientific approach using project methods and experiments in terms of creativity and students' critical thinking skills [22]. Subsequent research was conducted by Katimo, Suparmi, and Sukarmin about the influence of learning with the

scientific approach using experimental methods and demonstrations on learning achievement and creativity in terms of scientific attitudes [23], further research was conducted by Resti Fauziah, Ade Gafar Abdullah, and Dadang Lukman Hakim about basic electronic scientific learning based on problem-based learning [24]. A research conducted by Umi Fadhillah Ismawati and Sri Mulyaningsih about the effect of the application of learning with a scientific approach toward students' learning outcomes. Based on this description, new products will be developed and different in nature from previous studies, namely the physics learning module with the scientific approach and Islamic literacy on geometrical optics and optical devices learning the material.

2. Theoretical Basis

Learning is essentially a process of interaction between teachers and students, both direct interactions such as face-to-face activities or indirectly, namely by using various learning media [4]. Physics as part of subjects in school is one of the most basic sciences because it deals with the behavior and structure of things. The main objectives of all sciences, including physics, are generally considered to establish an order in observing the natural environment [26].

Module

A module is a form of printed teaching material that is used to help teachers and students in the learning process [15]. Modules are written with the aim that students can learn independently without guidance from the teachers [27]. A teacher does not directly give lessons or teach something to students face-to-face, but it is enough to use modules that contain material, methods, specifications, and methods of evaluation that have been designed systematically and attractively to achieve the expected competencies [28]. Abstract learning material is included in physics lessons, so the module is able to help students in describing abstract things, for example by using images, photos, charts, schemes, and others [29].

Scientific Approach

Learning processes in schools need to be formulated based on a curriculum that prioritizes individual experience through the process of observing, asking, reasoning, and trying to improve the creativity of students. Oriented to this reality, the 2013 curriculum focuses on the educational scientific approach, which is an approach that emphasizes five steps in gaining knowledge [14]. Scientific approach is a learning method that refers to the use of investigative techniques on phenomena or symptoms with the objectives of acquiring new knowledge, to evaluate, and to integrate prior knowledge [21]. This approach is seen to be most appropriate in the development of learners' interests and cognitive domain [30].

Learning with a scientific approach is a learning process that is designed in such a way that students actively construct concepts, laws, or principles through the stages of observing (to identify or find problems), formulating problems, submitting or formulating hypotheses, collecting data using various techniques, analyzing data, drawing conclusions and communicating concepts, laws, principles found [31]. Learning steps with the scientific approach include five steps, namely: 1) Observing, 2) Questioning, 3) Reasoning, 4) Experimenting, and 5) Managing. The last step investigates how the students respond, perceive, organize, and remember the information obtained when learning takes place [32].

Teaching Materials Based on Islamic Literacy

Islamic literacy is basically identical to the overall ability of language which consists of the ability to listen, speak, read, and write [33]. Literacy requires an unspoken sensitivity to the human self-regarding the relationships between textual conventions and the context of their use and ideally those abilities are used to critically reflect on the relationship between those relationships [34]. The characteristics of a person who has a quality shown by his abilities in literacy that include the ability to think creatively, analyze, make decisions, behave, and solve problems based on consideration of scientific information previously obtained [12]. Teaching materials can be said as all forms of material that will be used to help teachers/instructors in carrying out learning activities. The form of teaching

materials can be grouped into four, namely: printed material, listening material (audio), audiovisual material, and interactive teaching material [35].

Islamic Literacy is the development of *ruhaniyah-Ilahiyah* qualities in a person that is built on strengthening through the application of the noble values of Islam Understanding the values of *uluhiyah* Tawheed and *rububiyah* Tawheed is also a person's good Islamic literacy ability as a form of gratitude to Allah the Almighty [12]. 1) In *Rububiyah* Tauheed, Muslims believe in the *rububiyah* of Allah upon all things and believe that Allah does not have allies in His *rububiyah* towards the entire universe. The meaning of the word *rububiyah* is derived from the Arabic word *Ar-Rabb*, so *rububiyah* is the existence of Allah as the creator of everything that exists in the universe and as the God who controls everything [36] 2) *Uluhiyah* tauheed means to be obedient toward Allah the Almighty in the form of worship, submission, and absolute obedience. There is nothing worthy to be worshipped except Allah the Almighty, no one on earth or in heaven could be associated with Him. Tawheed will not work except by combining *uluhiyah* with *rububiyah*. [37].

3. Method

Research and development usually form a path to produce needed products until finally the ideal product is created.[38]The development model used in this study is the 4-D model which in this study it is limited into three stages.[39]The stages are presented in Figure 1.

