

DEVELOPMENT OF STEM-BASED E-LKPD IN THE SUBJECT OF AQIDAH AND AKHLAK TO IMPROVE STUDENT LEARNING OUTCOMES

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Abstract

This research aims to develop and test the effectiveness of STEM-based E-LKPD on Commendable Morals material for grade XI students of MAN Dairi. The research uses the ADDIE development model which includes the stages of analysis, design, development, implementation, and evaluation. The research subjects consisted of two classes: class XI Science 2 as an experimental class and class XI Science 3 as a control class. Data was collected through tests and questionnaires, then analyzed using validity, reliability, and Independent-Samples T-Test tests with the help of SPSS 26. The results showed that STEM-based E-LKPD obtained an average validity value of 94.9% with the "very feasible" category and practicality of 94% with the "very good" category. The effectiveness test showed an increase in pretest and posttest scores, namely in the medium category, in addition there was a significant difference between the experimental and control classes with a value of Sig. (2-tailed) = $0.010 < 0.05$. The results of the effect size test also showed that 10.8% had an effect on the effectiveness of the use of E-LKPD in learning. This proves that the use of STEM-based E-LKPD is effective in improving student learning outcomes. Advanced research can integrate other 21st-century capability indicators such as creativity, collaboration, and communication to strengthen students' holistic competencies.

Keywords: E-LKPD; STEM; Praiseworthy Morals; Learning Outcomes; Islamic Ethics

INTRODUCTION

Technological developments in the global era have completely transformed the educational landscape, presenting significant challenges related to student ethics and learning behavior. Today's students are considered digital natives, accustomed to the convenience of technology. However, problems are also beginning to emerge, particularly with students' seemingly stagnant learning interests. This is caused by several factors, such as monotonous learning conducted by teachers who are not at peace with technological developments (Pohan et al., 2022). Relevant education today is required to balance knowledge with morals and character (Pasaribu, 2022). In this context, the use of technologies such as e-learning and E-LKPD (Electronic Student Worksheets) presents both an opportunity and a challenge in shaping commendable character. Technology integration must be accompanied by a values approach to produce students who are not only academically competent, but also have good morals (Grosz et al., 2018; Rahayu & Fanreza, 2024). The goal is to encourage the creation of a conducive environment for students to grow and develop in a more positive direction by integrating character education into appropriate academic programs (Fanreza & Pasaribu, 2016).

In the digital era, the teaching and learning process is not only focused in the classroom, but also through digital media, online, and teleconferencing. Sitepu et al. (2022) stated that the Islamic Cartoon Pocket Book learning media can facilitate the learning process by instilling polite behavior in children. Furthermore, the use of digital learning media significantly increases learning motivation (Setiawan & Audia, 2025). However, in its implementation, students must be supervised by teachers so they can choose the positive aspects of technological advances. And teachers, as the primary role, must continuously supervise and be more technologically savvy than students (Fanreza, 2018). Despite the vast potential of technology, learning practices in many madrasas are suboptimal; many teachers still use traditional methods without incorporating in-depth reflection on moral values. As a result, the impact on student moral development tends to be minimal or unmeasurable. Furthermore, the main obstacle faced by teachers is a lack of competence in utilizing digital media sustainably and a stable network (Pasaribu et al., 2019; Susilawati et al., 2024). As a solution, the development of STEM (Science, Technology,

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Engineering, and Mathematics)-based e-LKPD is considered promising. This approach has been proven to combine scientific content with instructional techniques that facilitate reflection on moral values, significantly improving students' scientific literacy and critical thinking (Rizkika et al., 2022). Focusing on developing good morals is crucial because student behavior is increasingly influenced by digital culture, which has the potential to shift basic moral values. Character education without contextual spiritual content will lose its internal strength. These basic values of noble morals are normatively affirmed in Surah Luqman, verses 12-19 of the Quran, which serves as the primary guideline for moral education (Isnaini & Fanreza, 2024). Therefore, digitally packaged media, such as E-LKPD STEM, must be designed appropriately to reinforce these values while supporting efforts to produce a superior generation with noble character in order to welcome Indonesia Emas 2045 (Pasaribu et al., 2024). A number of previous studies have shown the effectiveness of STEM-based E-LKPD in the context of general science (Padh et al., 2024; Rizkika et al., 2022; Sabila et al., 2023). However, a significant gap identified is the lack of research that combines STEM-based E-LKPD in teaching praiseworthy morals explicitly in the Akidah Akhlak. Initial survey data at MAN Dairi confirms that available digital media do not yet systematically contain praiseworthy moral content (such as social etiquette and honesty). Therefore, this study aims to fill this gap by developing STEM-based E-LKPD that specifically contains praiseworthy moral material. The uniqueness of this study lies in the integration of Qur'anic values into the STEM structure through E-LKPD, making it an integrated medium between science, faith, and technology.

