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The Effect of Using Ankidroid on Cognitive Learning Outcomes of Islamic Religious Education

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ABSTRACT: Islamic religious education learning which emphasizes rote learning often causes students to feel bored and lack interest in learning. Students' efforts to memorize material tend to be unstructured and less systematic. The aim of this research is to determine the influence of flashcard media and AnkiDroid on the cognitive outcomes of Islamic Religious Education on the material Rahmat Islam for the Archipelago in Class XII SMA Negeri 1 Kasihan and to make a comparison between the two. This research makes a contribution by exploring the effectiveness of two learning media in improving PAI learning outcomes. To the best of the author's knowledge, there has been no research that specifically compares conventional flashcards with AnkiDroid in the context of PAI subjects. This research uses a quantitative approach with an experimental method with a quasi-experimental research design, namely a nonequivalent control group design. The research results show that both media, both flashcards and AnkiDroid, have a significant influence on PAI's cognitive learning outcomes in the Rahmat Islam Untuk Nusantara material. Nonetheless, there is no significant difference between the two.

Keywords: learning media, flashcards, AnkiDroid, cognitive learning outcomes, Islamic Religious Education.

INTRODUCTION

Education is a very important process in human life. It helps people to understand the world around them and helps them to develop as individuals who are skilled and useful to society. It also helps in character building and helps individuals to develop the abilities necessary to achieve success in life. Education also helps individuals to understand the values and principles that are essential for a prosperous and useful life in society. Therefore, education plays a very important role in building society and developing the character of the nation (Jahantab, 2021).

Education is a teaching and learning process. This activity is a form of two-way communication between educators and students. Learners with a new paradigm are not only objects, but learners in the current era are subjects. In other words, learners are no longer just recipients of material but also as subjects who can transform knowledge (Abriadi & Gianto, 2022). Because education is an

activity that continuously works to build society and national character, education plays an important role in society, where education can develop the whole human personality.

In general, learning is a permanent change from learning outcomes. These permanent changes include knowledge, psychomotor, and affective (Maghfiroh & Soebagyo, 2022). In particular, Islamic Religious Education certainly requires expertise in cognitive, psychomotor, and affective aspects in learning it. Students who study Islamic Religious Education at school have not been able to achieve competencies in accordance with the demands of the cognitive domain listed in the competencies. This is due to the need for more students in sufficient quantities to remember. The cognitive remembering stage becomes an obstacle for students when studying Islamic Religious Education because of the material that requires memorization first, such as verses of the Koran, terminology, Islamic figures, etc(Kolb, 2023; Selçuk, 2023).

PAI learning that requires memorization activities certainly makes students bored and dislike learning. Learners unsystematically try to memorize it. Educators also find it difficult to provide opportunities for students due to time constraints. In line with this, research from (Afifah & Inayati, 2021), states that teachers often find the problem that students find it difficult to memorize learning material. Teachers also have not found alternative media that can be used. To remedy this, students can use a daily schedule to remember their material. This is called spaced-repetition. In this case, there is a theory that spaced-repetition can turn short-term memory into long-term memory by creating a systematic schedule for memorizing material. Spaced-repetition like this can be used by students. However, this memorization method requires the preparation of a schedule for memorizing material.

One of the media that can integrate technological and information advances according to the demands of the 21st century development and industrial revolution 4.0 is smartphones. Smartphones can integrate information technology in learning is a central issue and has been proven in building social skills, learning independence, and providing opportunities to share materials wherever they are (Hanson, 2020). In line with this, to keep up with the flow of technological developments so that education is getting better, the education sector should integrate things related to technology (Sukiyasa & Sukoco, 2013). There have been many uses of media in learning. It aims to facilitate the learning process of students. One of the relevant learning media is AnkiDroid, the Android adaptation of the widely-used Anki flashcard application, holds significant relevance for researchers due to its advantageous features on smartphones(Rana et al., 2020). Its portability ensures that researchers can carry their customized flashcards anywhere, facilitating on-the-go study sessions(Harisanty et al., 2020; Toth et al., 2023). The incorporation of a spaced repetition algorithm enhances the efficiency of learning by prompting reviews at optimal intervals, maximizing information retention.

