Development of an Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School

Ayni Ananda Alif[1], Najmiatul Fajar[1(✉)], Bismi Safmita[1]

[1] Biology Education Study Program, Universitas Islam Negeri Mahmud Yunus Batusangkar, Indonesia
`najmiatulfajar@uinmybatusangkar.ac.id`

Abstract. This research is motivated by the problems faced in learning biology, among others, the content of understanding solid material, the media and methods used by teachers tend to be boring so that it affects students' interest in learning. Then the teaching materials and textbooks in the teaching and learning process have not been integrated with the Koran and hadith. As a religion-based school, ideally every subject should be integrated with Islamic values. In addition, in the process of learning biology, teachers do not use varied media and tend to be monotonous and conventional, whereas nowadays technology is increasingly advanced and can be used in the learning process. With Augmented Reality (AR) it can help students understand abstract biology material, especially on circulatory system material. Based on the problems above, it is necessary to develop a teaching material that is able to assist teachers in teaching and is also able to help students learn both at school and outside of school. The purpose of this study was to develop Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School which is valid and practical. The type of research used by researchers is research and development using a 4-D model, with the stages carried out namely the define, design and develop stages. The research results obtained are that the resulting module is very valid with a validation score of 91% and is very practical with a percentage score of 95% from teachers then from students 88%. Based on the questionnaire responses of teachers and students, they are included in the very practical category and can already be used in the teaching and learning process.

Keywords: Biology Module, Islamic Science, Augmented Reality (AR)

1   Introduction

Education has a very broad scope. In line with the goals of education, in every era there are always updates in the education system, in the 21st century, education is

required to be more advanced and easily accessible to all groups. In the world of education, the development of information technology has begun to have a positive impact because with the development of information technology, the world of education has begun to show significant changes [1].

Advances in technology cause no distance and boundaries between one person and another, as well as the development of information that is available globally through information technology such as the internet. Industry 4.0 is a phase of the technological revolution that changes people's behavior based on previous life experiences. This revolution requires humans to be able to predict the future that changes very quickly. One of the challenges in the world of education is the learning innovations carried out by teachers in the era of the industrial revolution 4.0 using the help of information technology devices that are developing rapidly, so that they can affect the improvement of the quality of education. The students faced by teachers today are generations who are already familiar with the digital world. Students already know the flow of information and industrial technology 4.0. This shows that teachers who are at the forefront of the world of education need to update their skills so that they are ready to face the era of Education 4.0 [1].

Based on the results of observations and interviews at MAN 2 Payakumbuh City, information was obtained that teachers in the biology learning process did not use teaching materials that varied and tended to be monotonous. Then in the learning process the teacher only uses teaching materials downloaded on the internet, textbooks, and power points. Teaching materials and textbooks have not been integrated with Islamic teachings. In addition, researchers also analyzed teaching materials that had been used by previous teachers, there were some deficiencies in them.

Then based on the results of interviews with students, the problems faced in learning biology are that it contains a lot of dense material understanding content. Current learning is usually guided by monotonous textbooks and boring learning systems that affect students' enthusiasm for learning. Media and learning models need to be developed that are able to accept student participation as a whole so that learning activities are not dominated by the same students. Biology is one of the general subjects. Based on Arimadona's view [1] , although Biology learning is not included in religious learning, Biology learning is Science learning that is framed in Islamic religious views. This means that learning Biology can be proven true through Islamic teachings, such as being guided by the Al-Quran and Hadith. To provide Biology knowledge, educators can directly integrate this knowledge with Islamic religious teachings. In line research the learning programs in Madrasah Aliyah must have Islamic characteristics where the learning carried out is integrated with relevant Islamic studies [3].

With regard to biology material which is very complex and much of it is abstract in nature, media is needed that can contextualize biological material so that it is more easily understood by students. To help solve this problem, currently technology can support creating learning media that functions to make it easier to explain material, namely Augmented Reality (AR) media. One of the developments in learning media that is currently still new is learning media using Augmented Reality (AR).

