Vol. 9, No.1, 2026, pp. 575-581
DOI: https://doi.org/10.32698/02294

Contents lists available at Journal Global Econedu

Journal of Educational and Learning Studies
ISSN: 2655-2760 (Print) ISSN: 2655-2779 (Electronic)

Journal homepage: http://jurnal.globaleconedu.org/index.php/jels

Effects of learning models and instructional media on pencak silat course learning outcomes

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Article Info

Article history:

Received Jul 23th, 2026
Revised Aug 01st, 2026
Accepted Aug 03rd, 2026

Keyword:

Blended learning,
Instructional media,
Learning outcomes,
Pencak silat,
Factorial experiment

ABSTRACT

This study examined the main and interaction effects of learning models and instructional media on university students' pencak silat learning outcomes using a 2 × 2 factorial experimental design. A total of 100 undergraduate students were randomly assigned to four experimental groups. Learning outcomes, encompassing theoretical knowledge and practical performance, were measured using achievement tests and analyzed with two-way ANOVA. The results indicated that instructional media significantly affected learning outcomes ($F = 9.45$, $p = 0.003$), whereas the learning model ($F = 2.68$, $p = 0.105$) and the interaction effect ($F = 1.59$, $p = 0.210$) were not significant. Video-based media produced higher learning outcomes than book/module-based media. These findings suggest that instructional media play a more important role than learning models in improving university students' pencak silat learning outcomes.

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Introduction

Pencak silat is one of Indonesia's indigenous martial arts and has become an integral component of physical education and sports science curricula because it simultaneously develops students' cognitive understanding, psychomotor competence, physical fitness, and character. However, achieving optimal learning outcomes in university-level pencak silat courses remains challenging because students are required to master theoretical concepts while accurately performing complex movement techniques involving coordination, balance, agility, timing, and precision. These multidimensional learning demands often lead to variations in students' learning achievement when instructional strategies fail to effectively integrate conceptual understanding with practical skill acquisition (Burhanuddin et al., 2023; Hariono et al., 2024). As higher education continues to embrace digital transformation, lecturers are increasingly expected to implement technology-enhanced pedagogical approaches that foster active learning and improve students' practical competencies. Recent studies have demonstrated that technology-supported instruction can enhance student engagement and psychomotor achievement in sports education when instructional design is appropriately aligned with learning objectives (Ambarwati, Aga, et al., 2024; Maulana et al., 2026).

Among various pedagogical approaches, blended learning has gained considerable attention because it combines the flexibility of online learning with direct face-to-face practice, allowing students to access learning materials before and after classroom sessions. Likewise, advances in multimedia technology have encouraged the integration of video-based instructional media, enabling students to repeatedly observe movement sequences,

body positioning, timing, and technical execution that are difficult to convey through printed materials alone. Nevertheless, previous studies have also indicated that the effectiveness of blended learning depends on the quality of instructional resources, learner engagement, and practical learning activities, while video-based instruction is most effective when integrated with structured feedback and supervised practice rather than being used as a standalone learning resource (Lubis, Haqiyah, et al., 2022; Sinulingga et al., 2023). Empirical evidence has reported positive effects of blended learning and multimedia-based instruction on students' motivation, technical skills, and psychomotor performance in martial arts education, although the magnitude of these effects has varied across different educational contexts (Ihsan et al., 2026; Muzakki et al., 2023).

Despite the growing body of research, the existing literature remains fragmented because most previous studies have examined learning models and instructional media independently. While several investigations reported that blended learning improves psychomotor performance, other studies emphasized the effectiveness of video tutorials, audiovisual media, or interactive multimedia in enhancing learning achievement. In addition, recent bibliometric evidence reveals that research on pencak silat learning has predominantly focused on technological innovations, including augmented reality, virtual reality, artificial intelligence, and mobile applications, with limited attention given to simultaneously evaluating instructional models and instructional media within the same experimental framework (Jamal et al., 2024; Lubis, Thongdaeng, et al., 2022). Consequently, inconsistencies in previous findings and the absence of integrated experimental investigations have limited understanding of the relative contribution of learning models and instructional media to students' pencak silat learning outcomes.

