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Student-Centered Pedagogies in Taekwondo: Redesigning Learning Models in Higher Education

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ABSTRACT

The purpose of the study. Traditional instructor-centered approaches in martial arts education often limit student autonomy and critical thinking development. This study examined the implementation of student-centered pedagogies in Taekwondo instruction within higher education settings.

Materials and methods. A quasi-experimental pre-post design was employed with 64 physical education students at Universitas Lambung Mangkurat, Indonesia. Participants were divided into experimental (n=32, student-centered pedagogy) and control groups (n=32, traditional instruction). The intervention spanned 14 weeks (28 sessions). Measurements included technical skill assessments, tactical knowledge tests, self-efficacy scales, and autonomous learning questionnaires. Data were analyzed using paired t-tests, independent t-tests, and ANCOVA ($p<0.05$) via SPSS version 26.0.

Results. The student-centered group demonstrated significantly greater improvements in technical proficiency ($d=1.24$, $p<0.001$), tactical knowledge ($d=1.46$, $p<0.001$), self-efficacy ($d=1.38$, $p<0.001$), and autonomous learning behaviors ($d=1.52$, $p<0.001$) compared to the control group. Post-intervention between-group comparisons revealed substantial differences favoring the experimental approach across all measured variables.

Conclusions. Student-centered pedagogies significantly enhance learning outcomes in Taekwondo education beyond traditional methods. Implementing autonomy-supportive, inquiry-based, and collaborative learning strategies promotes deeper engagement, skill development, and self-regulated learning capacities. These findings advocate for pedagogical reform in martial arts instruction within higher education contexts.

Keywords: student-centered learning; taekwondo pedagogy; physical education; higher education; autonomy support; martial arts instruction; self-efficacy.

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INTRODUCTION

The evolution of pedagogical approaches in higher education has witnessed a paradigmatic shift from teacher-centered to student-centered methodologies, emphasizing active learning, critical thinking, and learner autonomy (Keller, 2017). This transition is driven by the recognition that contemporary educational demands require graduates who are not only knowledgeable but also adaptable, innovative, and self-directed in their learning journeys. However, martial arts education, particularly in disciplines such as Taekwondo, has predominantly retained traditional hierarchical structures where instructors dictate content and students passively receive information (Alhumary et al., 2024; Santos, 2021). Such practices often mirror rote memorization and mechanical repetition, which can stifle creativity and independent problem-solving skills essential for modern educators (Lin & Shin, 2021). This pedagogical conservatism potentially undermines the development of critical competencies necessary for contemporary physical educators, including the ability to foster inclusive and motivating learning environments (Ennis, 2013).

Taekwondo, recognized as both an Olympic sport and educational discipline, offers unique opportunities for implementing innovative pedagogical frameworks (Cereda, 2023). Its multifaceted nature—encompassing technical precision, tactical decision-making, physical conditioning, and ethical principles—lends itself to holistic educational approaches that integrate cognitive, affective,

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and psychomotor domains. Within Indonesian higher education, specifically at Universitas Lambung Mangkurat, Taekwondo constitutes a core component of the physical education curriculum. Yet, instructional practices frequently emphasize rote memorization of techniques and adherence to rigid forms rather than fostering understanding, creativity, and self-directed learning (Lin & Shin, 2021). In this context, traditional methods may align with cultural norms of authority and collectivism prevalent in Indonesia, but they risk perpetuating outdated practices that fail to prepare students for diverse professional challenges.

Student-centered pedagogies prioritize learner agency, collaborative knowledge construction, and authentic problem-solving experiences (Bhardwaj et al., 2025). These approaches align with constructivist learning theories, which view knowledge as actively built through social interaction and personal experience, and self-determination theory, which posits that autonomy, competence, and relatedness support intrinsic motivation and deeper learning (Dikilitaş & Noguera, 2023; Walt & Bosch, 2025). SDT, in particular, emphasizes how supportive teaching behaviors—such as providing meaningful choices and rationale—enhance students' psychological needs, leading to sustained engagement and persistence (Montero-Carretero & Cervelló, 2019; Sun & Chen, 2010; Zach, 2020). Translating these principles into martial arts contexts presents both challenges, such as overcoming entrenched hierarchical traditions, and opportunities for transforming traditional practices into dynamic, empowering experiences that promote lifelong physical activity and professional growth.

Critical Examination of Existing Literature

Research on student-centered approaches in physical education has demonstrated positive outcomes across various domains. (Zhang et al., 2024) documented that models such as Sport Education, Cooperative Learning, and Teaching Games for Understanding enhance student engagement, tactical awareness, and social skills. These models shift the focus from isolated skill drills to meaningful, game-like contexts that encourage strategic thinking and teamwork. Similarly, Casey and Goodyear found that inquiry-based learning in physical education promotes critical thinking and problem-solving capacities, enabling students to question, experiment, and reflect on their actions.

