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THE EFFECTIVENESS OF ACID-BASE LEARNING USING ARABIC JAWI CHEMISTRY MODULES ON IMPROVING STUDENT LEARNING OUTCOMES IN ISLAMIC BOARDING SCHOOLS

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ABSTRACT
This study was motivated by low learning outcomes among students in acid-base material, attributable to ineffective learning resources and a learning process oriented toward the teacher as the primary source of instruction. Chemistry instruction in Islamic boarding schools requires innovative learning resources to support an effective learning process and improve student learning outcomes. This study aims to assess the effectiveness of the Arabic Jawi chemistry module on students' learning outcomes in acid-base chemistry and to examine their responses to the learning process. This study employed a pre-experimental one-group pretest-posttest design. The sample consisted of 27 students XI IPA at a modern boarding school in Banda Aceh City. Data were collected using tests and questionnaires. The effectiveness of the module was assessed using the N-Gain Score, a paired-samples t-test, and an effect-size test. The research results yielded an N-Gain score of 0.60, which is categorized as high, thereby supporting the alternative hypothesis (Ha). The effect size score was 0.91, classified as highly effective. The students demonstrated a high level of interest (86.75%) in the learning process. Therefore, it was concluded that the Arabic Jawi chemistry module is highly effective in improving students' acid-base learning outcomes at the boarding school.

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INTRODUCTION

Islamic boarding schools are one of the subsystems of national education that are indigenous, which is rooted in the culture and is still innate, original, and natural (Achmad, 2020). Islamic boarding schools have grown and emerged as a form of education in Indonesia. The Islamic boarding schools' education system is unique, especially in shaping its traditions. This is clearly seen in the categorization, classification, objectives, functions, principles, learning methods, and curriculum.

The curriculum used in Islamic boarding schools is integrated (Ali et al., 2022). The integrated curriculum combines several curricula, such as those of the Ministry of Religious Affairs, foundations, and Islamic boarding schools. In the era of competition and globalization, boarding schools need an integrated curriculum as a foundation for the future development of pesantren education. The integrated curriculum seeks to optimize learning in boarding schools to achieve educational goals effectively and efficiently.

Aceh has two types of boarding schools: salaf (traditional) and khalafi (modern), also known as boarding schools (Zuhairati et al., 2022). Students in modern boarding schools study general and religious sciences, and religious education is superior to all other subjects taught, particularly instruction using the kitab. For example, Kitab Kuning in Arabic Jawi, such as the Kitab Perukunan and the Kitab Tasawwuf. There is also the Kitab Jurumiyah on nahwu science, which also uses Malay and Arabic Jawi (Afifah, 2019).

Learning in Islamic boarding schools focuses on books written in Arabic Jawi (Suasana et al., 2022). Therefore, Islamic boarding schools generally use Jawi Arabic as a textbook in their curricula. In order for students to have a strong motivation to study Islam, pesantren require their students to speak Arabic and study Arabic jawi books written in Arabic Jawi or Arabic (Zulkhairi, 2020).

Tgk Chiek Oemar Diyan is one of the modern Islamic boarding schools in Aceh (Ubbaidillah & Evayani, 2020). This pesantren employs an integrated curriculum drawn from the Ministry of Religious Affairs, the dayah, and the Gontor curricula. The curriculum guides Tgk Chiek Oemar Diyan Islamic boarding schools in integrating academic and religious subjects (Safrida, 2022). The Ministry of Religious Affairs curriculum is used to apply the general field of science in learning. This is achieved by selecting several general subjects required by students and then organizing them so that they can be used to learning. General subjects at this pesantren include various fields of science, including chemistry.

Based on observations at the pesantren, students face difficulties in learning chemistry, particularly acid-base concepts, due to limited learning resources. The textbook materials used are considered ineffective. As a result, students record only what the teacher says, leaving no learning resources to support the learning process. This also significantly impacts the students' low understanding of the concepts of the material taught so that the learning outcomes are low. Low chemistry learning outcomes among students may be attributable to the continued use of ineffective learning resources (Lela et al., 2023). In addition, the chemistry learning process remains teacher-dominated, with the teacher as the primary source of instruction, resulting in ineffective learning (Bistari, 2018).

One approach to improving student learning outcomes in acid-base chemistry is the use of appropriate teaching materials (Rahmi, 2023). The use of modules as teaching materials (Aisyah et al., 2020) can increase students' interest in learning (Handayani et al., 2022). Modules as teaching materials have also proven effective in improving students' creative thinking skills and independence in learning chemistry (Putri & Azhar, 2023). Modules provide a systematic learning environment that motivates students to participate actively and creatively throughout the learning process,

thereby achieving learning objectives.

