



Project-Based Learning Using Animation Media to Enhance Arabic Speaking Skills in Pre-Service Teachers

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ABSTRACT

Background: University-level Arabic language learning frequently encounters challenges in cultivating authentic communicative competence due to reliance on monotonous instructional methods. Although audio-visual media integration has been widely researched in applied linguistics, studies exploring students' independent production of animated videos as a stimulus for creativity and speaking proficiency remain limited.

Purpose: This study investigates the effects of a project-based learning (PjBL) strategy integrated with animated digital video production on students' creativity and Arabic speaking skills (*maharah al-kalam*).

Methods: Using a quasi-experimental design, 127 university students in the Islamic Primary Education Teacher (PGMI) program were divided into an experimental cohort ($n = 69$) receiving the PjBL animated video intervention and a control cohort ($n = 58$) receiving traditional instruction. Data were collected using validated rubrics assessing speaking competence across five dimensions and creativity across four dimensions, with content validity from two experts and reliability confirmed by Cronbach's Alpha ($\alpha = 0.85$) and ICC = 0.88.

Results: As data did not meet normality assumptions, Mann-Whitney U tests were used. Gain scores showed significant differences in creativity ($U = 1,150.50$, $Z = -4.17$, $p = .002$, $r = .37$) and Arabic speaking competence ($U = 1,085.00$, $Z = -4.49$, $p = .001$, $r = .40$) between groups, both medium effects, favoring the experimental cohort.

Conclusions: Transforming students from media consumers into digital content producers is an effective strategy. This multimedia-driven PjBL approach accelerates foreign language communicative competence and fosters creativity essential in modern digital education.

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INTRODUCTION

The era of digitalization has fundamentally changed the landscape of Arabic language education, with the integration of multimedia technology now a prerequisite for achieving authentic communicative competence/*maharah al-kalam* (Almalahmeh, 2026; Sarah et al., 2024; Wahyuni et al., 2026). Bibliometric data show that research on digital learning media in Indonesia has experienced a significant surge in the past decade, confirming the paradigm shift from conventional methods to an interactive technology-based approach (Oktarina et al., 2025). Project-based learning (PjBL) has been widely recognized as a strategy that can increase student engagement and understanding of material



through a real-world context (Chang et al., 2024).

Theoretically, the effectiveness of animated videos in stimulating language skills is based on the cognitive theory of multimedia learning (Nagarajan & Muniisvaran, 2025; Ramezanali & Faez, 2019; Wijaya et al., 2023). This theory emphasizes dual-channel processing, in which the human brain processes visual and auditory information separately but simultaneously to build a stronger mental representation. In the PjBL project, the integration of the Arabic dialogue narrative with animated visuals helps in cognitive load management, thus facilitating vocabulary retention and understanding of complex sentence structures (Alhazmi, 2024; Rosalis & De Oliveira, 2023; Abdul Hamid et al., 2020). The application of this multimedia cognitive approach has been proven to significantly increase the motivation and achievement of maharah al-kalam students through active involvement in building an authentic mental representation of language.

Research shows that PBL has a significant impact on various aspects of learning. Project-based learning strategies with animated videos have been shown to increase learning effectiveness, with students treated using this model showing significantly higher scores compared to the control class (Lufiah et al., 2024). Furthermore, the integration of animated videos in project-based learning creates a more interactive learning environment. The integration of multimedia resources, such as animated videos, enhances project-based learning by encouraging active engagement and creativity, thereby creating a more interactive learning environment that motivates students and supports more in-depth learning and academic achievement (Xudayberdiyevna, 2024). Research related to learning Arabic through a project-based approach shows that this method is highly effective in improving student engagement and material comprehension by connecting it to real-world contexts (Masitoh & Aziz, 2025).

Project-based learning is a student-centered approach to learning that is effective in improving several learning outcomes. This approach encourages students to engage in real-world projects through exploration, collaboration, and problem-solving (Fitriany, 2024). Project-based learning opens up new ways to improve students' speaking, writing, listening, and reading skills. Additionally, project-based learning encourages students to be creative, hone critical thinking skills, and develop interpersonal skills because projects are typically conducted in groups.

The effectiveness of project-based learning on the development of speaking skills is also well documented. Project-based learning supported by mobile-assisted language learning (MALL) has proven to be significantly more effective than regular project-based learning or traditional teaching in improving students' speaking performance, covering sub-skills of fluency and coherence, lexical resources, grammar range and accuracy, and pronunciation (Benlaghrissi & Ouahidi, 2024).