Interaction in the classroom occurs between teachers, students, and teaching materials. Teachers must be able to develop teaching materials that are used so that students do not feel bored and bored when learning. Ways that teachers can do to create and develop teaching materials include using an approach in the process of developing teaching materials, which are in accordance with the material to be delivered. One type of teaching material that can be developed by teachers is learning modules (Al Azka, H. 2019, pp. 224-225). Modules have an important role in learning. In the module development there are a number of principles that need to be considered. Modules must be developed on the basis of the results of the analysis of needs and conditions. It is necessary to know exactly what material needs to be compiled into a module, how many modules are needed and are available to support the use of the module, and other things that are deemed necessary. Furthermore, a module design is developed that is considered the most suitable with various data and objective information obtained from the analysis of needs and conditions. The form, structure and components of the module are needed according to existing needs and conditions (Rahdiyanta, 2018, p. 3). Based on the problems above, it is necessary to develop teaching materials that are able to assist teachers in teaching and are also able to help students both at school and outside of school. Based on the description above, an idea arose for researchers to take the research title Development of an Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School.

2   Methodology

This type of research is classified as R&D (research and development) which is an effort to develop and validate products used in the learning process. With research subjects namely learning media experts as validators, biology subject teachers and students of class XI MAN 2 Payakumbuh City as test subjects using integrated biology modules in Islamic science with the help of developed Augmented Reality (AR) media . This development research model uses the 4-D development model. This 4-D development design has 4 stages or phases, namely define, design, develop, and disseminate. However, in this study, it was reported that it reached the third stage, namely the develop or development stage (validity and practicality). The stages that will be carried out in this 4D development model are as follows: The define stage is carried out front -end analysis , learner analysis , literature analysis , user analysis . and formulation of learning objectives (specifying instructional objectives). The design phase, contains activities to create a design for a predetermined product. The develop stage is carried out with the aim of seeing the validity and practicality of the product, this stage consists of two, namely the validation process for the validator and limited trials to see the practicality of the product. The instruments used in this study were validation sheets and practicality sheets. The data analysis techniques used in the validation and practicality sheets are as follows: Module analysis techniques in the form of validation tests are used to see the validity level of the resulting modules, using validity sheets to experts (media, language and material). Each aspect is rated

with a range of 1-4 using a Likert scale. The validation values obtained from the three validators are then analyzed using the formula:

$$P = \frac{number\ of\ part}{total\ number\ of\ possible\ parts} \, x \, 100\%$$

The results obtained are interpreted using the following criteria:

Table 1. Table of Validity Assessment Criteria

Range	Criteria
0% - 20%	**Invalid**
21% - 40%	**Invalid**
41% - 60%	**Valid Enough**
61% - 80%	**Valid**
81%-100%	**Very Valid**

Source : Riduan (2007)

Technical analysis of the data on the Practicality sheet includes student and teacher responses regarding the products made. After obtaining the data results through the practicality sheets given to students and teachers, it will be known whether the module is practically used or not. The data obtained from the questionnaire is entered into the formula to find the percentage by:

$$P = \frac{number\ of\ part}{total\ number\ of\ possible\ parts} \, x \, 100\%$$

Based on the percentage results, each range is categorized based on the table below

Table 2. Table of Practicality Assessment Criteria

Range (%)	Category
0-20	Impractical
21-40	Less Practical
41-60	Pretty Practical
61-80	Practical
81-100	Very Practical

Source : Akdon (2007)

3   Results and Discussion

From the research that has been done, the authors produce a product of Development of an Integrated Islamic Science Biology Module with the Support of Augmented

Reality (AR) Media on Circulatory System Material in Senior High School with the following stages:

3.1   Define Stage

The define stage is the stage for establishing and defining learning needs using an Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School. This define stage includes five main steps, namely front-end analysis which is carried out through interviews and observations with biology teachers. the method used by the teacher when teaching is lecture and in learning media the teacher only uses textbooks and power points, so that students become bored and less active in learning especially biology subjects are in the last hour. In addition to the media and learning methods used by teachers, teaching materials are also factors that cause students to be less active in learning. Teaching materials used in class are LKPD designed by the teacher and material downloaded on the internet. This material is used as the main teaching material in classroom learning, the researcher also analyzes teaching materials that have been used by previous teachers, there are some deficiencies in them. MAN 2 Payakumbuh City is a religion-based school, but in its learning it is rarely integrated with Islamic values, only limited to verbal delivery, especially in biology learning. The teaching materials used do not link biology learning material with Islamic teachings and values.