The innovation of teaching materials that can be used to improve student learning outcomes in acid-base learning at Tgk Chiek Oemar Diyan Islamic boarding school is the Arabic Jawi Chemistry Module (Nazira, 2023). This is strongly supported by the pesantren background, which is accustomed to using Arabic Jawi books in instruction; therefore, teachers can use this Arabic Jawi chemistry module as a learning resource in chemistry.

Research on the utilization of Arabic Jawi modules as teaching materials has been reported by Hasibuan (2023). The results of her study showed that the Arabic Jawi module improved students' learning outcomes in petroleum materials. However, the research has not measured the effectiveness of the Arabic Jawi module as a teaching material used in the learning process. The effectiveness of learning (Bistari, 2018) is essential to measure to determine whether a learning process has been successfully carried out.

Based on the problems, this study aims to measure the effectiveness of the Arabic Jawi chemistry module in improving the learning outcomes of students on acid-base learning, and reveal the students' responses to the learning process carried out at the Tgk Chiek Oemar Diyan Modern Islamic Boarding School.

METHODS

This study employed a quantitative approach using the pre-experimental One-Group Pretest-Posttest Design (Sugiyono, 2018). Based on this design, this study involved one class group whose learning outcomes were measured before and after the acid-base learning process using the Arabic Jawi chemistry module. The population of this study was students of class XI IPA at MAS Tgk Chiek Oemar Diyan, totaling 80 people. Furthermore, students of class XI IPA 3, totaling 27 people, were selected as research samples using a purposive sampling technique (Kusumastuti et al., 2024) based on the consideration of the lowest learning outcomes data.

Learning outcomes were measured using a written test comprising 10 multiple-choice questions with five answer options. The data were collected by administering a pre-test at the beginning of the learning period and a post-test at the end, using the Arabic Jawi chemistry module, with 25 minutes allocated to each. Furthermore, students provide feedback on the learning process by completing a 20-minute questionnaire.

Data on student learning outcomes were analyzed using the N-Gain test to measure individual learning gains (Rahmi et al., 2024), as follows:

$$\text{N-Gain} = \frac{S\ posttest - S\ pretest}{S\ maximum - S\ pretest} \quad \ldots 1)$$

The individual N-Gain scores were then averaged to determine the classical N-Gain score, which was interpreted based on the following criteria (Hake, 2002).

Table 1. N-Gain score criteria

N-Gain score	Criteria
$g < 0.3$	Low
$0.3 \leq g \leq 0.7$	Medium
$g > 0.7$	High

The effectiveness of the Arabic Jawi chemistry module was assessed using effect size analysis, a normality test, and a paired-samples t-test. The data normality test used the Shapiro-Wilk test and continued with the paired sample t-test to test the following research hypothesis. Ha is accepted if Sig < 0.05, while if Sig> 0.05, then H_0 is accepted (Giovany, 2017).

H_0: There is no significant effect of acid-base learning using the Arabic Jawi chemistry module on improving the learning outcomes of students in class XI.

H_a: There is a significant effect of acid-base learning using the Arabic Jawi chemistry module on improving the learning outcomes of students in class XI.

The effect size test (Riyanto & Hatmawan, 2020) is carried out by determining the effect size score using the following formula.

$$Effect\ Size = \frac{t^2}{t^2+df} \quad ...2)$$

With,
t = t calculated from the paired sample t-test
df = degree of freedom

The magnitude of the effect of acid-base learning using the Arabic Jawi chemistry module on improving student learning outcomes is then interpreted based on the following criteria (Budinarianti & Susiyawati, 2024).

Table 2. Effect size criteria

Effect size score	Effect
ES < 0,.	Less effective
0.3 < ES < 0.5	Moderately effective
ES > 0.5	Very effective

Learners' responses to the learning process were calculated using the following formula (Sudijono, 2015). The percentage of response obtained is then interpreted based on the criteria (Sugiyono, 2018) in Table 3.

$$p = \frac{f}{n}\ x\ 100\% \quad ...3)$$

With,
p = Response Percentage
f = Frequency of learner respons
n = Total number of answer

Table 3. Criteria for student response to learning

Score	Criteria
82 - 100	Very interested
63 – 81	Interested
44 – 62	Less interested
25 – 43	Not interested

RESULT AND DISCUSSION

Data on student learning outcomes in acid-base learning using the Arabic Jawi chemistry module are presented in Table 4 below.

Table 4. Comparison of learning outcome scores

Number of students	Average score	
	Pre-test	Post-test
27	43,3	78,8

As shown in Table 4, the average pre-test score is 43.3, and the average post-test score is 78.8. A comparison of the two tests indicates an improvement in learning outcomes after students use the Arabic Jawi chemistry module for acid-base learning. The increase in learning outcomes was then analyzed using the N-Gain score to assess the extent of the improvement.