Several publications have recognized the significance of AnkiDroid in the realm of mobile learning and knowledge retention. First, the article entitled "The Effectiveness of Using AnkiDroid Application in Japanese Language Learning at SMA Negeri 1 Tondano" (Lumi, 2022), shows that the use of AnkiDroid application media in vocabulary learning can improve students' ability to master Japanese vocabulary. Students who used AnkiDroid application media in their learning process had a higher average score (86.5%) than students who only used the lecture system (43.5%). There was a significant difference between the learning outcomes of the two groups.

Second, a thesis entitled "The Effectiveness of Quizlet Application and AnkiDroid Application As Media To Teach Irregular Verb (A Quasi Experimental Research at The Tenth Grade Students of Man 2 Semarang In The Academic Year 2020/2021)" (Widyaningsih, 2021). Based on the results of the independent sample t-test, it shows that the researcher's hypothesis that there is no significant difference between the use of Quizlet and AnkiDroid on students' mastery of irregular

verbs is valid. There is no significant difference in effectiveness between the t-test (1.920) and t table (2.656). This indicates that the t-test rejects the alternative hypothesis (Ha). As a result, the null hypothesis (H0) is accepted. This signifies that the researcher's null hypothesis that there is no significant difference in the effectiveness of the two apps is accepted. Although there is no significant difference in effectiveness, the teaching and learning experience using Quizlet app is more effective than using AnkiDroid app in improving students' mastery of irregular verbs.

Third, the article entitled "An Investigation of Anki Flashcards as a Study Tool Among First An Investigation of Anki Flashcards as a Study Tool Among First Year Medical Students Learning Anatomy Year Medical Students Learning Anatomy" (Rana, Laoteppitaks, Zhang, Troutman, & Chandra, 2020) the results showed 143 students completed an initial survey and were given flashcards. Of the 78 students who used the curriculum-specific flashcards, 20.1% found them extremely helpful, 29.5% very helpful, 33.3% moderately helpful, 15.4% slightly helpful, and 1.3% not at all helpful. In addition, 60.3% believed that flashcards helped reduce anatomy-related anxiety, 18.0% did not believe that flashcards reduced anxiety, and 12.8% did not answer or selected "other". These results suggest that repetition of anatomy facts through curriculum-specific Anki flashcards may positively impact affective learning outcomes among first-year medical students(Boroughani et al., 2023).

Of the three studies above, the author is basically the main reference and reference because similar research that is more specific to PAI subjects has not been found. The consideration is as a material comparison and differentiation of research conducted by the author. After looking at the background above, the author formulates the problem formulation:

1. How is the effect of flashcard media on the cognitive results of PAI on the material of the Grace of Islam for the Archipelago Class XII SMA Negeri 1 Kasihan?
2. How is the effect of AnkiDroid media on PAI cognitive outcomes on the material of the Grace of Islam for the Archipelago Class XII SMA Negeri 1 Kasihan?
3. How is the comparison between flashcards and AnkiDroid media on the results of PAI cognitive on the material of the Mercy of Islam for the Archipelago Class XII SMA Negeri 1 Kasihan?

METHOD

This research uses quantitative research methods, an approach based on postpositivist philosophy that utilizes experimental and survey strategies to collect statistical data (Emzir, 2019, p. 28). More specifically, this research uses experimental methods. According to Sugiyono (2012, p. 107), Experimental research occurs because of a treatment and is carried out in the laboratory (in the context of this research, in the classroom). Experimental research is characterized by researchers controlling or manipulating how groups of participants are treated and then measuring how the treatment affects each group (Lodico, Spaulding, & Voegtle, 2006, p. 177).

To evaluate the effectiveness of learning media, this study divided students into an experimental group, which used AnkiDroid media, and a control group, which used the traditional flashcard method(Maghfiroh & Soebagyo, 2022). However, the control group was not left without activity during the study; they will also receive instruction. This research uses an independent variable in the form of the use of AnkiDroid, a dependent variable in the form of student learning outcomes, and a control variable in the form of material with the same basic competencies at the same grade level.