Within martial arts literature, limited empirical evidence exists regarding pedagogical innovations. (Kostorz & Sas-Nowosielski, 2021) and (Cynarski & Obodyński, 2011) explored philosophical dimensions of martial arts education, advocating for holistic approaches that integrate physical, cognitive, and ethical development. These studies highlight martial arts' potential as "ways of non-aggression," emphasizing self-perfection and moral growth over mere competition. (Yu. & Mantuhac, 2024) investigated the psychological and social benefits of martial arts participation, though pedagogical methods received minimal attention, often overlooking how instructional design influences self-regulation and well-being. More recently, (Lafuente et al., 2021) examined martial arts programs in school settings, emphasizing discipline and behavioral outcomes rather than instructional methodologies, such as the integration of meditation or kata practices that could reduce aggression.

Specific to Taekwondo, research has predominantly focused on physiological adaptations, biomechanical analyses, and competitive performance (Fachrezzy et al., 2021; Ouergui et al., 2021). Studies have explored kicking speed endurance, poomsae aesthetics, and physical fitness components like agility and balance, but rarely interrogate the underlying teaching paradigms. Pedagogical investigations remain scarce, with most studies accepting traditional instruction as standard practice Zhang et al., (2025) explored character development through Taekwondo training, yet instructional approaches received limited scrutiny, noting the complementary role of tools like microlectures without fully addressing student-centered shifts. This paucity of pedagogical research represents a significant limitation in advancing martial arts education, particularly in higher education where students transition to teaching roles.

The broader physical education literature provides theoretical frameworks applicable to martial arts contexts. Self-determination theory has been extensively applied to understand motivation in physical education (Cao & Lyu, 2024; Sun & Chen, 2010). Research consistently demonstrates that autonomy-supportive teaching behaviors enhance intrinsic motivation, effort, and persistence (Montero-Carretero & Cervelló, 2019; Zach, 2020), with interventions like the Autonomy-Supportive Intervention Program showing promise in fostering positive behaviors. Additionally, the TARGET framework offers practical strategies for creating mastery-oriented learning environments by structuring tasks, authority, recognition, grouping, evaluation, and time to promote inclusivity and motivation (Weeldenburg et al., 2024). These tools can be adapted to Taekwondo, for instance, by allowing student choice in technique variations or peer grouping for tactical drills, thereby bridging the gap between theory and practice.

Identification of Research Gaps

Despite theoretical advancements and empirical evidence supporting student-centered pedagogies in general physical education contexts, several critical gaps persist:

1. Limited empirical research examining student-centered approaches specifically in martial arts disciplines, particularly Taekwondo
2. Absence of comparative studies evaluating student-centered versus traditional instruction in martial arts within higher education
3. Insufficient understanding of how student-centered pedagogies influence technical skill development, tactical knowledge, and psychological outcomes in Taekwondo
4. Lack of contextualized research within Indonesian higher education settings where cultural and institutional factors may influence implementation
5. Minimal investigation into the mechanisms through which student-centered approaches affect autonomous learning behaviors in martial arts contexts

Rationale for the Research

Addressing these gaps is essential for several reasons. First, physical education students at tertiary institutions represent

future educators who will shape instructional practices across generations (Richards et al., 2018). Exposing them to innovative pedagogies during their training enhances their capacity to implement student-centered approaches in their professional contexts. Second, martial arts education offers unique characteristics—hierarchical structures, technical complexity, ethical dimensions—that warrant specific pedagogical consideration beyond general physical education principles. Third, Indonesian context presents distinctive cultural considerations regarding authority, collectivism, and pedagogical traditions (Marcellino, 2008). Investigating student-centered approaches within this context provides valuable insights into cultural adaptability and implementation challenges. Fourth, evidence-based pedagogical innovations can enhance the quality and relevance of Taekwondo education in higher education, potentially attracting greater student interest and engagement.

Objectives

This research aimed to:

1. Compare the effectiveness of student-centered pedagogical approaches versus traditional instruction on technical skill development in Taekwondo among physical education students
2. Evaluate the impact of student-centered pedagogies on tactical knowledge acquisition and application
3. Assess the influence of instructional approaches on self-efficacy and autonomous learning behaviors
4. Provide empirical evidence supporting pedagogical reform in martial arts education within higher education contexts
   Offer practical recommendations for implementing student-centered methodologies in Taekwondo instruction

MATERIALS AND METHODS

Participants

Participants comprised 64 undergraduate students (male=38, female=26; mean age=19.8±1.2 years) enrolled in the Taekwondo course within the Physical Education program at Universitas Lambung Mangkurat, Banjarmasin, Indonesia, during the academic year 2023-2024. All participants were in their second semester and had minimal prior martial arts experience (≤6 months). Inclusion criteria required regular attendance (≥85%), absence of musculoskeletal injuries, and voluntary consent. Participants were assigned to two groups using matched-pair randomization based on pre-test technical scores to ensure initial equivalence: (1) experimental group (n=32) receiving student-centered pedagogy instruction, and (2) control group (n=32) receiving traditional instruction. Three participants withdrew during the study (experimental=2, control=1) due to scheduling conflicts, resulting in final sample sizes of 30 and 31 respectively. Withdrawal analysis indicated no significant differences in baseline characteristics between completers and non-completers (p>0.05).