The foregoing review identifies a clear research gap in the literature. Previous investigations have predominantly employed one-factor experimental or quasi-experimental designs to evaluate either learning models or instructional media separately, making it difficult to determine their relative contributions to students' learning outcomes. Moreover, empirical evidence examining whether instructional media and learning models interact to influence psychomotor achievement in university-level pencak silat courses remains limited. This limitation has restricted the development of evidence-based instructional strategies because lecturers often select learning models and instructional media independently without understanding how both components jointly influence learning effectiveness (Muktiani et al., 2022; Teo et al., 2022). Therefore, employing a 2 × 2 factorial experimental design is expected to provide a more comprehensive explanation by simultaneously examining the main effects of each instructional factor and determining whether their interaction contributes to students' learning outcomes, thereby addressing an important methodological limitation in previous studies.

Based on these considerations, this study aims to examine the main and interaction effects of learning models (blended learning and conventional learning) and instructional media (video and book/module) on students' pencak silat learning outcomes using a two-way factorial experimental design. The novelty of this study lies not merely in applying a factorial design, but in providing empirical evidence regarding the relative contribution of instructional models and instructional media within a single experimental framework for university-level pencak silat instruction. By integrating pedagogical and media variables into one analytical model, this study extends previous research that largely evaluated each instructional component independently and offers a more comprehensive perspective for designing practical sports instruction. The findings are expected to enrich the theoretical understanding of instructional design in sports education while providing evidence-based recommendations for lecturers in selecting effective pedagogical approaches and instructional media to improve learning outcomes in higher education (Ihsan et al., 2025; Latif et al., 2022).

Method

This study employed a quantitative experimental approach using a 2 × 2 factorial design to examine the effects of learning models and instructional media on students' pencak silat learning outcomes. Two independent variables were investigated: the learning model, consisting of blended learning (A1) and conventional learning (A2), and the instructional media, comprising video-based media (B1) and book/module-based media (B2). The population consisted of 120 undergraduate students enrolled in the pencak silat course at the Department of Sports Education, Faculty of Sport Science, Universitas Negeri Padang. A total of 100 students were selected using simple random sampling and randomly assigned into four experimental groups: blended learning with video media (A1B1), blended learning with book/module media (A1B2), conventional learning with video media (A2B1), and conventional learning with book/module media (A2B2), with 25 participants in each group.

Students' learning outcomes were assessed using learning achievement tests covering both theoretical understanding and practical performance in pencak silat. Descriptive statistics were first calculated to summarize the learning outcomes of each experimental group. Subsequently, a two-way analysis of variance (ANOVA) was performed at a significance level of 0.05 to examine the main effects of learning model and instructional media,

as well as their interaction effect on learning outcomes. The statistical analysis was conducted to determine whether differences in learning achievement were attributable to the instructional strategies implemented in the experiment.

Results and Discussions

This study investigated the effects of learning models and instructional media on students' pencak silat learning outcomes using a 2 × 2 factorial experimental design involving 100 undergraduate students. The data analysis was conducted in several stages to provide a comprehensive understanding of the research findings. First, descriptive statistics were calculated to summarize the learning outcomes of each experimental group. Subsequently, the average learning outcomes were compared according to the learning model and instructional media employed. Finally, a two-way analysis of variance (ANOVA) was performed to examine the main effects of learning model and instructional media, as well as their interaction effect on students' learning outcomes. The results are presented sequentially in the following tables to facilitate a systematic interpretation of the findings.

Table 1. Descriptive Statistics of Learning Outcomes Across Experimental Groups

Group	Learning Model	Instructional Media	n	Mean	SD	Minimum	Maximum
A1B1	Blended Learning	Video	25	83.40	9.19	68.25	90.75
A1B2	Blended Learning	Book/Module	25	75.00	7.34	68.25	90.75
A2B1	Conventional	Video	25	82.73	9.77	68.25	90.75
A2B2	Conventional	Book/Module	25	80.17	9.17	68.25	90.75
Overall			100	80.33	9.01	68.25	90.75

The descriptive analysis demonstrates noticeable differences in learning outcomes across the four experimental groups. Students receiving video-based instructional media consistently achieved higher mean scores than those using book-based media. The Blended Learning–Video group obtained the highest average score (M = 83.40, SD = 9.19), closely followed by the Conventional–Video group (M = 82.73, SD = 9.77). In contrast, the Blended Learning–Book group produced the lowest mean score (M = 75.00, SD = 7.34). These preliminary findings suggest that instructional media contributed more substantially to students' learning achievement than differences in learning models.