METHOD

This study uses a research and development (R&D) development model. The development model chosen is ADDIE (Analysis, Design, Development, Implementation, and Evaluation). The objects in this study were students of grade XI MAN Dairi who studied adab material consisting of an experimental class and a control class. The research subjects were selected using a cluster random sampling technique. The group that became the experimental class was class XI IPA 2 with 30 students, and the control class came from class XI IPA 3 with 31 students. The research instruments used in this study were E-LKPD, a question instrument to determine the effectiveness of E-LKPD use on students' learning outcomes in respectable morals, and a student response questionnaire. Prior to the empirical testing, all instruments underwent feasibility and validation tests. Afterward, the question instruments were empirically tested on 114 grade XII students. A practicality test was also conducted to assess whether the developed product was practical. Data collection was conducted using test and questionnaire techniques, to see the results of the assessment of media experts and material experts as well as student responses to the developed E-LKPD. The data analysis technique used SPSS 26 to analyze descriptive statistics. Furthermore, an effectiveness test will also be carried out which includes prerequisite tests, namely the normality test, homogeneity test, One Way ANOVA, N-Gain Test, independent sample T test, and effect size test to determine the effectiveness of using E-LKPD.

RESULTS AND DISCUSSION

This research has produced a flipbook-based E-LKPD (Electronic Student Worksheet) teaching material. This E-LKPD was developed using the CANVA application. The material in this E-LKPD includes Islamic Religious Education (PAI) material on commendable morals. This research uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. The analysis stage is the initial step in the process of developing STEM-based E-LKPD on the topic of Commendable Morals. This stage aims to obtain a real picture of the learning conditions, student needs, student characteristics, and the suitability of the curriculum used as a basis for product development. The analysis activity was carried out through interviews with teachers of the subject of Akidah Akhlak and the distribution of questionnaires to students using Google Forms for easier access and reach. The questionnaire was distributed to 114 students of grade XII MAN Dairi as the research sample.

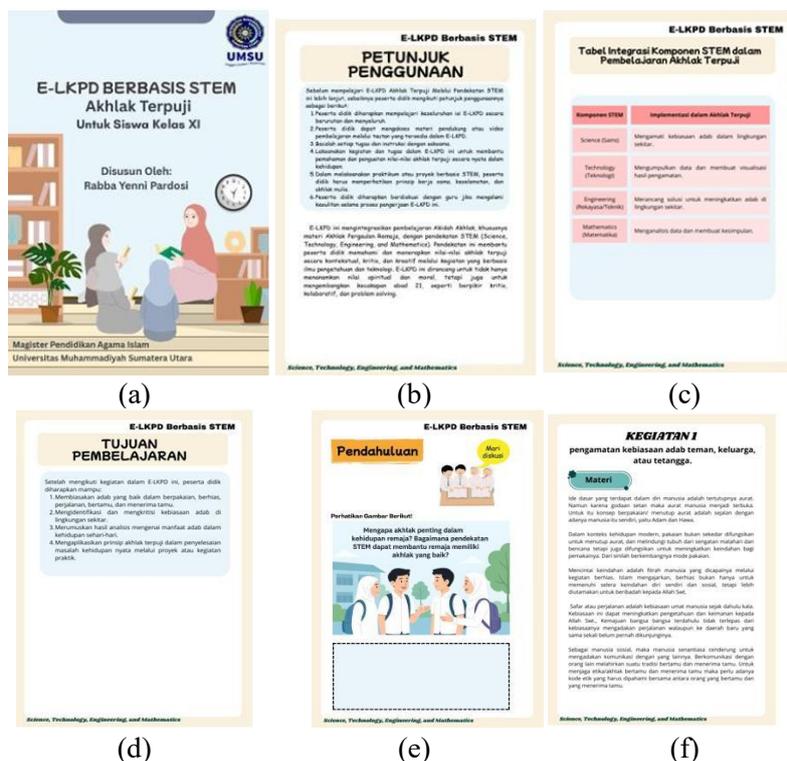
The survey results showed that 68.18% of students still use textbooks as their primary learning resource, while 91% are unable to create projects in their Akidah Akhlak (Islamic Creed) lessons. This indicates that the learning process is still teacher-centered and does not provide sufficient space for students to be creative or think critically. Therefore, innovative learning media are needed that can increase active student participation while utilizing digital technology, one of which is through the development of STEM-based E-LKPD. Analysis of student characteristics shows that the majority of students have adequate digital devices to support the use of electronic media. As many as 96.8% of students own smartphones, 67.7% own laptops, and 77.4% use the internet for learning. These data indicate that the implementation of digital media is very possible in the MAN Dairi learning environment. This finding is also in line with the views of Rahayu and Fanreza (2024), who emphasized