Next is the analysis of textbooks, the aim is to look at the content, the method of presentation and conformity with the syllabus used in MAN 2 Payakumbuh City. The text book used in MAN 2 Payakumbuh City is a book entitled Class XI Biology for Class XI SMA/MA Specialization in Mathematics and Natural Sciences published by PT Intan Pariwara in 2016 book for SMA/MA class XI semester 1 curriculum 2016 revised edition. Package book The number of books available at school is very limited, and borrowing is also not allowed for one semester but is limited to borrowing for one week so students don't have a fixed book handle, besides that textbooks also look so boring because the writing is small, not colorful, and there are few pictures. Teaching materials developed by educators are in the form of worksheets and material downloaded on the internet, teachers only provide teaching material per material or send only ppt. Furthermore, the analysis of the curriculum and syllabus, the curriculum used in MAN 2 Payakumbuh City in class XI is the 2013 curriculum.

Then Student Analysis (Learner Analysis), Through interviews and questionnaire sheets that have been distributed to students related to learning biology, it is found that they do not really like learning biology because they do not understand the basic material and concepts of material learning, biology learning is only in the form of ppt and lectures make them less active and less enthusiastic, they want active learning, and lots of models so that classes become more active, in this era they also want to use structured and neat learning, and if possible they hope that the material in biology is made in technology form, so they can understand biology learning material that is not clear in nature.

Then the Literature Analysis on Modules (Literature analysis), aims to find out the format and method of preparing the modules, so that the product to be developed can be designed properly and correctly. Then User Analysis is carried out to design the planning instructions for the users of the modules that will be produced, for students this module can be used independently or in groups and the success of learning depends on the persistence of each individual. Inside the module there is a QR code that will be scanned by the user so that it displays augmented reality (AR) circulatory system material through the assemblr edu application, which can be accessed by IOS or Android users. Memory needed to be able to install this application is 72 mb. Finally Formulating Learning Objectives (specifying instructional objectives), the purpose of this analysis is to determine the achievement of core competencies (KI), basic competencies (KD), and indicators.

3.2   Design Stage

The design stage (design) contains activities to design a predetermined product (Al Azka, H. 2019, p. 227). The module is designed according to the KD that has been selected, namely the human circulatory system.
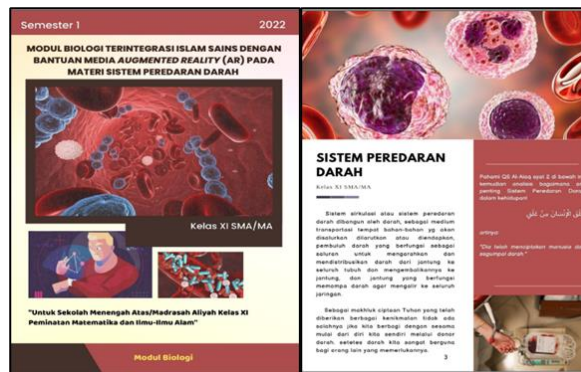

Fig. 1. . Module View

3.3   Development Stage

The Develop stage is carried out with the aim of seeing the validity and practicality of the product. This stage consists of two, namely the validation process for the validator and limited trials to see the practicality of the product. Development (development), there are activities to make the design into a product and test the validity of the product repeatedly until the product is produced according to predetermined specifications.

Validation Stage.
After the product has been designed, the next step is to validate the product to the validator to find out whether the product being developed is valid or not used by stu-

dents and teachers in learning. Based on the suggestions given by the validator above, the writer then revises the product according to the validator's suggestions and input during the validation process, so that the product can be used. Validation results from the three validators on Islamic science-based biology instruments and modules with the support of AR obtained the following data:

Table 3. Results of the Validation Analysis of Islamic Science Integrated Biology Modules with the support of *Augmented Reality* (AR) Media

No	Validated aspects	Validators			Total	Max Score	%	Desc
		1	2	3				
1.	Didactic Terms	27	36	35	98	108	91%	Very Valid
2.	Construction Terms	37	44	40	121	132	92%	Very Valid
3.	Technical Requirements	17	20	20	57	60	95%	Very Valid
4.	Language Requirements	12	16	14	42	48	88%	Very Valid
Amount		**93**	**116**	**109**	**318**	**348**	**91%**	**Very Valid**

From the table above it can be seen that according to the 3 validators this module can be used properly, which gets a score of 91% in a very valid category.

