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M-Learning-E-Book: Higher Level Thinking Skills, Retention, Motivation of Junior High School Students

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ABSTRACT

M-Learning-E-Book is an innovative learning model that is relevant to the demands of the twenty-first-century scheme. Studies on M-Learning-E-Book are still not widely conducted by Indonesian researchers and the study is still limited to the effect of this model on student learning outcomes. Therefore, this study aims to examine the effect of M-Learning-E-Book implementation on higher-order thinking skills, retention, and learning motivation. This research used quasi quasi-experimental method through pretest-posttest nonequivalent control group design. The research subjects were students of SMP Negeri Ngunut 1, 2023 academic year, totaling 87 experimental classes and 76 control classes in PAI lessons. In the control class, students followed learning in the form of expository and class discussions, while in the experimental class, students followed learning through E-book-based M-learning. In the experimental class, students met face-to-face for 4 times of online learning equivalent to 4 meetings. The research was conducted when the research subjects in both classes received the topic aspects of islamic history and culture. The instruments used to collect data were higher-order thinking skills test sheets, retention of learning outcomes, and motivation questionnaires. The data obtained were then analyzed using one-way MANOVA analysis with a significance level of 5%. The results showed that the application of M-Learning-E-Book had a significant effect on the achievement of higher-order thinking skills, retention, and learning motivation. The results of this study indicate that M-Learning-E-Book is one of the learning alternatives that are by the demands of the twenty-first century.

Keywords: *Higher Level Thinking Skills, Higher-Order Thinking Skills, Motivation*

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INTRODUCTION

Since the development of technology and information in the industrial Era 4.0 penetrated the world of education, mobile learning (M-learning) is one of the new paradigms of 21st-century learning models (Yektyastuti & Ikhsan, 2016). One of the breakthroughs in the utilization of technology in education is the application of mobile learning (Quinn, 2000), also known as M-learning (Viberg, 2015). It combines the process of delivering learning content online, offline, and mobile, with a learning model that provides the availability of easily accessible and visually nuanced subject matter on handheld and mobile electronic devices, such as smartphones, tablets, and iPads (Kumar Basak et al., 2018) (Van Bavel et al., 2016). Driven by its many benefits,

the application of M-learning has increased significantly in education. However although various studies have reported the advantages of M-learning, a teacher must be able to determine a suitable design to achieve the projected learning outcomes.

A good and effective learning process will help students achieve the competencies (Kast et al., 2002) that have been formulated in the learning objectives optimally (Enoch, 1995) (Dunlosky et al., 2013). Teachers can determine the form of learning that will be used as a means to achieve learning objectives and make learning more effective (Kudryashova et al., 2016). Students find it easy to learn (Amirullah & Hardinata, 2017). Learning comfort in students (Pratama et al., 2018). Media that can provide information precisely and quickly (Ahdan et al., 2020). Choosing the right learning model will make it easier for students to get optimal learning results (Supramono, 2016). Conversely, if learning does not apply the right learning model, it has an impact on the lack of understanding of concepts (Irwandani, 2015), lack of student involvement in the learning process (Dharma et al., 2023), inability to solve problems (Rizti & Prihatnani, 2021), decreased motivation (Wijanarko, 2017), loss of student confidence (Fardani et al., 2021), and student learning outcomes become less than optimal.

However, the quality of learning is not only determined by how well students achieve learning outcomes (Rahardjanto & Fauzi, 2019). Learning is also said to be quality if learning can facilitate students to think critically, analyze information, and make the right decisions (Haryanti & Febriyanto, 2017). Communicate effectively and work together in teams (Daniati et al., 2022). Students have strong digital skills in programming technology, data analysis, artificial intelligence, and the use of the latest software and hardware (Manongga et al., 2022). Individuals who can compete are those who have mastered various creative thinking and innovation skills (Arnyana, 2019). Problem-solving skills to be able to identify problems, design solutions, and implement them (Nurfitriyanti, 2016). Therefore, the learning process is expected to encourage students to be adaptive and flexible through the development of thinking skills in facing changes, both in technology and in the work environment (Rodiyah, 2021). This ability is invaluable in overcoming complex challenges in the 21st century.