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that the use of educational technology can increase student interest in learning, especially Generation Z, who are accustomed to using digital devices. In addition, a curriculum analysis was conducted to examine the suitability of the E-LKPD design with applicable education policies. Based on the results of interviews with teachers, it was discovered that grade XII MAN Dairi has implemented the Merdeka Curriculum. This curriculum emphasizes strengthening the profile of Pancasila students, namely faith, devotion to God Almighty, and noble character. The material on Commendable Morals has high relevance to these dimensions because it includes the habituation of polite behavior, responsibility, and social etiquette in everyday life. The theoretical studies referred to in this study, as proposed by Haneef (2005) and Sarjuni (2012), emphasize that morals are not enough to be understood conceptually, but need to be realized through habits and meaningful learning experiences. Therefore, this analysis reinforces the need to develop innovative learning media in the form of STEM-based E-LKPD that not only conveys concepts but also trains analytical skills, critical thinking, and reflection on moral values in real-life contexts.

In this analysis stage, the researcher also collected various supporting sources used in product development. The material source was obtained from the Akidah Akhlak book published by the Ministry of Religious Affairs, while the image source came from a free image provider website that is legally used for educational purposes. The development resources used the Canva application for visual design and the Liveworksheet.com website for creating interactive worksheets. Overall, the analysis results indicate that the learning conditions of Akidah Akhlak at MAN Dairi are in dire need of innovative technology-based teaching materials that are able to integrate moral values with scientific and social contexts through a STEM approach. The design phase was carried out to develop an initial draft of the STEM-based E-LKPD on the topic of Commendable Morals. This activity included planning the appearance, content structure, and selecting the digital media to be used. The E-LKPD was designed using Canva and Liveworksheet.com so that it can be accessed interactively through digital devices. The product structure consists of an introduction page, user instructions, learning outcomes, indicators, STEM-based activities, reflection exercises, and evaluations. Each activity is structured so that students can connect moral concepts with everyday life phenomena through scientific stages that reflect elements of science, technology, engineering, and mathematics. The content is presented in communicative language, accompanied by illustrations and case examples relevant to the students' environment. This design also emphasizes strengthening moral values such as honesty, responsibility, and social care through small project-based activities and self-reflection. The following are the results of the learning media design:



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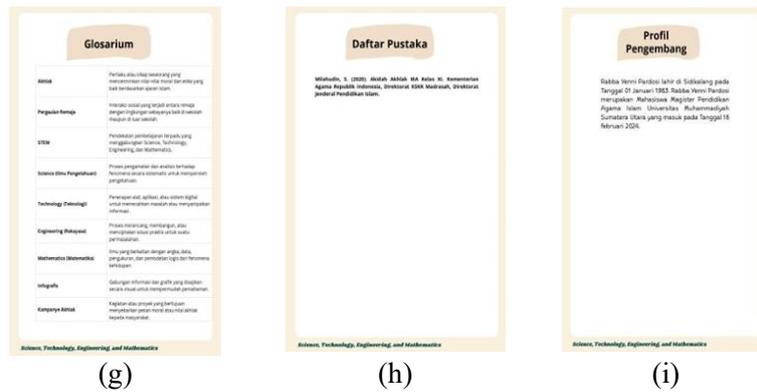