The research design applied is quasi-experimental research because the sample group has been divided into several classes, and the researcher cannot change the groups randomly so the sampling

process is not random. This limitation is significant, but it is often necessary to use preexisting groups when randomization is not possible (Fraenkel, Wallen, & Hyun, 2012, p. 275). However, quasi-research is better than pre-experimental research. This research design refers to a nonequivalent control group design, namely the no treatment group and the AnkiDroid treatment group.

The research was conducted at SMA Negeri 1 Kasihan Bantul which is located at Jalan Bugisan Selatan, Tirtonirmolo Village, Kasihan District, Bantul Regency, Special Region of Yogyakarta. The population consists of all Muslim students from class XII. This research has a research object focus on cognitive learning outcomes in Islamic Rahmat material for Islamic Religious Education Archipelago Class XII SMA. Furthermore, this material is material that includes the history of Islamic civilization. This material is elaborated from KD 3.8 Analyzing and Evaluating Da'wah Strategy and Islamic Development in Indonesia and KD 3.9 Analyzing and Evaluating the History of Islamic Development in Indonesia (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2018).

The data collection method uses pretest and posttest with multiple choice objective test instruments. As explained by Surapranata, quoted by Sukiman (Sukiman, 2017, p. 89), Multiple choice tests are objective tests consisting of questions or statements followed by a number of answer choices. The testee's task is to choose the most appropriate answer option from the options provided. Possible answers can be words, phrases, place names, character names, symbols, or specific sentences. It is often used in experimental research to measure the effects of a treatment given to research subjects. This technique is used to determine changes that occur during treatment, namely by comparing the initial conditions (pretest) with the final conditions (posttest).

Data analysis method, according to Arikunto (Arikunto, 2006, p. 76) It is valid if it has great support for the total score obtained. The test instrument is created based on a test grid, with a focus on the basic competencies being tested. In line with this, the test instrument already has a good content validity category if the test aims to measure basic competencies and learning indicators (Nurgiyantoro, 2013, p. 155). Research data were analyzed after fulfilling prerequisite tests, including normality and homogeneity tests.

In analyzing data, the steps involved involve several procedures. First, descriptive analysis was carried out to present information regarding the amount of data, maximum value, minimum value and average value. Next, a normality test was carried out using the Kolmogorov-Smirnov test or Shapiro–Wilk test to determine whether the distribution of the research data was normal or not. The next stage involves the paired sample t test or Wilcoxon test, which functions to identify the average difference between two paired samples. Next, a homogeneity test is applied to determine whether the data variance from two or more groups is homogeneous (the same) or heterogeneous (not the same). The final step is the independent sample t test or Mann Whitney test, which is used to determine the average difference between two unpaired samples.

RESULT AND DISCUSSION

1. Descriptive statistics

After conducting research, the author obtained pre-test and post-test data in both experimental and control groups as follows:

Table 1: Recapitulation of Pre-Test and Post-Test Scores for Experimental and Control Groups

No	Kelas Eksperimen (AnkiDroid)		Kelas Kontrol (Flashcard)	
	Pre-Test	Post-Test	Pre-Test	Post-Test
1	84	96	56	96
2	76	76	64	88
3	80	76	56	100
4	96	96	92	76
5	80	100	84	100
6	76	100	56	92
7	80	100	84	80
8	80	88	96	88
9	92	100	68	96
10	76	96	84	80
11	72	96	92	96
12	88	84	80	92
13	68	60	76	96
14	80	92	80	100
15	76	100	52	84
16	68	88	80	100
17	80	100	60	88
18	80	92	88	100
19	80	92	56	92
20	60	92	80	96
21	76	100	60	100
22	84	92	80	96
23	96	100	80	100
24	96	100	56	100
25	92	100	88	100
26	76	92	52	92
27	80	100	73	93
28	76	80		
29	68	100		
30	88	100		
31	76	100		
32	72	92		
33	72	96		
34	76	88		

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Eksperimen	34	60	96	79.41	8.479
Post-Test Eksperimen	34	60	100	93.06	9.095
Pre-Test Kontrol	27	52	96	73.07	14.057
Post-Test Kontrol	27	76	100	93.37	7.012
Valid N (listwise)	27				