Higher-order thinking skills (HOTS) are in high demand in the current era (Pohl, 2011; Gencel & Saracaloglu, 2018; Al-Mubaid, 2014). Through higher-order thinking skills, students will be able to understand, infer, connect facts with concepts, categorize, manipulate, find facts in an event that occurs, and find solutions to a problem that occurs (Thomas & Thorne, 2009). They are also able to digest information obtained from different points of view (Özdas & Batdi, 2017). Students with trained higher-order thinking skills will be able to be flexible see opportunities and face challenges in a rapidly evolving world (Ritter & Mostert, 2017). It can support student academic achievement (Mangangantung & Tuerah, 2021) (Conklin, 2012). Students will be accustomed to thinking critically and creatively both in decision-making and problem-solving related to analyzing, evaluating, and creating (Maye, 2013). Students can process information critically and creatively in dealing with and solving complex problems (Ramadhanti et al., 2022; Chianson et al., 2010) and involve analyzing, evaluating, and creating skills (N. F. Siregar & Nasution, 2019). Given the importance of higher-order thinking skills, the education and learning process is expected to encourage students to become individuals who have higher-order thinking skills (Hots) (Gradini, 2019; Puspitasari et al., 2020). Therefore, teachers as the main component that most often interacts with students are expected to be able to choose

learning that empowers the ability of higher-order thinking skills (Hots) and student retention optimally (Fahmi, 2021).

In addition to the optimal level of achievement of students' higher-order skills (Hots), The learning process is said to be well implemented if it is also able to improve students' memory or retention to recall facts, and information (Lubis, 2010) and previously known events and use it as a source of information during active and participatory learning (Daulay, 2016). With good learning retention, students will be more able to solve life problems (Shofiah et al., 2017), organize, remember, and analyze information that can be internalized into themselves (Abrami et al., 2008). Some studies state that students with high learning retention tend to achieve learning success (Gowasa et al., 2019; Daulay, 2016). In addition, learning retention is also reported to have a positive correlation with several parameters, one of which is learning outcomes (Fauziyah et al., 2013; Ardila et al., 2013).

In addition to the level of achievement of learning outcomes higher-order thinking skills and optimal student retention, the learning process is said to be well implemented if it is also able to motivate students to actively participate in learning (Syaparuddin et al., 2020). With learning motivation, students will be more interested in engaging in the learning process (Hanrahan, 1998; Schiefele, 1991; Boekaerts, 2002). A student with high learning motivation tends to achieve learning success (Harris, 1991; Su & Cheng, 2015). Some researchers state that motivation acts as one of the main keys to one's academic success (Glynn et al., 2005; Williams & Williams, 2011; Renninger et al., 2014; Krapp, 1999). In addition, learning motivation is also reported to have a positive correlation with several parameters, one of which is learning outcomes (Taurina, 2015; Alhadi & Saputra, 2017; Divjak & Tomić, 2011).

One of the learning models that by 21st Century competencies that can increase higher-order thinking skills (HOTS), retention, and learning motivation is mobile learning (M-learning) (Hasanudin et al., 2021; Susilo & Prasetyo, 2020). Through M-learning, students will be directed to follow the learning process actively and independently and train them to collaborate and communicate with peers (Ashim et al., 2019); (Anggia et al., 2022). The M-learning model is also considered a suitable form of learning for students in the field of Islamic Religious Education (PAI) (Pangastuti, 2017; Fahrul, 2021; Kulbi, 2019; Arif, 2016). It is also reported to have a positive impact on learning outcomes (Arif, 2016; Rahmawati & Mukminan, 2017), critical thinking skills (Romlah, 2021; Kartikawati & Pratama, 2017), and increased student motivation (Wati et al., 2021; Kurniasih et al., 2020).

Various studies have been conducted to examine the impact of M-learning by modifying M-learning learning activities by utilizing several applications. Some other studies try to integrate M-learning with other learning models, such as the online learning website model and M-learning through YouTube (Latifah & Prastowo, 2020). Mobile learning (M-learning) with TAPPS (Thinking Aloud Pair Problem Solving) model (Buchori et al., 2015). Based on the current trend of hybrid learning, studies on the integration of M-learning into hybrid design were found, one of which was conducted by Kusuma Dewi, (2018). In her research, M-learning can stimulate intellectual curiosity and motivate participants to seek global knowledge. The teaching and learning process becomes more efficient (Azimah & Wibowo, 2016), and stimulates and develops students' metacognitive awareness effectively (Subiyantoro, 2015). Further research conducted by Rasyid et al. 2019 reported that the use of M-learning has a positive impact on the development of students' thinking skills. However, there are still rare studies that integrate the application of E-book-based M-learning related

to higher-order thinking skills (HOTS), retention, and learning motivation in PAI learning.