Animated videos have become effective learning tools in various educational contexts. Research shows that interactive animated video media based on contextual methods is effective in improving students' reading literacy skills, confirming its effectiveness in improving literacy in educational environments with limited resources (Pujiariani & Cathrin, 2025). More specifically, research on animation media effectively improves the Arabic vocabulary mastery of students, showing positive results in the use of animation for language learning (Aini & Hikmah, 2022).

In the context of language learning in particular, research on project-based learning through animated videos shows that students develop their creativity to visualize the subject matter in the form of animated videos and better understand the subject matter ((Suharto et al., 2024). The study involved 32 vocational students, and the results showed that students responded positively to the process of creating animated videos, including working in groups (65.6%), trying to design their animated videos (62.5%), and enjoying learning to read for specific information (71.9%).

The ability to speak is one of the most important language skills and is often considered the most challenging to develop in language learning. Research on the effectiveness of Discovery Learning supported by animated video media in improving maharah kalam (Arabic speaking skills) showed a substantial improvement, with scores increasing from 55% in the pretest to 84.56% in the posttest in the experimental class (Febiola et al., 2025). The integration of animated video media with appropriate learning methods significantly improves students' communicative competence and participation. The application of the PjBL strategy through animated video media has a significant influence on students' cognitive abilities. This agrees with Sulisty and Lutviana's findings that video creation projects are meaning-making processes that increase the complexity and fluency of speech (Sulisty & Lutviana, 2023).

Language learning creativity can be enhanced through various strategies. Research shows that PBL has a significant positive influence on students' creative thinking skills, with improvements observed in idea generation, critical thinking, and problem-solving abilities (Arifatin, 2023). Collaboration and communication are found to be important elements in fostering creative thinking, and the integration of technology and real-world contexts further enhances students' creativity.

However, a crucial gap exists in the current literature. The majority of research on animated videos in Arabic learning still places students as passive consumers who simply watch content provided by teachers (Uqba et al., 2025; Firdaus & Hidayah, 2024; Mohd Rahimi et al., 2021). While several prior PjBL studies have successfully engaged students as content producers through standard video projects such as vlogs or recorded live-action role-plays these performative tasks frequently induce high camera-related anxiety and focus heavily on physical acting. In contrast, the process of creating animated videos demands a distinct cognitive engagement. It requires students to meticulously synthesize language through storyboarding, character design, and voice synchronization, providing a 'faceless' yet highly interactive avenue that significantly lowers the affective filter. Although PjBL has been extensively researched, research that specifically explores how the "production process" of animated videos by students can function as a cognitive stimulant for creativity and speaking ability is still very limited, especially in the student population of Madrasah Ibtidaiyah Teacher Education (PGMI). Without a deep understanding of the role of students as digital content creators, the potential of PjBL in fostering learning independence and language autonomy cannot be optimally measured.

This research fills this gap by testing the effectiveness of PjBL based on the production of independent animation videos by students. The main focus of this research is not only on the final result of the video but also on how the project stages from the planning of dialogue scenarios to the editing process—contribute to increasing the creativity and fluency of PGMI students. Through this approach, empirical evidence regarding the effectiveness of the integration of creative multimedia in the Arabic language education curriculum in higher education will be obtained.

RESEARCH METHODOLOGY

This study employs a quantitative approach with a quasi-experiment method through the nonequivalent control group design (Tenekedjiev et al., 2025; Kim & Steiner, 2016). This design was chosen because the unit of analysis is student classes (intact groups), which does not allow for individual randomization. The study involved two intact classes, which were allocated to an experimental cohort ($n = 69$) and a control cohort ($n = 58$) via simple cluster randomization (e.g., a coin toss). To mitigate instructor-induced confounding factors and external bias, both cohorts were taught by the same instructor, followed an identical syllabus, and received equal instructional time.