Table 2: Descriptive statistics

2. Normality

Tests of Normality

	Kelas	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Hasil Belajar Siswa	Pre-Test Eksperimen AnkiDroid	.208	34	.001	.939	34	.058
	Pos-Test Eksperimen AnkiDroid	.223	34	.000	.763	34	.000
	Pre-Test Kontrol Flashcard	.207	27	.004	.904	27	.017
	Post-Test Kontrol Flashcard	.202	27	.006	.853	27	.001

a. Lilliefors Significance Correction

Table 3: Normality test

Based on the output above, it is known that the significance value (Sig.) for (i) the data in the Shapiro – Wilk Pre-Test Experiment test is > 0.05, so it can be concluded that the research data is normally distributed. (ii) the data on the Shapiro – Wilk Post-Test Experiment <0.05, it can be concluded that the research data is not normally distributed. (iii) data on the Shapiro – Wilk Pre-Test Control test > 0.05, so it can be concluded that the research data is normally distributed. (iv) data on the Shapiro – Wilk Post-Test Control <0.05, so it can be concluded that the research data is not normally distributed. Because research data is not normally distributed, researchers can use nonparametric statistics (Wilcoxon Test) to analyze research data.

3. Wilcoxon test

a. Control Class

Ranks

		N	Mean Rank	Sum of Ranks
Post-Test - Pre-Test	Negative Ranks	4[a]	4.38	17.50
	Positive Ranks	23[b]	15.67	360.50
	Ties	0[c]		
	Total	27		

a. Post-Test < Pre-Test

b. Post-Test > Pre-Test

c. Post-Test = Pre-Test

Table 4: Control Ranks

Test Statistics[a]

	Post-Test - Pre-Test
Z	-4.127[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Table 5: Control Wilcoxon Test

Based on the output of Table 6 Wilcoxon Test for the control class, it is known that Asymp. Sig. (2-Tailed) value of 0.000 is smaller than <0.005, so it can be concluded that "the hypothesis is accepted". This means that there is a difference or influence of flashcard media on PAI cognitive results in the Islamic Grace for the Archipelago material for Class XII SMA Negeri 1 Kasihan.b. Kelas Eksperimen

Ranks

		N	Mean Rank	Sum of Ranks
Post-Test - Pre-Test	Negative Ranks	3[a]	4.67	14.00
	Positive Ranks	29[b]	17.72	514.00
	Ties	2[c]		
	Total	34		

a. Post-Test < Pre-Test

b. Post-Test > Pre-Test

c. Post-Test = Pre-Test

Table 6: Ranks Experiment

Ranks

		N	Mean Rank	Sum of Ranks
Post-Test - Pre-Test	Negative Ranks	3[a]	4.67	14.00
	Positive Ranks	29[b]	17.72	514.00
	Ties	2[c]		
	Total	34		

a. Post-Test < Pre-Test

b. Post-Test > Pre-Test

c. Post-Test = Pre-Test

Table 7: Experimental Wilcoxon Test

Based on the output of Table 8 Wilcoxon Test for the experimental class, it is known that Asymp. Sig. (2-Tailed) value of 0.000 is smaller than <0.005, so it can be concluded that "the hypothesis is accepted". This means that there is a difference or influence in the influence of AnkiDroid media on the PAI cognitive results in the Islamic Grace for the Archipelago material for Class XII SMA Negeri 1 Kasihan.

4. Mann Whitney Test

Ranks

	Kelas	N	Mean Rank	Sum of Ranks
Hasil Belajar Kognitif	Kelas Eksperimen	34	31.50	1071.00
	Kelas Kontrol	27	30.37	820.00
	Total	61		

Table 8: Ranks Mann Whitney

Test Statistics[a]

	Hasil Belajar Kognitif
Mann-Whitney U	442.000
Wilcoxon W	820.000
Z	-.255
Asymp. Sig. (2-tailed)	.798

a. Grouping Variable: Kelas

Table 9: Mann Whitney Test

Basis for decision making:
1. If the value of Asymp. Sig. < 0.05 then the hypothesis is accepted
2. If the value of Asymp. Sig. > 0.05 then the hypothesis is accepted

Based on Table 10: Mann Whitney Test, it is known that the Asymp. Sig. (2-tailed) of 0.798 > 0.05. So it can be concluded that "The hypothesis is rejected". Thus, it can be said that there is no significant difference between flashcard media and AnkiDroid regarding PAI cognitive results in the Rahmat Islam Untuk Nusantara class XII SMA Negeri 1 Kasihan material.