Furthermore, most research on high-order thinking skills (HOTS), retention, and motivation in PAI learning is conducted using models and learning strategies outside of conventional face-to-face settings, which are less effective, efficient, independent, accessible, and attractive. In line with the given information, no research studying the existence of M-learning syntax based on E-books in PAI learning has been conducted. Such research is necessary since it can provide information on how the implementation of M-learning based on E-books relates to high-level thinking skills, retention, and learning motivation in optimal and effective PAI learning. Furthermore, the findings can serve as the basis for research and development conducted in the teaching of Islamic religious education. Additionally, teachers of Islamic religious education can use the results as a basis for choosing effective models and strategies for teaching.

Evaluation of the benefits of implementing M-learning in the learning process still needs to be reviewed to find out the effect of this form of learning on various other parameters. Previous reports only examined the effect of E-book-based M-learning on students' thinking skills and metacognitive awareness. Retention which is a common parameter correlated with learning quality has never been analyzed in this learning model. Moreover, the empowerment of higher-order thinking skills (HOTS), which is also one of the indicators of 21st-century learning quality, has never been done. Changes in students' motivation to follow E-book-based M-learning are also rarely studied. Therefore, this study will assess the effect of E-book-based M-learning implementation on these parameters. In more detail, the main problem of this research is to examine the effect of E-book-based M-learning on higher-order thinking skills (HOTS), retention, and learning motivation in PAI learning.

METHODS

This research uses quantitative research, and the type of research design used is a quasi-experiment (pseudo-experiment). The experimental design uses a pretest-posttest nonequivalent control group design which aims to determine whether or not the application of E-book-based M-learning has a significant effect on higher-order thinking skills (HOTS), retention, and student learning motivation. The research was conducted in the odd semester of the 2023/2024 academic year, July to November 2023 in Tulungagung Regency. The dependent variables are three higher-order thinking skills (HOTS), retention, and learning motivation. The independent variable of this research is the E-book-based M-learning learning model. The research subjects were students of SMP Negeri Ngunut 1, 2023 academic year, totaling 87 experimental classes and 76 control classes in PAI lessons. In the control class, students followed learning in the form of expository and class discussions, while in the experimental class, students followed learning through E-book-based M-learning. In the experimental class, students met face-to-face for 4 times of online learning equivalent to 4 meetings. The research was conducted when the research subjects in both classes received the topic "Aspects of Islamic History and Culture". In the sub-topic "The Development of Islamic Science during the Abasiyah Dynasty and Islamic Scientists / Figures during the Abbasiyah Dynasty", students who receive E-book-based M-learning will carry out independent activities, discussions, and problem-solving, while students in the control class do not carry out these activities.

Data collection on each research parameter was carried out twice, namely before (pretest) and after (posttest) the introduction of independent variables in both classes. The instruments in this study are HOTS questions with indicators that refer to the highest level in Anderson & Krathwohl's revised Bloom taxonomy in 2001 (Arlianty et al., 2018), namely the incorporation of knowledge dimensions (factual, conceptual, procedural), 2018), namely the combination of knowledge dimensions (factual, conceptual, procedural, and metacognitive) and cognitive process dimensions (C4-analyzing, C5-evaluating, and C6-creating) which refer to the theme "Aspects of Islamic History and Culture" in grade 8. The HOTS instrument was arranged in the form of an open description of 10 questions so that students' HOTS could be accommodated (Damaianti et al., 2020). The retention data consisted of 20 multiple-choice questions; the retest was conducted two weeks after the posttest. Then learning motivation data was collected using a motivation questionnaire using the ARCS (Attention, Relevance, Confidence, and Satisfaction) model developed by Keller (Keller, 1987). This questionnaire consists of 22 statements. The scale used in this questionnaire is a Likert-type scale consisting of items with degrees of 1) strongly disagree; 2) disagree; 3) agree; and 4) strongly agree.

The results were analyzed using the MANOVA test (Tuckman, 1999). Before conducting the MANOVA test, the research data were tested for normality and homogeneity using the Shapiro-Wilk and Levene tests. If the data does not meet the assumptions of normality or homogeneity, then the data analysis will be transferred using Rank Quade Analysis of Covariance. Data analysis was conducted using IBM Statistics 24 software with a significance level of 5%.

RESULTS AND DISCUSSION

Table 1 describes the sample size of this study as 163 participants. This table provides information about the average scores of higher order thinking skills (HOTS), learning outcome retention and learning motivation.