Demographically, the sample consisted of 114 females and 13 males, with an average age ranging from 18 to 20 years old, which is typical for second-semester undergraduate students. Regarding their initial Arabic language proficiency, the students exhibited a heterogeneous background; a portion of them graduated from Islamic boarding schools (pesantren) or Madrasah Aliyah with basic Arabic exposure, while others came from public high schools with minimal to no prior Arabic foundation. Although the initial pre-test scores indicated a noticeable baseline difference between the experimental ($M = 81.1$) and control ($M = 77.2$) groups, this selection bias was methodologically controlled in the final analysis by evaluating the Gain Scores (the net difference between post-test and pre-test) rather than raw post-test scores, thereby ensuring a rigorous measurement of the intervention's actual impact.

The intervention in the experimental group was conducted for 8 weeks with a frequency of two sessions per week. The learning procedure follows the stages of systematic PjBL integrated with digital animation media. First, the Planning Stage (Weeks 1-2): Students brainstorm topics and prepare Arabic dialogue scripts. Second, Production Stage (Weeks 3-6): Students conducted voice-over recording and visual production utilizing the Canva platform. It is important to note that while Canva is not a dedicated 3D animation software, it was deliberately chosen for its accessibility to non-technical students. During this stage, students utilized Canva's built-in video editor, 2D vector elements, and motion features (such as element animations, page transitions, and motion paths) to create dynamic conversational scenes. The character animation process involved selecting customizable 2D avatars, sequencing multiple frames to simulate facial expressions or gestures during dialogues, and synchronizing these visual movements with their recorded Arabic voice-overs. Finally, the synchronized projects were rendered and exported into MP4 video format. Third, Evaluation and Feedback Stage (Weeks 7-8): Video project presentation in front of the class, followed by discussion and peer feedback to improve the language aspect.

Conversely, the control cohort underwent conventional Arabic instruction for the exact same duration and frequency (8 weeks, two sessions per week) under the same instructor, ensuring equal exposure time and syllabus alignment. The conventional learning procedure primarily relied on a teacher-centered approach utilizing standard textbooks and printed materials. Instead of project-based multimedia production, students in the control group were taught through direct instruction, where the lecturer explained vocabulary and grammatical structures, followed by students memorizing pre-written Arabic dialogues. To practice speaking, the control group engaged in traditional, live face-to-face role-playing in front of the classroom. Both cohorts were evaluated using the identical structured speaking performance rubrics and creativity assessments under the exact same testing conditions during the pre-test and post-test phases. This strict alignment ensures a clear treatment contrast, confirming that any differences in learning outcomes are directly attributable to the PjBL animated video intervention rather than discrepancies in instructional time, content, or evaluator bias.

Data were analyzed using descriptive and inferential statistics. Initially, baseline equivalence was assessed by conducting a Mann-Whitney U test on the pre-test scores, which confirmed an initial discrepancy between the cohorts. While Analysis of Covariance (ANCOVA) is traditionally the preferred statistical method to control for such baseline imbalances and selection bias in non-equivalent control group designs, the severe violation of the normality assumption ($p < 0.05$) precluded its valid application.

Consequently, analyzing the Gain Scores (post-test minus pre-test) using the non-parametric Mann-Whitney U test was adopted as the most rigorous alternative constraint by the data distribution. Acknowledging that change scores do not perfectly eliminate selection bias, this non-parametric

approach was specifically chosen because it safely accommodates non-normal distributions while effectively isolating the magnitude of actual intra-individual growth. This provides a more reliable measure of the intervention's impact than direct post-test comparisons under non-parametric conditions. The tests were performed at a significance level of $\alpha = 0.05$ using SPSS software.

RESULTS AND DISCUSSIONS

Table 1. Summary of the Pretest and Posttest Scores

Group	N	Test	Mean	Std. Deviation
Control	58	Pre-test	77,2	2,6
		Post-Test	79,4	2,2
Experiment	69	Pre-test	81,1	3,9
		Post-Test	83,8	2,7

Table 1 presents the descriptive statistics for the pre-test and post-test scores of the control and experimental groups. Prior to evaluating the intervention effect, baseline equivalence was formally examined because the descriptive statistics indicated a 3.9-point difference in initial Arabic-speaking proficiency between the two cohorts. A Mann–Whitney U test of the pre-test scores confirmed a statistically significant difference in baseline proficiency between the experimental and control groups ($U = 812$, $p < 0.001$). This finding indicates that the two intact groups were not equivalent at the outset, which is an important consideration when interpreting the subsequent intervention effects in this non-randomized quasi-experimental design.