Table 5. N-Gain score test results

Average score		N-Gain score
Pre-test	Post-test	
43,3	78,8	0,60

Based on the data in Table 5, the classical N-Gain Score is 0.60, indicating a moderate category. This finding indicates that the use of the Arabic Jawi chemistry module can improve students' acid-base learning outcomes. The results of this study are consistent with research by Putri & Azhar (2023), which reports that learning chemistry through an acid-base module based on problem-based learning can improve student learning outcomes, with an average N-Gain Score of 0.61. In addition, Lela et al. (2023) reported an average N-Gain Score of 0.58 for the use of POE-based chemistry modules in learning solution concepts. Based on these scores, both studies show an increase in student learning outcomes in the moderate category.

Table 6. Normality test results of learning outcomes score

Data	Sig.
Pre-test score	0,145
Post-test score	0,139

The results of the normality test in Table 6 indicate that the student learning outcomes data have a significant p-value greater than 0.05. The research data suggest that the pre-test and post-test scores are normally distributed. Furthermore, a paired-samples t-test was conducted to assess whether there was a significant difference between students' pre-test and post-test scores in acid-base learning using the Arabic Jawi chemistry module. The test is essential in quantitative research that involves measuring learning outcomes before and after acid-base learning using the Arabic Jawi chemistry module to determine the effectiveness of the learning (Rahmani et al., 2025).

Table 7. The result of hypothesis test

t	df	Sig.2-tailed
-16,48	26	0,000

By comparing the significance value in Table 7, it can be seen that the Sig. (2-tailed) The p-value obtained from the hypothesis test is less than 0.05, so Ha is accepted (Giovany, 2017). Thus, the paired sample t-test results show that the pretest score is significantly different from the posttest score (Rahmani et al.., 2025). Based on these findings, it can be concluded that there is a significant effect of acid-base learning using the Arabic Jawi chemistry module on improving the learning outcomes of XI students. The results of this study are in line with the research of Mufida et al. (2022), who reported that the results of the paired sample t-test showed a difference in the mean scores of the pretest and posttest. This finding indicates the effect of using electronic modules in improving student learning outcomes on atomic structure material.

Furthermore, the effect size test was conducted to measure the effect of using the Arabic Jawi chemistry module on improving student learning outcomes in acid-base learning. The results of the effect size analysis are presented in Table 8 below.

Table 8. The result of effect size test

t	df	ES score
-16,48	26	0,912

The effect size test results in Table 8 obtained a score of 0.912. Based on these findings, it can be concluded that the use of Arabic Jawi chemistry modules in acid-base learning is highly effective in improving students' learning outcomes at the Tgk Chiek Oemar Diyan Modern Islamic Boarding School. This finding is consistent with the research of Hilwannisa et al. (2025), which reports that the use of modules is highly effective in improving student learning outcomes in additive materials, with an effect size of 0.89.

Students gave a positive response to acid-base learning using the Arabic Jawi chemistry module. This finding is evidenced by an 86.75% response rate under very specific criteria. Learning acid-base using the Arabic Jawi chemistry module is a new thing that is fun for students. This is supported by research by Gola et al. (2022), which states that the use of modules in learning gets a very good response from students, with a percentage of 75.78%. The use of electronic modules is new, so students feel happy to follow the learning process.

Based on students' responses, it is known that the use of Arabic Jawi chemistry modules also increases their curiosity and interest in learning. This is evidenced by an increase in student learning outcomes. The findings of this study align with Lumbantobing's (2023) research, which reports that the use of modules can help students build conceptual

understanding from their curiosity and interest in learning. Learners can explore a variety of new ideas and connect them with their prior knowledge. Through this connection, students can solve problems better.

Students' responses also indicate that learning acid-base chemistry using the Arabic Jawi chemistry module can improve students' ability to read Arabic Jawi. This shows that students are very interested in participating in the learning process. The findings of this study are supported by Kamza et al. (2021), which states that the use of Arabic teaching materials in the learning process has a positive and significant impact on increasing students' interest in learning.

CONCLUSION

Students' learning outcomes increased significantly, indicating that the Arabic Jawi chemistry module is highly effective in improving students' learning of acid-base materials at the Tgk Chiek Oemar Diyan Modern Islamic Boarding School. Students reported a strong interest in using the Arabic Jawi chemistry module to learn acid-base concepts. The results of this study provide essential information for chemistry teachers to develop more effective teaching materials, apply innovative learning methods to increase student motivation and learning outcomes, and develop a chemistry curriculum that is more relevant to students in pesantren.

Future research is expected to test the effect of using the Arabic Jawi chemistry module on students' interest and learning outcomes by employing experimental designs with random samples to draw more representative conclusions. Further research should employ alternative research instruments and a more appropriate time for data collection.

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