The average higher order thinking skills score of 83.89 indicates that the majority of participants had a good level of higher order thinking skills (HOTS). The standard deviation of 7.357 indicates that there is some variation in the higher order thinking skills (HOTS) scores among the participants. The range of scores was 70 to 96 with a statistical value range of 26. This, suggests that there may be some participants with relatively medium or high HOTS scores in the sample. The mean student learning outcome retention score of 80.47 indicates that the majority of participants had good learning outcome retention. The standard deviation of 10.525 indicates that there was some variation in student learning retention scores among the participants. The score range is 60 to 97 with a statistical value range of 37. This, suggests that there may be some participants with relatively low or high learning outcome retention scores in the sample. The average student learning motivation score of 78.36 indicates that the majority of participants had moderate learning motivation. The standard deviation of 9.868 indicates that there was some variation in student learning outcome retention scores among the participants. The score range was 60 to 96 with a statistical value range of 36. This, suggests that there may be some participants with relatively low or high learning outcome retention scores in the sample.

Table 1
Statistical Description of Participants

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
HOTS	163	26	70	96	83.89	7.357	54.124
Retensi	163	37	60	97	80.47	10.525	110.769
Motivasi	163	36	60	96	78.36	9.868	97.379
Valid N	163						

The level of thinking skills, retention of student learning outcomes, and learning motivation can be measured through tests. The optimal achievement of these parameters can be influenced by the learning model applied in the classroom. The results of the Shapiro-Wilk and Levene test analysis of the data obtained in this study are presented in Table 2. Based on Table 2, the value of Asymp Sig. Higher-order thinking skills, retention of learning outcomes, and learning motivation from the Shapiro-Wilk test are 0.076; 0.093; and 0.087; while from the Levene test are 0.480; 0.650; and 0.840, respectively. Thus, all data obtained from this study have met the requirements of normality and homogeneity assumptions.

Table 2
The Results of the Normality and Homogeneity Tests of the Research Data

Data	Statistical Tests	Sig.
Higher Order Thinking Skill	Shapiro-Wilk	0.076
	Levene	0.480
Retention of learning	Shapiro-Wilk	0.093
	Levene	0.650
Learning Motivation	Shapiro-Wilk	0.087
	Levene	0.840

The achievement of higher-order thinking skills (HOTS) is one of the parameters of learning success. Based on the hypothesis testing results presented in Table 2, the F value is 515.56 with Asymp Sig. < 0,05. Thus, there is a significant difference in the achievement of students' higher-order thinking skills (HOTS) results in the experimental class and the control class. The average corrected scores presented in Table 3 project that students in the experimental class have better higher-order thinking skills (HOTS) results compared to the control class (90.318 > 78.028). This information shows that students who received E-book-based M-learning have a much higher level of higher-order thinking skills (HOTS) than students in other classes.

Table 3
The Results of the MANOVA Test of the Research Data

Data	Degree of Freedom	F	Sig.
Higher Order Thinking Skill	1	515.56	< 0.05
Retention of learning	1	525.36	< 0.05
Learning motivation	1	639.94	< 0.05

Other findings revealed that a significant difference in student learning retention between the experimental and control groups was obtained in the hypothesis test, with an F value of 525.56 and an Asymp Sig. < 0.05. The corrected mean score presented in Table 4 projected that students in the experimental group had better learning retention results compared to the control group (90.387 > 71.233). The information indicates that students who received M-learning based on E-books had significantly higher learning retention rates compared to those in the control group. Regarding the results of the hypothesis test for student learning motivation, an F-value of 639.94 was obtained with Asymp Sig. < 0.05. Therefore, there is a significant difference in learning motivation between the experimental and control groups. The corrected mean scores presented in Table 4 indicate that the experimental group students have a significantly better learning motivation compared to the control group (87.378 > 69.442). This conclusive evidence suggests that students who received M-learning based on E-books have a significantly higher learning motivation than those in the control group.

Table 4
The Comparison of Mean Scores of Corrected Results from Experimental and Control Classes

Data	Classes	Pretest	Posttest	Increase (%)	Corrected Mean Scores
Higher Order Thinking Skill	Experiment	59.872	89.870	50.103	90.318
	Control	60.020	77.040	28.357	78.028
Retention of learning	Experiment	60.721	89.050	46.654	90.387
	Control	59.700	70.640	18.324	71.233
Learning motivation	Experiment	60.116	86.570	44.004	87.378
	Control	58.275	68.950	18.318	69.442

The results of the study showing the effect of E-book-based M-learning implementation on students' higher-order thinking skills (HOTS) are in line with several previous reports examining almost identical learning designs. Some reports, such as Puspita (2021); Alamsyah et al. (2019); NOVA (2022); and Cao (2022) argue that the application of M-learning has a positive impact on higher-order thinking skills (HOTS). Furthermore, Rahmi et al. (2023); Mardiana (2017); Azizah et al., (2017); Assobirin et al. (2023) suggested that M-learning can facilitate students to obtain meaningful learning maximally to improve critical thinking skills.