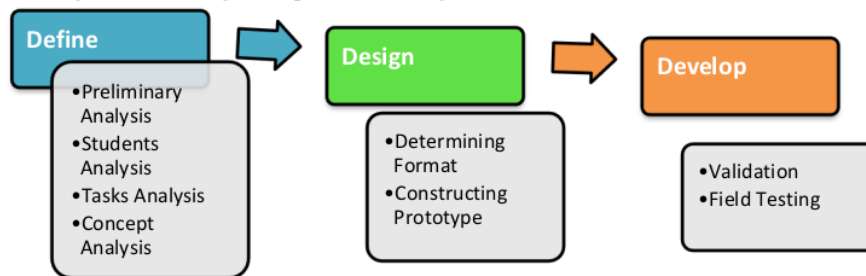


Figure 1 Stages of 4-D model development

Data Collection technique used was in the form of validation sheet to find out whether the developed module was valid or not. Validation sheets were given to media experts, material experts, religion experts, and linguists. Data analysis was in the form of non-test instruments through descriptive data analysis techniques. This non-test instrument was in the form of a Likert scale. The Likert scale was used to measure attitudes, opinions, and perceptions of a person or group about a social phenomenon.[40]Followed by giving questionnaires to acquire responses of physics teachers and class XI students. The percentage of overall answers of respondents was determined by the formula:

$$P = \frac{\sum x}{\sum xi} \times 100 \%$$

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Description:

P = Percentage

$\sum x$ = Score

$\sum xi$ = Maximum score for each item [41]

Determination of interpretation criteria for questionnaire validation scores can be seen in table 1:

Table 1 Scale of Interpretation of Validation Criteria [42]

Interval	Criteria
0 - 20 %	Very Low Feasibility
21 - 28 %	Low Feasibility
41 - 60 %	Fairly Feasible
60 - 80 %	Feasible
80 - 100 %	Highly Feasible

Rating scales of the students and teachers' questionnaire responses are as follows:

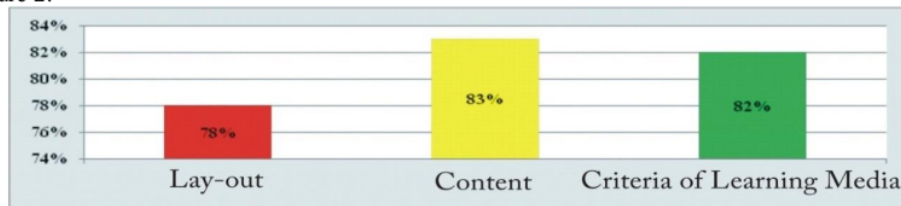
Table 2 The scale of Responses Interpretation [43]

Interval	Criteria
0 - 20 %	Unattractive
21 - 40 %	Less attractive
41 - 60 %	Fairly attractive
60 - 80 %	Attractive
80 - 100 %	Very attractive

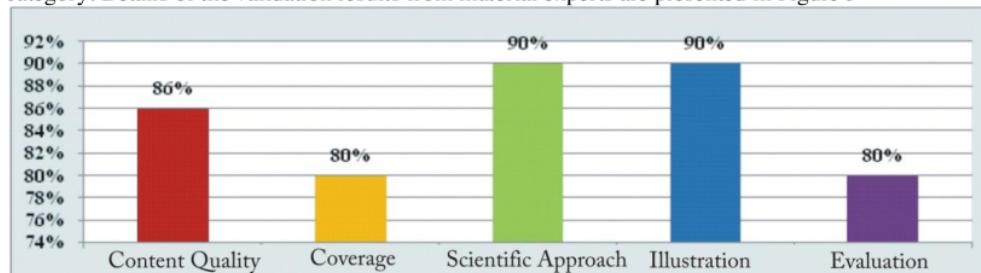
4. Result and Discussion

In the define phase of the study reveals that there is no teaching material that is in accordance with core competencies 1 (living and practicing the teachings of the religion). The analysis of students was carried out on the eleventh-grade students of Senior High School and Islamic High School(SMA / MA) who had different characteristics and had received geometrical optics and optical devices materials but had never used the Islamic literacy based physics learning module with a scientific approach. Students stated that the module needs to be developed. Concept analysis was done by identifying the main concepts to be developed, systematically compiling and detailing relevant concepts to the material being developed. The developed material was designed for geometrical optics and optical devices material for the eleventh-grade students which refers to core competencies and basic competencies. From these results, it is concluded that the physics module must be developed with a scientific approach based on Islamic literacy.