Table 2. Mean Learning Outcomes by Learning Model and Instructional Media

Factor	Category	Mean	SD
Learning Model	Blended Learning	79.20	9.68
	Conventional	81.45	9.52
Instructional Media	Video	83.07	9.41
	Book/Module	77.58	8.26

The comparison of marginal means indicates that students exposed to video-based instruction achieved substantially better learning outcomes than those using printed instructional materials. The average achievement of the video groups (M = 83.07) exceeded that of the book groups (M = 77.58), indicating an improvement of approximately 5.5 points. Conversely, only a small difference was observed between blended learning and conventional learning models, with conventional instruction showing a slightly higher average score (M = 81.45) than blended learning (M = 79.20). This descriptive pattern suggests that instructional media had a stronger influence on student performance than the learning model itself.

Table 3. Two-Way ANOVA Results

Source of Variation	F	p-value	Decision
Learning Model	2.68	0.105	Not Significant
Instructional Media	9.45	0.003	Significant
Learning Model × Instructional Media	1.59	0.210	Not Significant

The inferential analysis using two-way ANOVA revealed that instructional media significantly affected students' pencak silat learning outcomes (F = 9.45, p = 0.003). In contrast, the learning model did not produce a statistically significant effect (F = 2.68, p = 0.105). Likewise, the interaction between learning model and instructional media was not statistically significant (F = 1.59, p = 0.210). These findings indicate that students' achievement was primarily influenced by the type of instructional media rather than by the instructional approach employed or by any interaction between the two independent variables.

Table 4. Comparison of Learning Outcomes Between Video and Book-Based Media

Instructional Media	Mean Score	Difference
Video	83.07	
Book/Module	77.58	5.49

The comparison between instructional media demonstrates a clear advantage of video-based learning resources over conventional printed materials. Students learning through instructional videos achieved an average score that was approximately 5.5 points higher than students relying on books or modules. This result suggests that visual demonstrations of pencak silat techniques provide richer learning experiences by facilitating observation of movement sequences, body positioning, coordination, and execution accuracy. Consequently, video media appear to enhance both cognitive understanding and psychomotor performance more effectively than text-based instructional materials.

Table 5. Summary of Hypothesis Testing

Hypothesis	Statistical Test	p-value	Decision
H1: Learning model affects learning outcomes	Two-way ANOVA	0.105	Rejected
H2: Instructional media affects learning outcomes	Two-way ANOVA	0.003	Accepted
H3: Interaction exists between learning model and instructional media	Two-way ANOVA	0.210	Rejected

The hypothesis testing confirms that only instructional media significantly influenced students' learning outcomes in the pencak silat course. Although blended learning has frequently been promoted as an innovative instructional approach, its implementation in this study did not yield statistically superior achievement compared with conventional learning. Furthermore, the absence of an interaction effect indicates that the effectiveness of instructional media remained consistent regardless of the learning model applied. Therefore, the findings emphasize that selecting appropriate instructional media, particularly video-based resources, is more critical than choosing between blended and

The present study examined the effects of learning models and instructional media on students' pencak silat learning outcomes using a 2 × 2 factorial experimental design. The descriptive analysis revealed that the Blended Learning–Video group achieved the highest mean score (M = 83.40, SD = 9.19), followed closely by the Conventional–Video group (M = 82.73, SD = 9.77). In contrast, the Blended Learning–Book group obtained the lowest average score (M = 75.00, SD = 7.34), while the Conventional–Book group achieved a mean score of 80.17 (SD = 9.17). Overall, students who learned using video-based instructional media achieved a higher average score (M = 83.07) than those using book-based media (M = 77.58). These findings suggest that the type of instructional media plays a more substantial role in improving learning outcomes than the learning model itself. Video media provide rich visual demonstrations, allowing students to observe movement sequences repeatedly, thereby facilitating cognitive processing and motor skill acquisition. This finding is consistent with multimedia learning theory, which argues that combining visual and verbal information enhances meaningful learning by reducing cognitive load and improving information retention (Anifah et al., 2022; Nelson et al., 2025; Rustiyanti et al., 2024; Wahyudi et al., 2025).