Figure 1. Results of E-LKPD Design, (a) cover page, (b) instructions for use, (c) STEM integration in learning, (d) learning objectives, (e) introduction, (f) STEM-based learning activities, (g) glossary, (h) bibliography, (i) profile developer

The E-LKPD components consist of several main parts as shown in Figure 1, namely: (a) a cover page containing the subject identity and activity title; (b) user instructions explaining the steps for independent and collaborative learning; (c) STEM integration in learning that links elements of science, technology, engineering, and mathematics in the context of commendable morals; (d) learning objectives formulated in accordance with the achievements of the Independent Curriculum; (e) an introduction containing learning motivation and an introduction to activities; (f) STEM-based learning activities that guide students to observe, analyze, and reflect on moral values through social phenomena around them; (g) a glossary containing important terms; (h) a bibliography listing references; and (i) a developer profile as information on the compiler's identity.

Each section is designed in an integrated manner to support active student engagement. Activities in the E-LKPD combine moral concepts with real-world applications based on science and technology. For example, observing social habits in the surrounding environment is integrated with the stages of STEM thinking: observing phenomena (science), utilizing digital media (technology), designing simple solutions (engineering), and performing logical calculations (mathematics). The visual design is created in soft colors with contextual illustrations to attract students' attention, while the navigation structure allows direct interaction without losing focus on moral values. The results of this design indicate that the E-LKPD not only presents material informatively but also fosters students' critical, reflective, and collaborative thinking skills in accordance with the characteristics of 21st-century learning. With this approach, students not only receive knowledge but are also actively involved in solving real-world problems. This is in accordance with the statement of Rahmawati et al. (2019) that STEM learning encourages students to be directly involved in the process of searching for concepts and applications in everyday life.

The development stage was carried out after the initial design of the STEM-based E-LKPD was completed. To ensure product feasibility, expert validation was conducted involving four validators, consisting of three Aqidah Akhlak subject teachers and peer review. Validation was carried out to assess the presentation, language, content, and design aspects of the E-LKPD. Each validator provided an assessment according to the aspects being assessed. Indonesian language teachers assessed the language aspect, while Aqidah Akhlak teachers assessed the presentation, content, and design aspects of the E-LKPD. The validators used consisted of three Aqidah Akhlak teachers and three Indonesian language teachers. The validation results are shown in Table 1.

Table 1. Results of E-LKPD validation calculations

Aspect Assessed	Validator			Average	Criteria
	1	2	3		
Presentation	94%	92%	96%	94%	Very Worthy
Language	95%	93%	94%	94%	Very Worthy
Contents / Material	96%	95%	97%	96%	Very Worthy
Design E- LKPD	97%	94%	96%	95.67 %	Very Worthy
Average Overall	95.5 %	93.5 %	95.75 %	94.9 %	Very Worthy

The validation results show that the E-LKPD obtained an average score of 94% in terms of presentation, 94% in language, 96% in content/material, and 95.67% in design, with very good criteria. These validation results are in line with research by Rizkika et al. (2022) and Sabila et al. (2023) which showed that STEM-based E-LKPD

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has a very good level of validity. However, this study has its own advantages because it integrates Islamic moral values, so that the product is not only academically valid but also relevant in character building. Amal Salim Kadhim et al. (2017); Cohen & Morse (2014), emphasize that moral education must be developed through an innovative approach so that values can be embedded more deeply. The content aspect was assessed as being in line with the learning outcomes of the Independent Curriculum and capable of integrating commendable moral values into a scientific context. The display aspect was deemed attractive and communicative, while the media aspect was deemed easily accessible and efficient for use in digital learning. Based on the validator's suggestions, minor revisions were made to the layout, color matching, and clarity of instructions. After the improvements were made, the final product was declared ready for implementation in learning. In addition, the learning instrument test was also conducted including validity, reliability, and level of difficulty. The empirical test was conducted on 114 students of class XII MAN Dairi, majoring in religion, with a total of 30 multiple-choice questions, consisting of 15 pretest questions and 15 posttest questions. The purpose of the empirical test was to: determine the validity of the questions based on student responses, determine the level of difficulty of the questions, and assess the practicality of the questions before being used in E-LKPD as a pretest, posttest, and additional evaluation. The results of the empirical test showed: all questions were declared valid and reliable.