In the research, higher-order thinking skills (HOTS) describe students' concept mastery. Students in the experimental class had better concept mastery because E-book-based M-learning was able to facilitate meaningful learning. In the experimental class, such learning conditions were realized through independent learning activities, discussions, and problem-solving by students. This problem-solving aims to solve problems in PAI learning. Therefore, learning activities in the experimental class facilitated students to gain meaningful learning experiences through problem-solving activities associated with real conditions that occur in everyday life. This activity is the main feature of the M-learning learning model (Ammatulloh et al., 2021; Wagiono et al., 2020).

Besides being facilitated to gain higher-order thinking skills (HOTS), students in the experimental class were also facilitated to become active and creative learners. During learning activities, they are encouraged to actively and creatively reflect on

their knowledge and have the awareness to collaborate in groups. Collaborative activities in solving problems through independent learning activities, discussions, and problem-solving are known to be able to educate students to become active and creative learners (Fikriyah & Sutedjo, 2016; Indrawati, 2021; Mariana & Hidayanto, 2022; Yuniati, 2011; Litchfield et al., 2007; Marunevich et al., 2021). These collaborative activities are also reported to optimize the process of knowledge absorption during learning (Suminah, 2018; Roberts, 2000; Zhang et al., 2019; Johnson et al., 2014).

The next parameter in this study is the retention of student learning outcomes. Based on the results of hypothesis testing using MANOVA (Table 2), the F value obtained on the creative thinking skills variable is 525.36 with Asymp Sig. < 0,05. Thus, the achievement of retention ability of students who get E-book-based M-learning learning is significantly different from students who do not get learning. Furthermore, based on the results of the data analysis presented in Table 3, it can be seen that the average corrected score of students' learning retention in the experimental class (90.387) is higher than the average corrected score of student's creative thinking skills in the experimental class (90.387) control class (71.233). Thus, based on the results of the MANOVA test and the average corrected score, the achievement of creative thinking skills of students who received E-book-based M-learning learning was much higher than students who did not receive learning.

The effect of the application of E-book-based M-learning on the retention of student learning outcomes is in line with several previous reports that examine the use of M-learning on the retention of learning outcomes. Ardiansyah & Nana (2020); N. Khairunnisa et al. (2022); S. R. Khairunnisa & Nurmalasari (2023); Nurhasanah et al., (2022) emphasized that M-learning can empower students' learning outcomes retention ability. In line with these findings, Utomo et al., n.d.; Martha et al. (2018); and Putra (2021), also suggested that E-book-based M-learning is a learning that has the potential to further develop retention of learning outcomes. Further research states that Flipbook-based M-learning has the potential for most of the students' learning time to be devoted to learning activities, the behavior of students in carrying out tasks is on average high, the accuracy of the teaching content material is by students' abilities, creating a friendly and positive learning atmosphere (Hastira et al., 2023).

Similar to the parameters of higher order thinking skills (HOTS), one of the reasons why the retention of student learning outcomes in the experimental class is better than the control class is because of Flexibility in learning; Faster learning; Collaboration between students; More involved in learning activities; Learning with more than one device; Mobile devices support learning performance; Learning flow supported by technology. The application of M. learning provides high accessibility anytime anywhere, students get notifications and updates about their lessons. Feedback in the form of assessments or constructive comments from teachers can be easily received by students, teachers can also monitor students' academic progress, and learning paths are more easily monitored.

The third parameter is learning motivation. Based on Table 2, the F value obtained from the MANOVA test on the learning motivation variable is 639.94 with Asymp Sig. 0,00 < 0.05. Thus, the learning motivation of students who received E-book-based M-learning learning treatment is significantly different from students who did not receive learning. Therefore, although the average corrected student learning motivation in the experimental class (87.378) is greater than the control class (69.442) (Table 3), the learning motivation of students who received E-book-based M-learning learning can be said to be significantly better than the control class students who did

not receive learning. There is a significant difference, based on the average corrected score, the increase in student learning motivation in the experimental class (44.004) is also higher than in the control class (18.318). This finding shows that there is an effect of E-book-based M-learning to increase student's learning motivation.