Given the baseline imbalance, post-test scores were not interpreted through a simple between-group comparison, as such an approach could confound the intervention effect with pre-existing differences between the cohorts. Instead, the analysis also examined individual change over time using Gain Scores (post-test minus pre-test). As shown in Table 1, the experimental group demonstrated a greater descriptive gain of 2.7 points, compared with 2.2 points in the control group. Although this difference in descriptive gain suggests a greater improvement in Arabic-speaking proficiency among students who received the PjBL intervention, the statistical significance of the between-group difference in Gain Scores was assessed separately. Thus, the observed improvement should be interpreted in conjunction with the inferential analysis rather than as evidence of intervention effectiveness based solely on the descriptive gain.

Initially, ANCOVA was considered to adjust for baseline differences between the non-equivalent cohorts. However, a rigorous evaluation of the parametric model assumptions indicated that ANCOVA was inappropriate. Parametric model diagnostics revealed that the residuals exhibited severe departures from normality. Furthermore, applying ANCOVA to intact groups with significant baseline disparities substantially increases the risk of violating the homogeneity of regression slopes assumption, which can lead to severely biased parameter estimates.

Given the non-normal distribution of the residuals and the inherent risks of modeling non-equivalent intact groups with parametric constraints, a robust non-parametric strategy was purposefully adopted to ensure analytical rigor. Rather than applying complex data transformations that might obscure the practical interpretability of the outcomes, the Mann-Whitney U test was performed on the students' Gain Scores (the net difference between post-test and pre-test scores). This non-parametric approach makes no assumptions about residual normality and provides a highly conservative, robust, and reliable evaluation of the relative intra-individual growth between the experimental and control groups.

The Mann-Whitney U test on students' gain scores revealed that the PjBL strategy coupled with animated video production significantly enhanced student creativity ($U = 1150.50$, $p = 0.002$) as well as their Arabic speaking competence ($U = 1085.00$, $p = 0.001$).

The results of the Mann-Whitney U test on the gain scores demonstrated a significant difference between the two groups ($p < 0.05$), confirming that the implementation of the animated video-assisted PjBL model is highly effective in enhancing the students' Arabic speaking skills and creativity compared to the conventional model.

Table 2. Normality test - Control class

	Tests of normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	,231	58	,000	,823	58	,000
posttest	,202	58	,000	,897	58	,000

Lilliefors Significance Correction

Based on the results of the normality test in the table above, the results of the control class value were obtained. The significance value of *the pretest* was 0.000, and *the posttest* value was 0.000, both of which were smaller than 0.05. This indicates that the pre- and post-test data are abnormally distributed.

Table 3. Normality test - Experimental class

	Tests of normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	,132	69	,005	,909	69	,000
posttest	,208	69	,000	,901	69	,000

Lilliefors Significance Correction

Based on the results of the normality test in the table above, the results of the experimental class value were obtained. The significance value of *the pretest* was 0.000, and that of the posttest was 0.000, both of which were smaller than 0.05. This indicates that the pre- and post-test data are abnormally distributed.

The results of the Mann-Whitney U test on the gain scores demonstrate that the application of the animation video-assisted PjBL learning strategy had a statistically significant superior impact on students' speaking ability (maharah al-kalam) compared to the conventional method. This indicates that the magnitude of improvement from pre-test to post-test in the experimental group was significantly greater than that in the control group. Consequently, the working hypothesis (H_a) is accepted, and the null hypothesis (H_0) is rejected, confirming that the PjBL animated video model effectively enhances students' speaking proficiency.

Factors Influencing Arabic Learning

While this study quantitatively measured speaking proficiency and creativity, the observed improvements may be theoretically explained by underlying affective factors. Language anxiety is a major obstacle to learning Arabic, which is often triggered by fear of mispronunciation or sentence structure when speaking in public (Achmad et al., 2025; Alnuzaili & Uddin, 2020; Hanifansyah,

2025). Although language anxiety was not directly measured as an empirical variable in the current study, prior literature suggests that the integration of PjBL through the creation of animated videos offers a more flexible and informal learning environment, which psychologically lowers the anxiety threshold (Rahmaniah et al., 2025; Widyastuti et al., 2025). It is highly plausible that in this model, students do not feel pressured by real-time live assessments. Instead, having the opportunity to practice, re-record, and refine their speech before the project is published acts as a supporting mechanism that fosters the courage to communicate more authentically, thereby indirectly contributing to the enhanced speaking scores.