Flashcards are a useful tool for teaching and learning, especially in Islamic Religious Education (PAI) subjects. They are a simple and effective way to review and reinforce information and can be used in a variety of ways, including as a study aid, review tool, or quiz game(Saada, 2023; Saepudin et al., 2023). One of the benefits of using flash cards in PAI is that it can help students store and remember information more effectively. This is because flashcards allow students to actively engage with the material, rather than just passively reading or listening. By actively reviewing the information on flashcards, students can process and understand the material more deeply, which can lead to better retention and recall.

There is also evidence to suggest that the use of flashcards can have a positive impact on student learning outcomes. In one study, students who used flashcards to review material had significantly higher test scores than those who did not use flashcards. In addition, students who use flashcards are able to remember information more accurately and at a higher speed. In this research, students' use of flashcards influences cognitive learning outcomes. Overall, the use of flashcards can be a valuable tool for teaching and learning in PAI, and can help students retain and remember important information more effectively.

AnkiDroid is a popular flashcard application that can be used to study and review material in various subjects, including Islamic Religious Education (PAI). The app allows users to create their own flashcards or import ready-made decks from various sources. Flashcards can include text, images, audio, or video, and users can customize the review process by setting the review frequency for each card. One of the benefits of using AnkiDroid to learn PAI is that it allows users to review the material at their own pace and on their own schedule. The app also tracks progress and provides feedback to users, which can help them identify areas that need additional review or support.

Overall, AnkiDroid can be an effective tool for studying and reviewing material in PAI, as it allows users to customize their learning experience and track their progress. However, it is important to note that the effectiveness of any learning tool, including AnkiDroid, will depend on the individual user and how they use it. It's also important to use AnkiDroid along with other strategies and learning resources to get the most out of it.

Comparison of the use of conventional flashcards with AnkiDroid-based flashcards on PAI cognitive results in the Rahmat Islam Untuk Nusantara material for Class XII SMA Negeri 1 Kasihan, there was no significant difference. This means that researchers have not provided AnkiDroid for the long term. Based on the theory of spaced-repetition, repeated repetition will change students' memory from short-term to long-term. In the research and with limited research time, the researcher only took one material, namely the Grace of Islam for the Archipelago. In other words, spaced-repetition has not been studied in depth.

CONCLUSION

First, based on the Wilcoxon Test for the control class, it is known that Asymp. Sig. (2-Tailed) value of 0.000 is smaller than <0.005, so it can be concluded that "the hypothesis is accepted". This means that there is a difference or influence of flashcard media on PAI cognitive results in the Islamic Grace for the Archipelago material for Class XII SMA Negeri 1 Kasihan.

Second, based on the output of the Wilcoxon Test for the experimental class, it is known that Asymp. Sig. (2-Tailed) value of 0.000 is smaller than <0.005, so it can be concluded that "the hypothesis is accepted". This means that there is a difference or influence in the influence of AnkiDroid media on the PAI cognitive results in the Islamic Grace for the Archipelago material for Class XII SMA Negeri 1 Kasihan.

Third, based on Table 10: Mann Whitney Test, it is known that the Asymp. Sig. (2-tailed) of 0.798 > 0.05. So it can be concluded that "The hypothesis is rejected". Thus, it can be said that there is no significant difference between flashcard media and AnkiDroid regarding PAI cognitive results in the Rahmat Islam Untuk Nusantara class XII SMA Negeri 1 Kasihan material.

Based on the research that has been carried out, the suggestions from researchers are first, Islamic Religious Education Teachers should pay more attention to learning media that is suitable for students, by using media such as printed flashcards or AnkiDroid, to support learning in the classroom(Khan & AlGhamdi, 2024; Moqaddamerad & Ali, 2024). Second, students are advised to actively use AnkiDroid as a tool to help understand the material and improve memory. Finally, for future researchers it would be better to carry out the spaced-repetition theory in PAI, it is not enough to test it in just one material. It would be good for a long term like a full semester to test the effectiveness of AnkiDroid media.

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