INTERNATIONAL JOURNAL OF
SCIENCE ARTS AND COMMERCE

Developing Augmented Reality Based Encyclopedia for Islamic Financial Literacy Learning

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Abstract

This study aims to develop an encyclopedia based on augmented reality as Islamic financial literacy learning media. This development research uses a 4D model consisting of 4 phase (Define, Design, Develop, and Disseminate). Material expert, media expert, and teacher are invited to test the media feasibility. The results of the feasibility test show that the level of feasibility is 4.56 which means that the learning media is very feasible to use. Furthermore, we conducted an experimental test to determine the increasing of Islamic financial literacy by using an AR based encyclopedia. The t-test results show that the t-value in the experimental class is 11.13 with a significance level of <0.05 (significant), while the control class is -1.876 with a significance level of 0.076 (not significant). This study provides implications that learning media, especially the AR based encyclopedia, is able to improve the level of Islamic financial literacy.

Keywords: Islamic Financial Literacy, Encyclopedia, Augmented Reality.

Introduction

Islamic finance is currently growing rapidly. This event not only occurring in Muslim-majority countries, but Islamic finance has also entered the western market (Sergie, 2014). All the more, after the many shocks in the conventional banking system, Islamic banking and finance has attracted much attention from the world community (Kontot, et al. 2016). In particular, Indonesia, Islamic financial institutions are developing every year. Based on the Financial Service Authority, In 2020, total Islamic financial assets grew rapidly to 21.84%. Even so, the market share of Islamic finance was recorded as low with the proportion of assets at 9.9%. This

is caused by the low Islamic financial literacy of the community which is only 8.93% and financial inclusion which is around 9.1% (Tempo, 2020).

Islamic finance is quite complex. In contrast to conventional finance which is based on the concept of interest-based finance, Islamic finance avoids the interest system which is prohibited in every religion (Dinc et al. 2021). Furthermore, every transaction or event in Islamic finance also needs to be ensured that the transaction is in accordance with Islamic law (Sharia) (Khan and Bhatti, 2008). Therefore, it is very urgent to provide Islamic financial literacy. Islamic financial literacy serves to provide an understanding of sharia non-compliant practices in Islamic financial institutions and manage sharia non-compliant risk (Bhatti, 2020). Islamic financial literacy will help individuals to apply the financial basis in accordance with Islamic law (Abdul Hamid and Nordin, 2001).

Applying financial literacy from an early age is important so that learning outcomes can be accumulated into adulthood (Mandell and Klein, 2009). In order to afford an interesting learning for children, it is necessary to use interesting learning media as well. Especially for today's generation, children live in the era of digitalization which technological advances are part of their daily life. Therefore, the development of learning media needs to incorporate technology so it can attract children's interest. Previous researchers have conducted Islamic financial literacy in various ways, such as community-based workshops (Dewi and Ferdian, 2021), modules (Wahyuny, Murtini, and Hakim, 2018), and learning media (Aisyah and Saepuloh, 2019; Sari et al. 2021). Technology-based learning media is still limited, besides the existence of learning media can facilitate the socialization process. This has prompted us to develop an augmented reality-based Islamic financial literacy encyclopedia. The encyclopedia was chosen because it contains many attractive images and colors (Supriatin, 2018). Augmented reality is an instructional media that can produce more attractive and interactive learning (Karlsson et al. 2017). The existence of virtual objects in the real environment allows children to have experiences that do not occur in the real world (Klopfer and Squire, 2008). The combination of encyclopedia and augmented reality technology is expected to be able to provide clear explanations and children are able to apply knowledge in daily life.

Literature Review

Islamic financial literacy

The definition of literacy can be interpreted as task based and skill based. The definition of task-based literacy defines literacy as the ability to use printed or written information to function in society, achieve a goal, and develop knowledge and potential (White and McCloskey, 2005). The National Assessment of Adult Literacy (NAAL) in 2003 stated that skill-based literacy focuses on individual's knowledge and skills that required in daily life.