The results of the pretest item validity test showed that all questions had a calculated r value greater than the r table (0.184) so it can be concluded that all pretest items were declared valid. The lowest calculated r value was found in question number 1 at 0.268 and the highest value was found in question number 14 at 0.627. Thus, the fifteen pretest items used in this study were suitable for use because they met the instrument validity criteria. Meanwhile, the results of the posttest item validity test showed that all questions had a calculated r value greater than the r table (0.184) so all posttest items were declared valid. The lowest calculated r value was found in question number 1 at 0.349, while the highest calculated r value was found in questions number 8 and 13 at 0.780. Thus, the fifteen posttest items were suitable for use in this study because they met the instrument validity criteria. This aligns with research by Rahmawati et al. (2019), which also found that test instruments with good validity are able to measure students' abilities according to the established indicators. Validity is key to ensuring that test items truly reflect the competencies being assessed, particularly in measuring critical thinking skills in the topic of Commendable Morals.

The results of the pretest item reliability test obtained a Cronbach's Alpha value of 0.760 with a total of 15 items. This value is in the reliable category, so the pretest instrument can be trusted for use in research. Furthermore, the results of the posttest item reliability test showed a Cronbach's Alpha value of 0.874 with a total of 15 items. This value is in the reliable category with a higher level of reliability than the pretest. This is in line with the findings of Yuliasari et al. (2024) that STEM-based learning requires reliable instruments to truly reflect the expected improvement in 21st-century skills. The high reliability in this study indicates that the test is truly stable as a measuring tool for improving students' critical thinking skills. The results of the reliability test are shown in Table 2.

Table 2. Results of the Pretest Item Reliability Test

	Cronbach's Alpha	N	Category
Pretest	0.760	15	Reliable
Posttest	0.874	15	Reliable

Based on the results of the pretest difficulty level test, it was found that out of 15 questions, 14 were in the medium category and 1 was in the easy category, namely question number 11. These results indicate that most of the pretest questions were in the medium category with a difficulty index ranging from 0.30–0.70, while easy questions had a difficulty index of more than 0.70 (Arikunto, 2010). This composition indicates that the pretest questions were proportional and suitable for use because the majority of the questions were in the medium level of difficulty so that they were able to distinguish the initial abilities of students before being given treatment. Furthermore, based on the results of the posttest difficulty level test, it was found that out of 15 questions, 13 were in the medium category and 2 were in the easy category, namely question number 1. These results are consistent with the pretest, namely the majority of questions were in the medium category. This posttest instrument also met the criteria for question quality because the distribution of difficulty levels was balanced and there were no questions in the difficult category. This aligns with research by Dewy et al. (2022), which emphasized that questions in the STEM context must be structured proportionally to foster students' critical, creative, and innovative traits. Therefore, both the pretest and posttest questions can be concluded as suitable for use as

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measuring tools for student learning outcomes, as they meet the recommended difficulty level criteria: a greater number of questions of moderate difficulty, a small number of easy questions, and none that are too difficult. The implementation phase was conducted to test the practicality and effectiveness of STEM-based E-LKPD in learning Commendable Morals after being declared very feasible by experts. The trial was conducted at MAN Dairi involving two classes, namely class XI IPA 2 as the experimental class using STEM-based E-LKPD and class XI IPA 3 as the control class using conventional LKPD. The number of students in each class was 30 and 31 people. The implementation was carried out for three meetings with collaborative and reflective learning methods adapted to the activities in E-LKPD. Before and after learning, pretests and posttests were conducted to assess improvements in learning outcomes. The results of the post-test assessment of students at the summative evaluation stage were used to determine the level of effectiveness of E-LKPD. Based on the data obtained, the measure of central and dispersion of student scores can be presented in Table 3.