Practicality Stage
This Practicality Test aims to see the practicality level of the Islamic Science-Based Biology Module with the support of AR Media when used in the learning process in class.
Results of teacher practice:

Table 4. Practical Results of the Islamic Science Integrated Biology Module with the support *of Augmented Reality* (AR) Media by the Teacher

No.	practical aspects	Total Rating	Max Score	%	Desc
1.	Ease of Use	26	28	93%	Very practical
2.	Efficiency in Learning	7	8	88%	Very practical
3.	Benefit	24	24	100%	Very practical
Amount		**57**	**60**	**95%**	**Very practical**

The results of the practicality of students

Table 5. . Results of Practicality of Integrated Islamic Science Biology Module with the support of *Augmented Reality* (AR) Media by Students

No.	practical aspects	Total Rating	Max Score	%	Desc
1	Ease of use	724	832	88%	Very Practical
2	Time efficiency	183	208	88%	Very Practical
3	Benefits gained	646	728	89%	Very Practical
Amount		**1553**	**1768**	**88%**	**Very Practical**

From the table above it can be concluded that the module that used by students has made it easier for them to understand biology learning, especially in the material of the Circulatory System in Humans. From the table it can be seen that the practicality index is 88% in the very practical category.

Discussion

This research produced the final product in the form of an integrated biology module in Islamic science with the support of *Augmented Reality* (AR) media on valid and practical material on the human circulatory system in class XI, which was developed using *research and development* (R&D) research with a 4-D development model, which aims to determine the validity and practicality of an Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School.

Module Validity

The first aspect of determining the quality of learning products is validity, this validation stage is carried out so that the integrated biology module of Islamic science with the support of augmented reality (AR) media can determine its feasibility based on expert judgment or validators. Based on the results of the validation of the Islamic science integrated biology module with the support of augmented reality (AR) media which has been carried out by lecturers and teachers covering aspects of the validation of didactic requirements, construction requirements as well as technical requirements and linguistic requirements have obtained a percentage result of 91%, which includes into a very valid category. In accordance with the statement regarding the validity assessment criteria put forward by Izzati & Raja Ali Haji (2020, p. 703), that is said to be valid if all aspects of the percentage results show a result of ≥ 61%.

The first condition is the didactic requirement known to obtain a yield of 91% so that it is declared very valid, in line with the statement (Khunaeni et al., 2020, p. 90)

which states that the developed module has self-instruction and self-contained characteristics , so students can independently use the module for activities learn to be independent. The second condition is the construction requirement is known to obtain a yield of 92% so that it is declared very valid, as according to Haviz et al., (2013, p. 33) states that construct validation shows internal consistency between product components. This is also in line with Sappaile's statement (2007, p. 6), namely, construct validity is validity that questions how well the test item measures what a particular concept or conceptual definition is actually intended to measure.

Construct validity is often used in instruments designed to measure conceptual and outcome variables such as attitudes, interests, self-concept, locus of control , leadership style, achievement motivation, etc. for example those that maximize performance, such as instruments to measure talent , intelligence , emotional intelligence, and others. The third requirement, namely technical requirements , is known to obtain a yield of 95% so that it is declared valid. This is in accordance with the statement of Arsal et al. (2019, p. 440) that in learning biology, the ability of technology to present information visually is very important. Good pictures, animations and an interactive environment can facilitate understanding of learning objectives. These technical requirements place more emphasis on writing, drawing, and displaying modules . The fourth condition, namely the linguistic component , is known to obtain a result of 88% so that it is stated to be very valid. Language is a tool for communicating and interacting with modules, language is also a tool for communicating with other people and communicating with other people and communication in a social interaction, for that in the learning process the teacher must be creative in developing language in the learning process (Afriadi, Lufri, et al., 2013, p. 25).

So overall the integrated biology module of Islamic science with the help of augmented reality (AR) media produced reaches a percentage of 91% with a very valid category, that is, it fulfills the didactic requirement criteria with a percentage of 91%, construction requirements with a percentage of 92%, technical requirements 95% and requirements language by 88%.

Module practicality

The second aspect of determining the quality of learning products is practicality, the practicality aspect is determined from the results of user and user assessments (Haviz et al., 2013, p. 34). A product that is developed can be said to be practical if the product is valid, suitable for purpose, easy to use, and has no problems. In the practicality stage, the author gave practicality sheets to teachers on limited practicality trials to students in class XI MIA 1 at MAN 2 Payakumbuh City, which consisted of 26 students by deploying the Islamic science integrated module, the authors obtained teacher response results and student questionnaire results. towards the practicality of integrated Islamic science modules with support of Augmented Reality (AR) media. The results of filling out the response questionnaire showed that they had obtained a percentage result of 95%, which was included in the very practical category which included aspects of ease of use, efficiency in learning and benefits. It is said that practical is determined based on the results of assessments by users or users, the level of practicality in terms of explanations whether teachers or other parties think that learn-

ing materials are easy and can be used by teachers and students (Utama et al., 2022, p. 31).