Bhabha et al. (2014) defines financial literacy as a combination of awareness, knowledge, skills, attitudes, and behaviors that are important in making financial decisions that ultimately lead to the achievement of financial well-being. Huston (2010) conceptualized financial literacy in two dimensions, namely the understanding dimension (knowledge of personal finance) and the use dimension (application of personal financial concepts and products). Huston (2010) divides financial literacy into 4 categories, i.e. the basics of personal finance, lending, saving/investing, and protecting resources. Some researchers conduct research on financial literacy (Hung et al., 2009; Glaser and Weber, 2007). The results of this study are financial literacy will affect a person's behavior.

The application of financial literacy from an Islamic point of view creates a concept of Islamic financial literacy. Islamic financial literacy refers to the ability to distinguish between halal and haram which is described in the Qur'an 6:119. Halal and haram are not defined by humans, but by Allah. Al Qaradawi (2001) states that the definition of halal and haram is as commanded in the Qur'an, which comes from Allah SWT. Islamic financial literacy is used to influence a person's attitude in terms of financial behavior, especially in distinguishing conventional financing (conventional financing) and Islamic financing (Islamic financing) (Antara, Musa, and Hassan, 2016). The level of individual awareness and knowledge of Islamic finance can affect a person's attitude (Jaafar and Musa, 2013).

In addition, Antara, Musa, and Hassan (2016) stated that the basic principles of Islamic finance are the avoidance of Riba '(interest), avoidance of Gharar (uncertainty), and avoidance of Maysir (gambling). Islamic finance also prohibits the sharing of profits and risks in business, zakat and takaful. Islamic finance is more likely to use the terms mudarabah, musharakah, murabahah, istisna, ijarah, and quard Hassan in its business activities.

Augmented Reality Technology

Augmented Reality (AR) technology provides opportunities for students to understand abstract concepts (Furi´o, Gonz´alez-Gancedo, Juan, Segu´i, and Rando, 2013) and visualize events that are uncapable to explore in the real world. This creates a perception that AR allows the appearance of virtual objects in the real world (Chen, Liu, Cheng, and Huang, 2017). In addition, AR also allows users to interact with real and virtual objects that able to support teaching and learning activities (Kim and Kim, 2018). AR can be used and applied as an innovative instructional media. Therefore, the learning process becomes attractive and interactive (Gün and Atasoy 2017; Karlsson et al. 2017). AR technology starts with marker identification or geographic location. When the marker identification is successful, a three-dimensional shape will appear on the surface. If no marker is present, only geographic location is detected, and digital information is allocated to the set of coordinates on the network (Kipper and Rampolla, 2013).The mechanism of AR technology depends on markers to produce images that are separated from real objects on the background (El Sayed, 2010).

Some of the advantages of using AR technology in learning are: 1) providing learning in a simple and interesting form, 2) offering students to learn by interacting with the experiences they want to have, 3) enriching the learning process with modern expertise and technological capabilities, 4) having simple and effective characteristics, 5) providing clear and concise information, 6) providing seamless interaction between teachers and students, 7) learning to be cost effective and its ability to be spread more easily, 8) providing practical space that quickly provides experience, 9) offers the possibility of innovation and renewal every time, and 10) creates a learning atmosphere that is fun, passionate, and thrilling (Safar, Jafar, and Yousefi, 2016).

Research Method

This study adopts the research and development model developed by Thiagarajan and Semmel (1974), namely the 4D model (define, design, develop, and disseminate). The flow of research and development procedures used is explained by figure 1.