Table 3. Measures of central tendency and distribution of pretest and posttest data

Data	Experiment		Control	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Minimum	53	67	53	60
Maximum	93	100	87	93
Average	72.17	86.23	68.29	80.58

Based on the data in Table 3, the pretest score for the experimental class was 72.17 and the control class 68.29. After treatment was given to the experimental class, the post-test score for the experimental class was higher, with an average score of 86.23 and for the control class 80.58. This indicates that descriptively, student learning outcomes in the experimental class were higher than those in the control class. This finding is in line with Arikunto's (2010) opinion that improvements in learning outcomes can be seen through a comparison of the average scores of the treated and untreated groups. This finding is also consistent with the research of Rizkika et al. (2022) which proved that STEM-based E-LKPD can significantly improve critical thinking skills and student learning outcomes. Prior to hypothesis testing, prerequisite analysis tests were conducted, including normality and homogeneity tests, to ensure the data met parametric assumptions. The normality test was conducted using the Shapiro-Wilk test in SPSS version 26.0. The results of the normality test are shown in Table 4.

Table 4. Normality Test Results

Data	Shapiro Wilk			
	Experiment		Control	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Statistical	0.948	0.937	0.941	0.933
Df	30	30	31	31
Sig	0.153	0.074	0.087	0.053
Information	Normal	Normal	Normal	Normal

The results of the normality test using Shapiro–Wilk showed that the pre-test and post-test data in both the experimental and control classes were normally distributed. This is indicated by the significance values (Sig.) which were all greater than 0.05, namely for the pre-test of the experimental class of 0.153, the post-test of the experimental class 0.074, the pre-test of the control class 0.087, and the post-test of the control class 0.053. Thus, it can be concluded that the normality assumption is met, so that the data is ready to be analyzed using parametric tests. Next, a homogeneity test was conducted which aims to determine the equality of variances, or whether the samples come from a homogeneous population or not. The analysis was carried out using the SPSS 26 program by looking at the Box's M statistical test or Levene's test. The results of the homogeneity test are shown in Table 5.

Table 5. Results of Homogeneity Test

	Lavene Statistics	df1	df2	Sig.
<i>Pretest</i>	0.358	1	59	0.552
<i>Posttest</i>	0.013	1	59	0.909

Based on Table 5, the results of the homogeneity test using Levene's Test show that the significance value (Sig.) for the pre-test is 0.552 and for the post-test is 0.909, both greater than 0.05. This indicates that the variance of pre-test and post-test scores between the experimental and control classes is homogeneous. This finding is in line with Arikunto's (2010) opinion that improvements in learning outcomes can be seen through a comparison of the average scores of the treated and untreated groups. This finding is also consistent with the research of Rizkika et al. (2022) which proved that STEM-based E-LKPD can significantly improve critical thinking skills and student learning outcomes. Thus, the homogeneity assumption is met, so the data is ready to be analyzed using parametric tests to determine the effect of using E-LKPD on student abilities. Next, a One-Way ANOVA test, or test of differences in students' initial abilities, was conducted to determine whether there were similarities or differences in students' initial abilities between the experimental and control classes. The test results are shown in Table 6.

Table 6. One-Way ANOVA Test Results

	Sum of Squares	Mean Square	F	Sig.
<i>Pretest</i>	229,086	229,086	2,861	0.096

Based on Table 6, the analysis results show that for the pre-test, the F value = 2.861 with a significance (Sig.) = 0.096, which is greater than 0.05. This indicates that there is no significant difference in the initial abilities of students between the experimental class and the control class, so it can be said that both groups have equal initial abilities. To test the effectiveness of the use of STEM-based E-LKPD on student learning outcomes, an N-Gain test was conducted to measure learning effectiveness by comparing score increases between the pretest (before learning) and posttest (after learning). The results obtained based on the N-Gain test are displayed in Table 7.

Table 7. N-Gain Test Results

Class	Mark N- Gain	Information
Experiment	0.516	Currently
Control	0.384	Currently

Based on the N-Gain test results, the experimental class had an N-Gain value of 0.516, which is in the moderate category, while the control class had an N-Gain value of 0.384, which is in the moderate category. This indicates an increase in the average score after the treatment. The next step is to test the difference in the average post-test results between the experimental and control classes. This test uses the Independent-Samples T-Test because the data meets the assumptions of normality and homogeneity. This test can determine whether there is a significant difference between the two groups after being given the treatment. The results of the effectiveness test analysis are shown in Table 8 below.