Based on the results of the percentage of giving practicality questionnaires to teachers regarding the first requirement, namely the aspect of ease of use (user friendly), it is known to obtain a result of 93% so that it is declared very practical . AR) that is developed can help and facilitate teachers in providing correct explanations of the concepts of the circulatory system material being studied. According to (Haviz et al., 2013, p. 34) the practicality aspect is determined from the results of the user's or user's assessment. The second requirement is the aspect of efficiency in learning to obtain results of 88% so that it is declared very practical. When the module is practical in terms of time effectiveness or efficiency, thus the teacher can utilize minimal time with maximum results (Afriadi, Lufri, et al., 2013, p. 26). Furthermore, the aspect of the benefits of obtaining a result of 100% is declared very practical. In line with Natalia's statement, (2021, p. 54), namely learning with modules that are developed according to the characteristics of students can increase activeness in the learning process, this increase is due to the presentation of material in the module interesting and equipped with AR and the integration of Islamic science. This is reinforced by research from Amelia et al., (2022, p. 69) which states that with the continuous development of AR technology it can be utilized in various fields including education.

So the practicality stage by giving a response questionnaire to the teacher as a whole the integrated biology module of Islamic science with the help of augmented reality (AR) media produced reached a percentage of 95% with an aspect of ease of use of 93%, an aspect of efficiency in learning of 88% and an aspect of benefits of 100%. Practicality assessment by the teacher to see or consider that the module material is easy for students to understand and can help teachers in the learning process (Afriadi, Lufri, et al., 2013, p. 22).

For the results of the percentage of practicality sheets given to students, a percentage of 94% is obtained, meaning that the developed module is very practical to use. Practicality by students to see the ease in the learning process by students as module users (Afriadi, Lufri, et al., 2013, p. 22). Based on the results of the percentage of giving practicality questionnaires to students regarding the first requirement, namely the Aspect of Ease of Use (User Friendly) it is known to obtain a result of 88% so that it is stated to be very practical, User friendly in the learning process which is practical because the module has clear instructions for participants students, then the module can be used for individuals and can help students understand the concept (Afriadi, Lufri, et al., 2013, p. 26). The second requirement is the Aspect of Efficiency the learning time obtained results of 88% in the very practical category. It is said that because the use of the module provides initial knowledge to students and makes study time efficient. This is in line with the statement from Afriadi, Lufri, et al., (2013, p. 26) namely the function of the module for students can make time efficient in the learning process, by using the module students can follow lessons according to their respective abilities. Furthermore, the third requirement is Aspect The benefits obtained with a result of 89% are in the very practical category. This is in line with (Mashami, 2021, p. 74) that the AR application in the module is a very positive and

new added value for students. AR technology can add a virtual world in the form of 3D animation into the real world, namely when students study the module they can see the real form of the material through 3D animation so they are no longer just imagining it.

So overall the results of the percentage of distributing questionnaires given to students obtained results of 88% with a very practical category, aspects of ease of use with a percentage of 88%, efficiency of learning time 88% and benefits obtained 89%. In accordance with research from (Hastiningrum et al., 2020, p. 209) which states that the average practicality by teachers is higher than practicality by students. This proves that the teacher is more enthusiastic and supports the module development. After going through the validation and practicality stages, it is known that the Development of an Integrated Islamic Science Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material in Senior High School is feasible and practical to use in the learning process so that it can answer the problems faced by teachers when implementing PBM.

4   Conclusion

Based on the results of the development of an integrated Islamic science biology module with the Support of Augmented Reality (AR) media on Circulatory System Material in Senior High School, the conclusions is: Islamic Science Integrated Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material has met the very valid category with a validation score of 91% then the Islamic Science Integrated Biology Module with the Support of Augmented Reality (AR) Media on Circulatory System Material is very practical with a percentage score from teachers 95% and from students 88% . Based on the teacher's questionnaire response, it is very practical to use in the learning process.

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