The design stage is the stage of making a module design that refers to the concept of module development by applying a scientific approach and Islamic literacy. The developed module was then validated. Suggestions for improving the modules provided by media experts included: to add a more interesting blend of colors, changes to the design of usage instructions, and changes to the covers. After revision, the result of the validation by the media experts obtained a percentage of 81% which belonged to the highly feasible category. the detail of the validation result by the media experts are presented in Figure 2.

**Figure 2** The Diagram of Media Validation Assessment

Suggestions from material experts were: to add materials on the properties of reflections formed, the formation of reflections on plane mirrors, an addition of material for competence 5, the evaluation must be in accordance with indicators, and to give instructions on evaluation. After revision, the result of the validation by the material experts obtained a percentage of 85% which belonged to the highly feasible category. Details of the validation results from material experts are presented in Figure 3

**Figure 3** The Diagram of Material Validation Assessment

Suggestions by religion experts included: adding Arabic-Indonesian transliteration and adding material of Muslim scientific figures. After revision, the results of the average validation from religion experts were 93% which belonged to the highly feasible category. Details on the validation results from religion experts are presented in Figure 4.

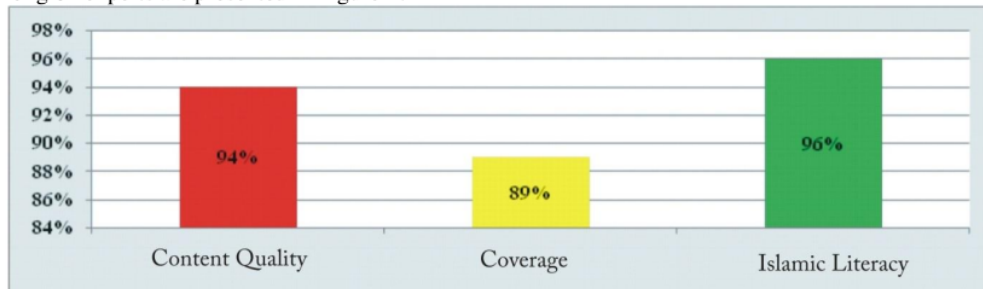


Figure 4 The Diagram of Religion Validation Assessment

Linguist suggestions were: revising the punctuation, sentence improvement, paragraph improvement. After revision, the results of the average validation from linguists were 97% which belonged to the highly feasible category. The details on the results of the validation from the media expert are presented in Figure 5.

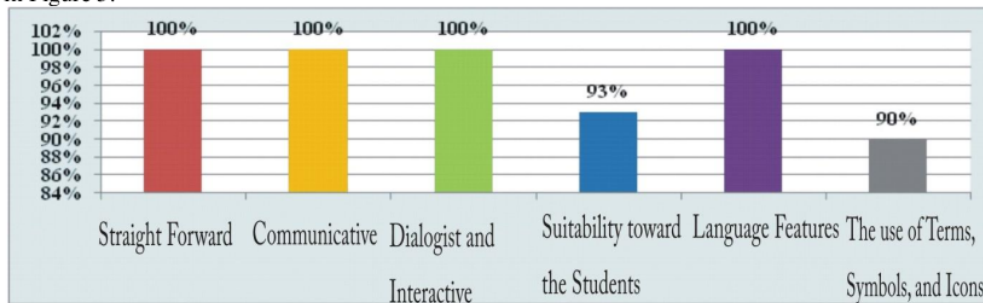


Figure 5 The Diagram of Language Validation Assessment

The field testing stage was conducted to obtain the teachers and students' responses toward the developed module. The teachers' responses toward the developed module in detail are presented in Figure 6. The average results of the teachers' responses obtained a percentage of 87% which belonged to the highly feasible category.

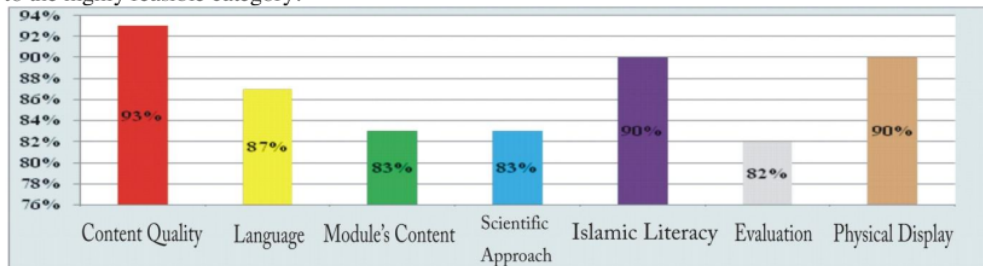


Figure 6 The Diagram Of Teachers' Assessment

The results of small group field testing conducted at Islamic Senior High School Al-Kautsar Bandar Lampung, SMAN (Senior High School) 10 Bandar Lampung, MA (Islamic Senior High School) Da'ar Al-Hikmah are presented in Figure 7. The small group field testing was conducted to 10 students. The average score of all aspects was 91 % which belonged to the highly attractive category.