Table 8. Results of the Independent Samples Test

	Independent Samples test				
	Lavene Test		t- test		
	F	Sig	t	df	Sig (2- tailed)
Equal Variances Assumed	0.013	0.909	2,674	59	0.010
Equal Variances not Assumed			2,675	58,996	0.010

Based on the results of the Independent-Samples T-Test shown in Table 7, it is known that the Levene's Test for Equality of Variances value shows significance of 0.909 (greater than 0.05). This means that the post-test data in the experimental and control classes have homogeneous variances, so the interpretation of the t-test results uses the Equal variances assumed row. Based on the 2-tailed Sig. value obtained at 0.010. This shows that the 2-tailed Sig. value <0.05 so that the difference in learning outcomes between the experimental and control classes is

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declared significant. This means that the use of STEM-based E-LKPD has been proven effective in improving student learning outcomes compared to learning in the control class. This finding is supported by Hillmayr et al (2020) who emphasized that interactive digital learning media has a significant impact on improving learning outcomes, as well as by Padh et al (2024) who found that STEM-based E-LKPD improves students' creativity and academic achievement. Additionally, an effect size test was conducted to measure the magnitude of the difference or effect between the experimental and control classes. The results of the effect size test are shown in Table 9.

Table 9. Effect size test results

F	Sig	Partial Eta Squared
7.1520	0.010	0.108

Based on the results of the statistical analysis conducted, it can be concluded that there are significant differences in learning outcomes between class groups after being given treatment. The results of the ANOVA test on the posttest showed a value of $F = 7.152$ with a significance of $p = 0.010$ ($p < 0.05$), which indicates that the differences that occurred between groups were not due to chance factors. Furthermore, the magnitude of the resulting effect is included in the medium category with a Partial Eta Squared (η^2) value of 0.108. This indicates that the class variable is able to explain approximately 10.8% of the variance of the posttest learning outcomes achieved by students. Thus, it can be concluded that the intervention or treatment applied to class groups has a significant influence on improving student learning outcomes.

The final stage in ADDIE development is the evaluation stage. Formative evaluation is carried out at the end of each stage in the form of product revisions before proceeding to the next stage (Mulyatiningsih, 2019). Summative evaluation of the developed E-LKPD is to determine the results of the E-LKPD feasibility analysis, the practicality of the E-LKPD and to determine student learning outcomes. The results of product development obtained E-LKPD with a STEM approach included in the very feasible category with a percentage of 94.9%, the practicality of E-LKPD is included in the very good criteria with an average of 94%, and based on data from the independent samples test results, the Asym.Sig (2-tailed) value is $0.010 < 0.05$. In addition, it can be concluded that there is an increase in student learning outcomes in the experimental class, in line with the findings (Hillmayr et al., 2020; Rizkika et al., 2022) that STEM-based E-LKPD media is effective in improving learning outcomes and critical thinking skills. Thus, this STEM E-LKPD has validated previous research findings regarding the effectiveness of electronic media in encouraging improved learning outcomes and critical thinking skills, and is ready to be implemented more widely in learning contexts.

CONCLUSION

The results of the study indicate that the STEM-based E-LKPD on the Praiseworthy Morals material is proven to be feasible, practical, and effective for use in learning Aqidah Akhlak. The expert validation results obtained an average of 94.9% with a very feasible category, while the practicality test reached 94% with a very good category. The effectiveness test through the Independent-Samples T-Test showed a significance value of $0.010 < 0.05$, which means there is a significant difference in learning outcomes between the experimental class and the control class. Thus, the use of STEM-based E-LKPD has a positive effect on improving student learning outcomes while supporting the strengthening of Islamic moral values in the context of 21st-century learning. Further research is recommended to develop STEM-based E-LKPD on different materials and educational levels so that the results are broader and more general. Further development can also be directed at the integration of mobile learning-based media to make it more interactive and easily accessible. In addition, future research can add qualitative analysis to explore the influence of E-LKPD on the formation of character and moral values of students in more depth.

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