The effect of E-book-based M-learning applications on student learning motivation is in line with several previous reports that examine the use of M-learning learning on learning motivation. Arif (2016); Ahdan et al. (2020); Kamasi & Saruan (2020); and A. Siregar & Manurung (2021) emphasized that M-learning can increase student learning motivation. In line with these findings, several previous studies inform that M-learning is a recommended form of learning that can increase student learning motivation Utomo et al., n.d.; Martha et al. (2018); Putra (2021). In line with that, several previous studies have also reported a correlation between motivation and several parameters of student learning success (Yuliawan, 2016; Irfan, 2018; Pramana & Wilani, 2018; Awe & Benge, 2017). One parameter that correlates with motivation is learning outcomes. Students who have good learning outcomes tend to have high learning motivation. This is also supported by the findings of several learning experiences on M-learning most likely to increase student learning motivation (A. Siregar & Manurung, 2021; Arif, 2016).

Related to the learning experience, students who received E-book-based M-learning in the experimental class did several activities that were able to increase their learning motivation. The first activity is learning activities related to the development of science during the Abasid Dynasty and Figures/legends during the Abasid Dynasty through discussion and problem-solving activities. During learning, students in the experimental class carried out these activities. This explanation is in line with Movahedzadeh et al. (2012) who delivered discussion and problem-solving activities that are believed to be able to increase student involvement in the learning process. Furthermore, students in the experimental class followed online learning. Based on several references and some previous studies, interactive learning activities offered in online learning design are considered capable of creating a pleasant learning climate and increasing learning motivation and student involvement in the learning process (Afip, 2014; Shea et al., 2015; Vaughan, 2014).

DISCUSSION

The Impact of Implementing M-Learning Based E-Book Learning on Higher Order Thinking Skill (HOTS).

Through a series of learning activities in the M-Learning class based on E-Book learning for Islamic education conducted in this research, students were able to draw conclusions from the process of collecting experimental data and present their findings to their classmates. Furthermore, the activities they engaged in trained them to think critically through the application of the M-learning model based on E. Using books as a powerful method in this research involves engaging students in their own environment and enhancing a broader learning experience due to the quality of mobility and the E-book-based M-learning supporting platform (Mohiuddin et al., 2022; Díaz-Sainz et al., 2021). This aligns with the statements of Kwangmuang et al. (2021) and Y.-M. Huang et al. Huang et al. (2022) Both studies indicate that E-book based M-learning can stimulate students' higher-order thinking skills (HOTS) to analyze, evaluate, and create including elements to form coherent or functional entities or organize elements into new patterns or structures through producing, planning, or

producing processes. This has an impact on the cognitive complexity of students by adding dimensions of factual, conceptual, procedural, and metacognitive knowledge.

The impact of implementing M-learning-based E-books on higher-order thinking skills (HOTS) at the levels of analyzing, evaluating, and creating is solely dependent on the application of M-learning-based E-book learning, which can depict the process of mental thinking. This aligns with Atkinson et al.'s statement. (2023) Dan Wei and Wei (2023) both concluded that the M-learning model based on E-books can trigger the emergence and creation of various learning experiences acquired by students by involving all the senses, physical, and psychological aspects of the students, thus assisting in developing their various potentials.

Empowering high-level thinking skills through stimuli in M-learning-based E-book learning is positioned as the cause of behavioral changes resulting in specific responses during learning (Martín-Núñez et al., 2023; Cai, 2021). To improve higher-order thinking skills through M-learning-based E-book learning, stimuli can be provided to students as learning supplements in the form of E-books (Qazi et al., 2023; Ung et al., 2022). These facts reinforce the urgency of high-order thinking skills (HOTS)-based learning. Based on this study, some high-achieving academic students who participate in M-learning still exhibit significantly low HOTS capabilities. It is encouraged that educators implement various teaching models to enhance HOTS, including PAI teachers. Therefore, in addition to implementing E-book-based M-learning, employing alternative forms of learning is reported to enhance high-order thinking skills (HOTS).

Based on previous research, various models and learning strategies have been reported to effectively improve high-order thinking skills (HOTS). These learning models and strategies, including the Strategy for Enhancing Thinking Skills (SETS) (Puspaningtyas, 2019), should be utilized for optimal results. Modeling Technological, Pedagogical, and Content Knowledge (TPACK) (Susilawati & Khaira, 2021); Problem-Based Learning Model (Inayati, 2020); and Flipped Classroom Learning Strategy integrated with Discovery Learning Model (E. D. Kurniasih & Nofiana, 2022) are various learning models that can be applied by teachers. In addition to applying these models, it is essential to implement an assessment process that supports the development of students' higher-order thinking skills (HOTS). To achieve this goal, educators must possess an accurate understanding of what, why, and how high-order thinking skill (HOTS) based learning is implemented.