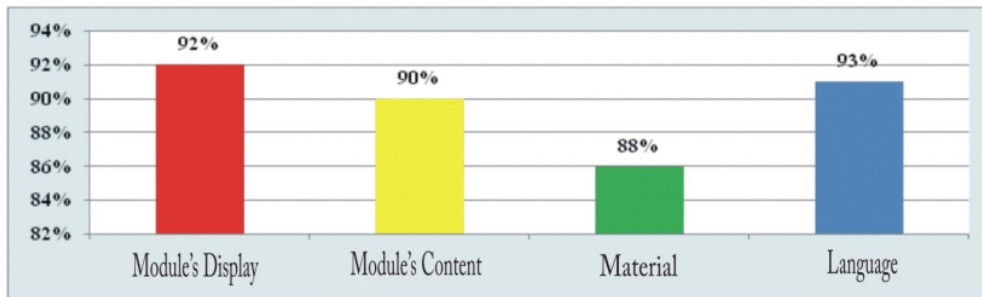


Figure 7 Small Group Field Testing Diagram

Furthermore, the results of field testing conducted at Islamic Senior High School Al-Kautsar Bandar Lampung, SMAN (Senior High School) 10 Bandar Lampung, MA (Islamic Senior High School) Da'ar Al-Hikmah is presented in Figure 8. The field testing was conducted to 25 students. The average score of all aspects was 90% which belonged to the highly attractive category.

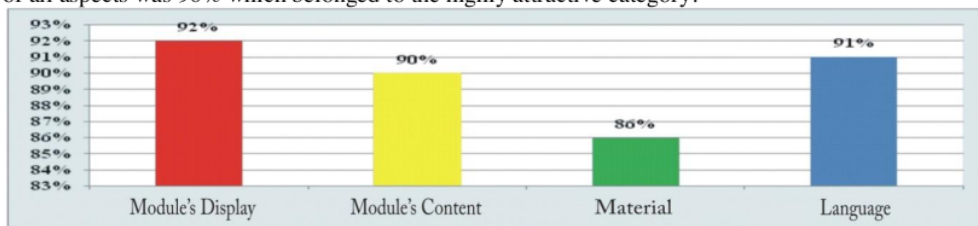


Figure 8 The Diagram of Field Testing

33

The final results of the developed module are presented in Table 3:

Table 3. The Organization of the Developed Module

Display	Description
<i>Concept Map</i>	Concept maps
<pre> graph TD Root[Faithful To Allah] --> A[Recognizing the Light of Allah] Root --> B[Good deeds] A --> C[Optical Geometrics] B --> D[Optical Devices] C --> E[Ḥablum min Allāh & Ḥablum min annās] C --> F[Phenomena of Allah's Creation] D --> G[Limit the View] D --> H[Mizan] E --> I[Light Travel in] F --> J[Light can be reflected] G --> K[Eyes & Camera] H --> L[Microscope] </pre>	

FAITHFUL TO ALLAH THE ALMIGHTY

Tauheed Material



Faith in God is a belief in the absolute being called Allah. Allah is absolute in the essence, character, deed, and form. Among the elements of faith in Allah is believing in the personal attributes of Allah, negative attributes (muḥāl) for Allah, and jāʾiz for Allah. Thus believing in Allah is believing that Allah exists (wujūd) whose existence does not depend on others.



Asbābunnuzūl

IbnAbiHatim narrated from Ali bin Rabah who said, "Someone told me that one time Farwah bin Masik al-Ghathifi came to the Messenger of Allah and said, " O Prophet of Allah, actually the Saba 'people are a people who are respected the darkness era (*Jahiliyah*). Meanwhile, I was worried that they would later turn away from Islam. Therefore, may I fight them? 'The Messenger of Allah answered, ' I have not been instructed to do anything to them. "Not long after this verse came down (15-17) which depicted the true state of saba '.

Remember!!!

Faith to Allah covers four aspects:

- ❖ Believe in his existence.
- ❖ Believe in his *rububiyah*.
- ❖ Believe in his *isuluhiyah*.
- ❖ Believe in his names and attributes

Information about Islam and *Asbabunnuzul*(The Origin of Verses)

They symbolize "Fire" as the incarnation of God The light and they light the fire in their temples. They are the *Majusi* people who turn away from Allah.