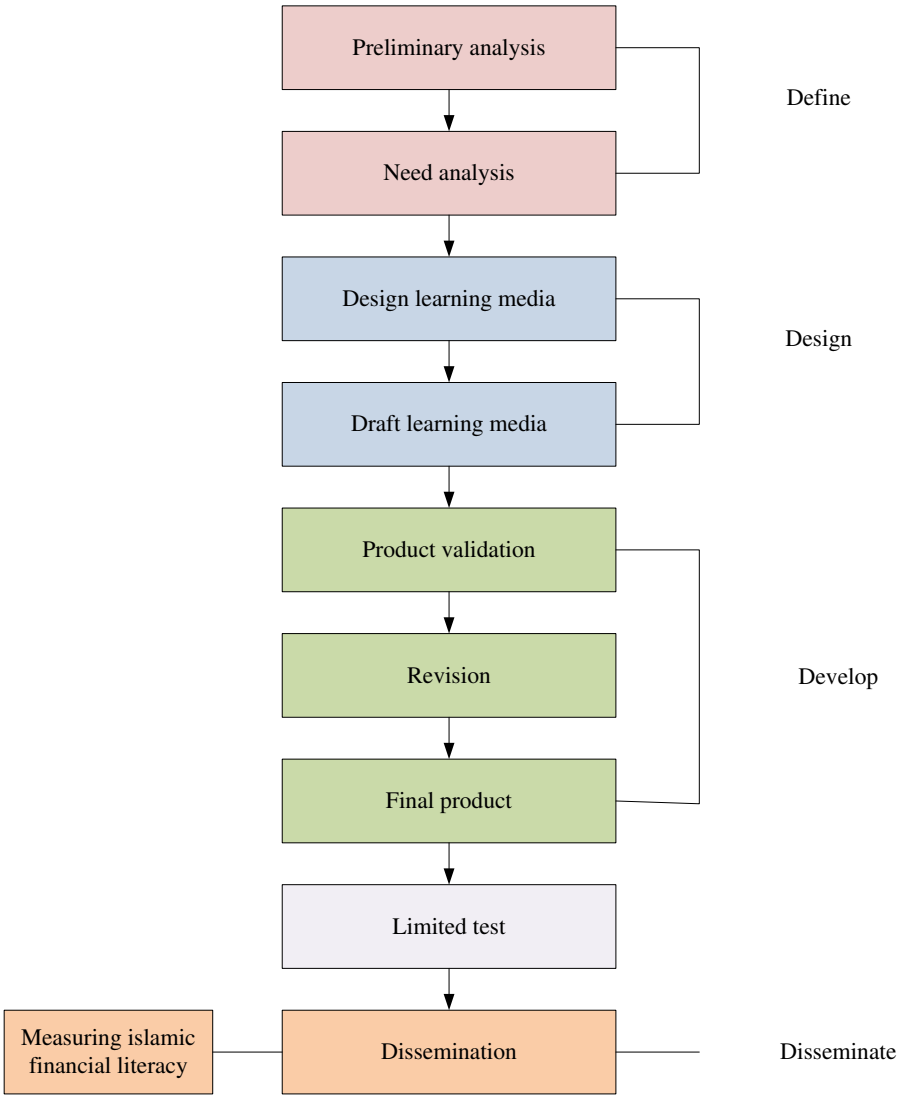

Figure 1. The flow of 4D development model

In the define phase, we conduct a needs analysis related to AR based encyclopedia by examining the aspects of students, classroom learning, and the learning media used. The instrument used in this phase is the initial measurement instrument for students' Islamic financial knowledge. In addition, an interview was conducted with one of the teachers to find out the learning needs and obstacles experienced.

Furthermore, at the design phase, we make the initial design of the learning product. This design is related to making themes, making main characters, making story boards, and making media. In addition, we also compiled a test to measure students' understanding of Islamic financial literacy material.

At the development phase, we invited experts to assess the feasibility of an AR based encyclopedia. There were 3 invited experts, they were material experts, media experts, and teachers. The score given by the expert will be calculated and converted into qualitative data (very feasible/feasible/quite feasible/less feasible/not feasible). Table 1 is a guideline used in converting actual scores to qualitative data.

Table 1. Conversion of actual scores into qualitative categories

No.	Interval score	Category
1.	$\overline{X} > 4,2$	very feasible
2.	$3,4 < \overline{X} \leq 4,2$	Feasible
3.	$2,6 < \overline{X} \leq 3,4$	quite feasible
4.	$1,8 < \overline{X} \leq 2,6$	less feasible
5	$\overline{X} \leq 1,8$	not feasible

Resources: sukarjo (2006)

After the feasibility assessment, we revise the learning media according to expert advice. The revised learning media will used in the next phase.

The last phase is dissemination. At the dissemination phase, we distribute the finished product to students at the school. Before being distributed, we conducted an experimental test to measure the level of financial literacy after using an augmented reality-based learning media encyclopedia. We tested it by creating an experimental class and a control class. The experimental class consisted of students who used the AR-based encyclopedia, while the control class did not use it.

Results

The research and development process adopts a 4D model (define, design, develop, and disseminate). The following are the results of Research and Development process.