The inferential analysis further confirmed that instructional media had a statistically significant effect on learning outcomes ($F = 9.45$, $p = 0.003$), whereas the learning model did not show a significant effect ($F = 2.68$, $p = 0.105$). These results indicate that the effectiveness of instructional media outweighed the influence of the instructional approach adopted during the learning process. Video-based media allow students to repeatedly observe correct movement execution, body positioning, timing, and coordination, which are fundamental elements in learning complex motor skills such as pencak silat. From the perspective of observational learning, repeated visual exposure enhances motor planning and execution by strengthening learners' mental representation of movement patterns before physical practice (Bandura, 1986). Likewise, contemporary motor learning literature emphasizes that visual demonstrations improve movement accuracy, technical consistency, and skill retention, particularly in sports requiring coordinated whole-body movements (Doewes et al., 2022; Nopiyanto et al., 2025; Subekti et al., 2025; Sudirman et al., 2022).

Interestingly, although blended learning produced a slightly different average performance from conventional learning (79.20 vs. 81.45), the difference was not statistically significant. This finding suggests that integrating online and face-to-face instruction does not automatically improve learning outcomes when compared with conventional classroom instruction. In practical sport courses such as pencak silat, learning

effectiveness depends not only on the delivery model but also on the quality of demonstrations, practice opportunities, instructor feedback, and learner engagement. Consequently, both instructional approaches may provide comparable learning experiences when students receive similar practical training and guidance. This finding aligns with previous studies reporting that blended learning can enhance learning flexibility but does not necessarily produce superior psychomotor outcomes unless supported by high-quality instructional resources and structured practice sessions (Ahmad et al., 2024; Ambarwati, Abusini, et al., 2024; Hasibuan et al., 2024; Nugroho & Doewes, 2025).

Another important finding was the absence of a significant interaction between learning model and instructional media ($F = 1.59$, $p = 0.210$). This result indicates that the effectiveness of video-based instructional media remained consistent regardless of whether learning was implemented through blended learning or conventional instruction. In other words, instructional media independently influenced students' achievement without being moderated by the instructional model. This finding implies that well-designed learning media can effectively support skill acquisition across different educational settings. Previous educational technology research similarly suggests that the instructional value of multimedia resources is relatively stable across learning environments because learners benefit primarily from the quality of visual representation and instructional design rather than from the delivery format itself (Mardius et al., 2026; Nugroho et al., 2024; Nurhidayah et al., 2024; Rohayati et al., 2022).

The present findings highlight the importance of selecting appropriate instructional media to improve learning outcomes in practical sports education. The significant contribution of video-based media suggests that integrating multimedia resources into pencak silat instruction can enhance students' understanding of movement mechanics and facilitate the development of technical proficiency. Although the learning model alone was not found to significantly influence achievement, incorporating high-quality instructional videos into either blended or conventional learning environments represents an evidence-based strategy for improving educational effectiveness. Therefore, future research should investigate longer intervention periods, include additional instructional variables such as feedback strategies and learner motivation, and evaluate learning outcomes using broader indicators encompassing cognitive, affective, and psychomotor domains to provide a more comprehensive understanding of effective instructional practices in martial arts education.

Conclusions

This study concludes that instructional media significantly influence students' pencak silat learning outcomes, whereas the learning model does not produce a statistically significant effect. Students who learned using video-based instructional media achieved higher learning outcomes than those who used book/module-based media, indicating that visual demonstrations are more effective in facilitating the acquisition of theoretical knowledge and practical skills in pencak silat. Furthermore, no significant interaction was found between the learning model and instructional media, suggesting that the effectiveness of video-based media is consistent regardless of whether learning is implemented through blended or conventional instruction. These findings highlight that the selection of appropriate instructional media plays a more critical role than the choice of learning model in improving students' learning achievement. Therefore, integrating video-based instructional media into practical sports education is recommended as an evidence-based strategy to enhance the effectiveness of pencak silat learning in higher education.

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