Figure1. Fire-Worshipping People
Source: www.kaummajusi.com

The Concept of Light Based on Rububiyah Tauheed

The sun is the only source of the greatest energy for the earth without which life will not take place on earth. Allah SWT has created the sun, so it is not appropriate for us to worship other than Allah especially worshipping His creation, the sun. It is hoped through the sun the people would always remember Allah and thank Him for all His blessings and His vast gifts.

Self-reflection

Self-reflection

Leave the mark(✓) based on honest feeling to respond to the following statements

No	Statement	Habit			
		Always	Often	Seldom	Never
		4 points	3 points	2 Points	1 Points
1.	Perform five time prayers at the mosque (for men)				
2.	Carry out <i>zakat</i> , almsgiving, and <i>infaq</i> with sincere heart				
3.	Able to hold back anger				
4.	Able to forgive the others' mistakes				

The Light of Faith is the Divine Reflection of Light

A poem reminds us of the importance of the light of faith in the heart, "The sun's sky sinks when it is night. The sun of the heart never sets even though the day is dark. "The light from the sun of a believer's heart will defeat the light of the sun, moon, and stars because the one that emanates from it is the light of God. The light can soften the hardness of the human heart and mind so that it can form a civilization that is beneficial to the universe. Such light of the heart will forever live, when the rays of natural objects will always sink.

The parable of light in Islam

GEOMETRICAL OPTICS

Physics Material

Optical Geometry is a branch of science that studies the properties of light propagation such as reflection, refraction, and the principle of the rays of light. There are three principles in geometric optics commonly known as the properties of light, namely light travels in straight lines, light can be reflected, and light can be refracted. These three principles form the basis of all calculations in Geometrical optics.



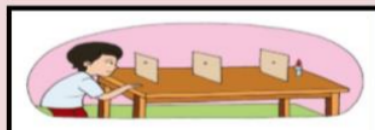
Activity 1

Experiments on the Nature of Light

Observing

Objective: Examining the straight line of light

Tools and materials: A candle and three pieces of paperboard



1) Reflection of Light on a Plane Mirror



In a day, we can see the mirror many times just to admire the beauty that Allah SWT has given us. By seeing the beauty that Allah SWT has given us, then we should be grateful and use good manner when we see ourselves in the mirror.

Plane Mirror based on *Rububiyah* Tauheed

SAMPLE QUESTION

How many reflections are formed from an object when two mirrors form a 30 ° angle?

Discussion:

It is known that: $\theta = 30^\circ$

Problem :Number of formed reflection (n)=...?

Answer:

$$n = \frac{360^\circ}{\theta} - 1 = \frac{360^\circ}{30^\circ} - 1 = 11$$

Example Questions



Independent Task

An object is located in front of 2 plane mirrors that form a 60 ° angle.
Determine the number of reflection formed.

Task for Students

IBNU SAHL

Abu Sad al-Ala ibn Sahl is a Muslim physicist who is famous for his expertise in optics. Six centuries before Snell discovered the law of refraction of light, Muslim scientists named Ibn Sahl had discovered it.



Source:www.ilmuislam.com

Islamic Figures in Physics

6

This research successfully developed a physics module ¹⁴ a scientific approach based on Islamic literacy on geometrical optics and optical devices material for the eleventh-grade students of Islamic Senior High School / Senior High School. The results of the research obtained are also in line with the research that has been done before, ³²ely the research on the development of student-oriented worksheets of Islamic values through a guided inquiry approach ⁸ temperature and heat material that belongs to the highly attractive category and could be used in the teaching and learning process with a percentage of 90% from the students, 84% from the educators, 91% from the design experts, 89% from the Islamic religion experts, and 85% from the physics experts [44]. Research on the development of students' workbook based on Islamic values with directed inquiry approach on static electricity for the ninth grade students of Muhammadiyah Junior High School with the results that students are easier to learn independently and the developed product leads to the students' spiritual attitude with a percentage of feasibility reaching 83.59 % which belongs to the highly feasible category [45]. Furthermore, a research on ²⁵ development of physics teaching materials integrated with Quranic values on motion material for the tenth-grade students of Senior High School resulted in an increase in student' learning outcomes with effectiveness reaching 90.4 after using the developed product [46]

5. Conclusion

29 The result of the study indicates that the developed product is appropriate to be used. The average percentage of validation results from media experts, material experts, religion experts, and linguists obtained respectively 81%, 85%, 93%, and 97%. All of these results state that the module is in the highly feasible category. Furthermore, the percentage of the average response from the teachers and the students is 87%, 91% (small group field testing), and 90% (field testing) which states that the module is in the highly attractive category.

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