Define

In this phase, we conducted needs analysis, task analysis, concept analysis, and goal specifications determination. The needs analysis carried out by pre-research surveys that consisting of interviews with teachers and measuring the level of Islamic financial literacy in students. The results shows that the level of Islamic financial literacy of students was only 35.7% and was included in the low category. In addition, there is still a lack of learning media used in Islamic financial literacy learning, especially in riba concept. The results of the task analysis, concept analysis, and goal specification are shown in the following table.

Table 2. The results of task analysis, concept analysis, and goal specification

Item	Analysis section	Analysis result
1.	Aspect	Understand the meaning of riba, the history of

		riba, and the difference between buying-selling and riba
2.	Achievement indicators	1. Students are able to explain the meaning of riba 2. Students are able to explain the history of riba 3. Students are able to explain the difference between buying and selling and riba
3.	Subject matter	Riba

Design

In this phase, we determine the theme, characters, and story board. The theme chosen is introduction of riba. Regarding the characters, there is one main character, namely Syira,. Syira is described as a cheerful and diligent child. Syira is depicted as a little girl who wears a hijab and likes to wear pink clothes. Then, we create a series of stories that contain the definition of riba, examples of riba transactions, and the law of riba.

Figure 1. character of Syira

The story board contains the material of riba, such as the definition of riba, the history of riba, and the difference of riba and transaction. Figure 2 showed the result of the encyclopedia design.

Figure 2. The design of encyclopedia

he production of AR applications and animations was using Unity 3D software and vuforia SDK to support Augmented Reality development. Meanwhile, the coding process is carried out using Microsoft Visual Studio 2012 software and the process of creating object resources using Corel Draw X7 and Blender applications. The concept of AR technology incorporated in the encyclopedia in the activities section. When students scan on the barcode, image will appear. Then, students determine whether the activity contains usury or not. Figure 3 showed the result of the AR technology incorporated in encyclopedia.

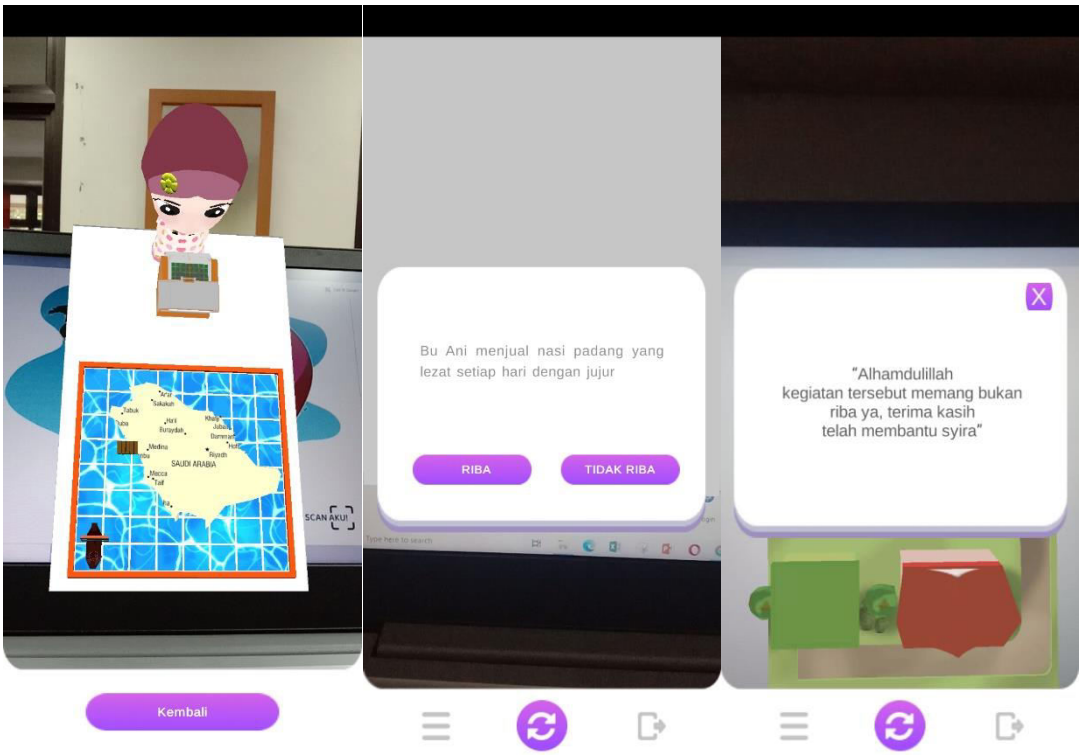

Figure 3. The AR Technology in Encyclopedia

In addition, we also developed an instrument to test the effectiveness of using financial literacy learning media. The following is the specification of the tests used.