Impact of M-Learning Implementation Based on E-Books on Students' Learning Retention.

There may be a significant difference in the retention of learning outcomes between students in the experimental and control classes for the application of M-learning based on E-books in this study, possibly due to factors. Firstly, the learning material of Islamic Education in M-learning based on E-books is presented in various forms of media, such as videos, audios, and images, which enable students to learn in a more enjoyable and engaging manner. Active engagement with learning materials allows for effective learning. This is supported by studies such as IP, Sri Wahjuni S, (2012); and Nizam & Law, (2021) which found that engaging and varied learning media can significantly improve memory retention. Additionally, E-book-based M-learning enables students to select and customize the necessary PAI learning materials. This has a positive impact on improving learning effectiveness and aiding students in deepening their understanding of PAI learning material. Several studies, including

those by Ezaldeen et al. (2022), Huang et al. (2022), and Ahmad & Tarmudi (2012), have concluded that students who learn according to their needs and characteristics can enhance learning effectiveness. Fourthly, M-learning based on E-books provides flexibility because students can learn at their own pace and schedule. This is in line with the research findings of Ameloot et al. (2023) and Tong et al. (2022), who stated that accessibility to learning can significantly impact learning outcomes. Third, M-learning based on E-books is easily utilized by students, enabling them to access and use materials for learning exercises. Fourthly, M-learning based on E-books provides flexibility because students can learn at their own pace and schedule. Fourthly, M-learning based on E-books provides flexibility because students can learn at their own pace and schedule. Students can select their preferred time and location of learning, thereby optimizing their study time and aligning with their individual needs (Chen, 2023; Karlsen et al., 2023).

Based on previous research, various models and learning strategies have been reported to effectively improve learning retention. Some of these models and strategies include the inquiry-based learning model (Barus & Sani, 2018) and the Think Pair Share learning strategy (Fauziyah et al.,). 2013; Model POE (Predict-Observe-Explain) (Shofiah et al., 2017); Model Project Based Learning (Umi, 2015); Model Auditory Intellectually Repetition (AIR) Learning (Linuwih & Sukwati, 2014). In addition to the implementation of various learning models and strategies, student learning outcomes retention can be enhanced. Teachers can create M-learning lessons based on E-books that bring real-life situations to students and can be accessed anytime, anywhere, in their daily lives. This enhances their memory and understanding as the material is presented through visualizations or animations, which engage them. Therefore, the implementation of E-book-based M-learning is expected to improve the quality of learning, leading to an increase in the retention level of PAI learning outcomes.

The Impact of Implementing M-Learning E-Book-Based Education on Student Learning Motivation

Differences in students' motivation to adopt E-book-based M-learning in this study are likely due to factors such as the appropriate use of M-learning, which can foster enjoyment of classes, cultivate and enhance motivation to complete assignments, and facilitate students' understanding of the material (Imani & Montazer, 2019; Bond, 2020). Secondly, mobile learning utilizing E-books as a robust method in this study involves engaging students with their own environment and enhancing a broader learning experience due to its quality of mobility and supportive platform (Díaz-Sainz et al., 2021); (Maketo et al., 2023). Thirdly, M-learning utilizing E-books is suitable for the characteristics of the current new generation as it enhances critical thinking and motivates students, resulting in the creation of meaningful knowledge (Ismail et al., 2018). Fourthly, E-book-based M-learning assists students in developing better learning processes in accordance with their learning style and preferences (Szymkowiak et al., 2021). Fifthly, M-learning based on E-books can motivate students highly and thus create meaningful knowledge (Jeno et al., 2022). Fourthly, M-learning based on E-books provides practical-realistic opportunities for independent, beneficial, and ongoing learning for educators and students (Carlson & McGowan, 2022).

Based on several previous studies, various models and learning strategies have been reported to increase learning motivation optimally. Some of these learning models and strategies include the Attention, Relevance, Confidence, and Satisfaction (ARCS) learning model (Jamil, 2019); Cooperative Learning Model (Sappaile et al.,).