Furthermore, drawing on existing literature, active involvement in independently producing digital content has also been proven to significantly increase self-efficacy (González-Prida et al., 2024; Yuan et al., 2025). In the context of this PjBL intervention, it can be theoretically inferred that the success of students in mastering animation software and completing complex digital projects likely provides a sense of achievement that strengthens their confidence in their language competence. Prior empirical studies show that self-efficacy is a powerful predictor of learning motivation, suggesting that students who develop higher digital confidence tend to be more persistent in dealing with linguistic difficulties during the project completion process. Therefore, while not directly measured herein, digital self-efficacy serves as another plausible psychological factor driving the enhanced speaking outcomes observed in the experimental cohort.

Finally, literature suggests that the collaborative aspect of PjBL plays a crucial role in mitigating psychosocial barriers through peer support (Farhansyah et al., 2025; Ospankulova et al., 2025; Xu, 2024). During the scenario planning and product evaluation stages of this study, the group-based design inherently facilitated peer interactions, which theoretically create a safe space for students to give feedback without fear of judgment. By shifting the instructional focus from strict grammatical accuracy to a collaborative meaning-making process, this strategy not only resulted in the empirically measured improvement of PGMI students' speaking performance but also aligns with pedagogical frameworks that promote learner independence.

CONCLUSION

This study concludes that the application of the PjBL model integrated with independent animation video production demonstrates a significant positive impact on enhancing the empirically measured outcomes: Arabic speaking competence and creativity of PGMI students. Beyond these direct findings, existing literature provides a basis for understanding the underlying mechanisms of this success. Viewed through the lens of the cognitive theory of multimedia learning, it is theoretically plausible that integrating visual and auditory elements in animation assists students in managing cognitive load, which prior studies indicate can support vocabulary retention and communicative confidence. Furthermore, while affective variables were not directly assessed herein, literature implies that this PjBL strategy may function as a supportive mechanism to mitigate language anxiety and build digital self-efficacy, positioning it as a highly relevant and holistic pedagogical approach for language education in the digital age.

The novelty of this research emphasizes the importance of repositioning the role of students in the curriculum from passive media consumers to active digital content producers. The practical implication is that educational study programs, such as PGMI, must explicitly integrate digital literacy in language learning strategies to equip prospective teachers with instructional skills relevant to the needs of the 21st century. Building on these findings, future studies should empirically test the

hypothesis that digital self-efficacy acts as a mediator in improving verbal communicative competence within multimedia-based language learning environments.

While these initial results are promising, several notable limitations restrict the broader generalizability and definitive causal interpretations of the findings. Beyond the relatively short duration of the intervention (8 weeks) and a sample limited to a single institution, the quasi-experimental design utilized non-random assignment of intact classes. This approach resulted in statistically significant baseline differences between the cohorts. Although this study attempted to mitigate these disparities through Gain Score analysis and by assigning the same instructor to both groups, we acknowledge the inherent limitations of change-score analysis in perfectly eliminating selection bias, as well as the potential for unobserved class dynamics or residual instructor effects. Furthermore, despite establishing initial instrument validity and inter-rater reliability, the inherently subjective nature of evaluating speaking proficiency and creativity leaves some degree of uncertainty regarding rater consistency. Consequently, causal inferences should be interpreted with caution. Further research employing true randomized controlled trials (RCTs) is highly recommended. Additionally, future studies should explore the effectiveness of PjBL by integrating artificial intelligence (AI) in script creation or automated voiceovers to assess phonetic accuracy more precisely, alongside longitudinal designs to examine the long-term retention of students' speaking abilities.

DECLARATION OF AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In preparing this manuscript, Gemini was used to brainstorm the initial outline concepts and structure the literature review. Following the use of this AI tool, the authors thoroughly reviewed and refined the material, assuming complete responsibility for the final published content.

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AUTHORS' CONTRIBUTION

Author 1: Conceptualization, Investigation, Formal Analysis, and Writing Original Draft.

Author 2: Methodology, Validation, Resources, Data Curation, and Writing, Review & Editing.

Author 3: Supervision, Project Administration, Visualization, Writing – Review & Editing, and Final Approval of the Manuscript.

DECLARATION OF THE COMPETING INTEREST

The authors report no conflicts of interest. No financial or personal relationships with other individuals or organizations could inappropriately influence or bias the content of this manuscript.

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