Table 3. Test specification

Variable	Indicator	Type, number of question
Riba	1. understand the meaning of riba	Multiple choice: 1,2
	2. understand the law of riba	Multiple choice: 3,4
	3. understand the history of riba	Multiple choice: 5,6
	4. understand the difference of riba and transaction	Multiple choice: 7,8
	5. understand the effect of riba	Multiple choice: 9,10

Develop

In this phase, we asked experts to assess the feasibility of learning media. There were three invited experts, they are material expert (lecturer at the economics faculty) a media expert (

lecturer at the information technology faculty) and a teacher. The following are the results of the feasibility test from material experts, media experts, and teachers.

Table 4. Material validation result

No	Aspect	Score
1	Material	4
2	Learning design	5
3	Language	5
Average score		**4,86**

The overall results of the validation aspects carried out by material experts are 4.86 and are categorized as "Very Eligible".

Furthermore, Media expert validation consists of 5 aspects, namely ease, display of text/writing, visual quality, audio quality, and animation quality.

Table 5. Media validation results

No	Aspect	Score
1	Convenience	4
2	Text/Text Display	4,4
3	Visual Quality	4
4	Audio Quality	4,33
5	Animation Quality	3,67
Average score		**4,08**

The overall result of the validation aspects carried out by media experts is 4.08 and is categorized as "Eligible".

Furthermore, the teacher validates all aspects of material and media.

Table 5. Teacher's validation results

No	Aspect	Score
1	Material	4,57
2	Learning design	4,75
3	Convenience	5
4	Language	4,75
5	Text/Text Display	4,2
6	Visual Quality	5
7	Audio Quality	5
8	Animation Quality	4,67
Average score		**4,74**

The overall results of the validation aspects carried out by the teacher are 4.74 and are categorized as "Very Eligible". The average result of the three experts is 4.56 and is categorized

as "Very Eligible". Subsequently, the recommendation from the experts are the basis in the revision process.

Disseminate

We conducted an experimental test before disseminating the learning media. The experimental test aims to determine the ability of learning media in improving Islamic financial literacy. The test was carried out by using the pretest-posttest in the experimental class and the control class. The sample used was 40 elementary school students who were taken through a quota sampling process. The following are the results of the t-test of the experimental class and the control class.

Table 6. ***Paired Samples Test***

		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Experiment	-29.000	11.653	2.606	-11.130	19	0.000
	Control	-5,000	11,920	2,665	-1,876	19	0,076

The results of the t-test show that the t-value in the experimental class is 11.13 with a significance level of <0.05. This means that there is a significant increase in Islamic financial literacy in students who use the Islamic financial literacy AR based encyclopedia. On the other hand, in the control class, the resulting t value is -1.876 with a significance level of 0.076. This means that there is no significant increase in the control class.

Conclusion, Implication, and Limitation

The urgency of Islamic financial literacy for the younger generation encourages the need to develop learning media. The integration of technology in the learning process will produce interesting and fun learning. Therefore, the development of AR based encyclopedia learning media is expected to be an alternative in conveying Islamic financial literacy, especially in the discussion of riba.

The AR based encyclopedia was successfully developed by adopting the 4D development model. Expert assessment shows that this learning media is very feasible to use. Based on the results of pre-post-media use testing, the experimental class resulted in a significant increase in Islamic financial literacy scores, while in the control class there was no increase.

This study provide an implication that learning media is very necessary in the learning process, including in Islamic financial literacy. Incorporated technology in learning in the form of AR will result in a better understanding because students can interact with virtual objects in the real

world. This activity can support the learning process (Kim & Kim, 2018). In addition, learning using AR technology is also fun and attracted.

However, this study has limitation in its development. The material developed is only limited to riba material. Further researchers can develop AR-based learning media on other Islamic financial literacy materials. Materials from other aspects of Islamic financial literacy will help students understand Islamic financial literacy as a whole.

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