2023); Application of various learning models and strategies can enhance student motivation to learn. Some of these models include the Inquiry-Based Learning Model (Winanto & Makahube, 2016), the Problem-Based Learning Model (Dayeni et al., 2017), the Discovery Learning Model (Adeninawaty et al., 2018), and the Blended Learning Model (Wihartini, 2019). It is important to maintain objectivity when evaluating the effectiveness of these models. Technical term abbreviations should be explained when first used, and language should be clear, concise, and free of bias or ornamental phrases. Correct grammar, spelling, punctuation, and citation should also be maintained. Teachers can create M-learning lessons based on e-books by utilizing technology that resonates with students today. This provides students with a unique interest in accessing the materials through smartphone applications, leading to increased learning intensity. Higher learning intensity has a significant impact on students' learning motivation and has a high probability of improving their academic performance. Combining the best aspects of face-to-face and online learning can enhance students' motivation to learn and provide flexible scheduling options for students.

Several prior research studies have found differences regarding the implementation of M-learning based on E-books. Nikmah et al. (2020) stated that it can enhance problem-solving abilities, while Mariati et al. (2021) concluded that it is highly effective during art-based mobile learning, providing a unique experience for students to appreciate and create art even in the context of online learning. Listyorini (2013) states that E-book-based M-learning offers many advantages in facilitating the learning process without any time, space, or location constraints. Mardiana (2017) shows the improvement of Physics HOTS abilities among students through M-learning. Malik et al. (2020) assert that mobile learning and visual learning styles can enhance German vocabulary mastery of students with effectiveness. Research in the field of Islamic Religious Education is still very seldom found. Previous studies have been conducted on different subjects, such as Mathematics (Hakim, 2017); Geography (A. K. Putra et al., 2021); Electronics (H. Pratama & Yusro, 2016); and Indonesian language (Hendrawan, 2018). There is a scarcity of research related to modifications of the M-learning teaching model based on E-books that integrate the measurement of three parameters - high-order thinking skills (HOTS), learning retention, and student motivation - in PAI lessons.

Based on the findings from this study, it is highly recommended to implement M-learning based on E-books in various schools across Indonesia. Training and dissemination of the benefits of M-learning based on E-books should be conducted to ensure that PAI teachers are familiar with this instructional model. The findings indicate that the majority of high-order thinking skills (HOTS), learning retention, and students' learning motivation in the experimental class (M-learning based on E-book) achieved better results compared to the control group. These facts highlight the necessity to modify learning methods employing integrated mobile learning and E-books. Teachers are encouraged to implement various learning models that can enhance high-order thinking skills (HOTS), learning retention, and student motivation, including PAI teachers. The implications of this study relate to the application of E-book-based M-learning. Firstly, our concept offers flexible learning options without any restrictions of time and location. Secondly, our learning materials are accessible online, enabling learners to study anywhere and at any time as long as they have a cellular network, and learners can even study via mobile phones. Third, even without a notebook or PDA, mobile phones can also become vital tools in the learning process.

Fourth, it is hoped that mobile learning can become an alternative source of learning that can improve the efficiency and effectiveness of the learning process and outcomes of students in Indonesia in the future.

The limitations of this study are as follows: Firstly, it solely examines the general high-order thinking skills (HOTS), learning retention, and student motivation, without considering the factors that influence these skills and learning outcomes, or the factors that shape the development of HOTS, learning retention, and student motivation. Secondly, the study involved a limited number of research subjects, namely 163 students. Therefore, the results cannot be generalized to a large group of subjects. Thirdly, there were some incomplete responses and some participants who did not fill out the questionnaire seriously. Consequently, the conclusions drawn are solely based on the data analysis. Therefore, further research is needed regarding the quality of high-order thinking skills (HOTS), retention of learning outcomes, and student learning motivation using different research methods, a broader sample, and more extensive research instruments.

The results of this study demonstrate that the combination of M-learning and E-books enhances high-order thinking skills, learning retention, and motivation among students in PAI lessons. Therefore, implementing innovative learning methods such as the one used in this research is recommended for various secondary school subjects.

CONCLUSION

In this study, the effect of E-book-based M-learning on the results of HOTS high-level thinking skills, retention, and increased student learning motivation at the junior high school level was studied. The results of this study indicate that there is a significant difference between students taught using E-book-based M-learning and students taught using conventional learning, both on the parameters of HOTS high-level thinking ability, retention, and increased student learning motivation. The results of this study indicate that E-book-based M-learning is an alternative form of learning that is relevant to the demands of the 21st century. Assessment of the application of M-learning on other parameters needs to be developed in future research to reveal the positive impact of the model more thoroughly. The addition of study duration is also suggested so that the long-term impact of E-book-based M-learning can be analyzed.

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