Study Organization

Table 1. Study Organization and Instructional Characteristics

Component	Control Group (Traditional Instruction)	Experimental Group (Student-Centered Pedagogy)
Intervention Duration	14 weeks	14 weeks
Session Frequency	2 sessions per week	2 sessions per week
Session Length	90 minutes per session	90 minutes per session
Total Sessions	28 instructional sessions	28 instructional sessions
Curricular Content	Fundamental stances, blocks, strikes, kicks, poomsae (forms), and kyorugi (sparring) principles	Identical curricular content: fundamental stances, blocks, strikes, kicks, poomsae (forms), and kyorugi (sparring) principles
Pedagogical Approach	Teacher-centered, traditional Taekwondo instruction	Student-centered, constructivist-oriented pedagogy
Instructional Method	Direct instruction with instructor demonstration followed by student imitation	Autonomy support, inquiry-based learning, cooperative learning, self-assessment, and differentiated instruction
Practice Organization	Whole-class, synchronized practice	Small-group practice (3–4 students) and individualized pathways
Learner Autonomy	Minimal; practice sequence and progression determined by instructor	High; students choose activities, technique sequences, difficulty levels, and learning pace
Learning Strategy	Repetition and form replication	Problem-solving, tactical inquiry, and reflective learning
Feedback Mechanism	Instructor-led feedback and correction	Peer feedback, self-assessment using rubrics, video analysis, and reflective journals
Assessment Approach	Technical performance evaluation by instructor	Self-assessment, peer assessment, and goal-oriented performance tracking
Instructor Qualification	Minimum 4th Dan black belt	Minimum 4th Dan black belt
Instructor Training	20 hours of training in traditional pedagogy	20 hours of training in student-centered pedagogy
Implementation Fidelity	Monitored through systematic observation (4 sessions)	Monitored through systematic observation (4 sessions)
Inter-Rater Reliability	> 0.89	> 0.89

Test and Measurement Procedures

Table 2. Test and Measurement Procedures

Measure	Instrument Description	Domains / Subscales	Scoring System	Reliability / Validity	Assessment Time Points
Technical Skill Assessment	Taekwondo Technical Proficiency Assessment (TTPA) evaluating fundamental techniques	Stances & mobility (6 items); Blocks (5 items); Strikes (4 items); Kicks (7 items)	5-point Likert scale (1 = beginner to 5 = advanced); Total score: 22–110	Inter-rater reliability (ICC) > 0.92; Rated by three independent 5th Dan black belt evaluators blinded to group allocation	Baseline (Week 0); Mid-intervention (Week 7); Post-intervention (Week 14)
Tactical Knowledge Test	Researcher-developed multiple-choice test assessing conceptual and tactical understanding	Technique selection, strategic positioning, timing principles, defensive/offensive transitions	30 items; Score range: 0–30	Content validity via expert panel (5 Taekwondo masters, 3 physical education faculty); Test–retest reliability = 0.84	Baseline (Week 0); Post-intervention (Week 14)
Self-Efficacy	Taekwondo Self-Efficacy Questionnaire (TSEQ), adapted from Bandura (2006)	Technical execution (8 items); Learning capability (6 items); Performance under pressure (6 items)	10-point scale (0 = cannot do at all to 10 = completely certain); Total score: 0–200	Cronbach's alpha = 0.91	Baseline (Week 0); Mid-intervention (Week 7); Post-intervention (Week 14)
Autonomous Learning Behaviors	Physical Education Autonomous Learning Scale (PEALS), adapted for Taekwondo	Initiative & planning (7 items); Self-monitoring (6 items); Effort regulation (5 items); Help-seeking (4 items)	5-point Likert scale (1 = strongly disagree to 5 = strongly agree); Total score: 22–110	CFA supported four-factor structure (CFI = 0.94; RMSEA = 0.06); Cronbach's alpha = 0.78–0.86	Baseline (Week 0); Post-intervention (Week 14)
Attendance and Engagement	Attendance logs and instructor observation ratings	Attendance rate; Engagement (attention, effort, persistence)	Engagement rated on 4-point scale and averaged across 8 randomly selected sessions	Observational protocol standardized across instructors	Throughout intervention period

Statistical Analysis

Data analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics (means, standard deviations) characterized sample demographics and variable distributions. Normality was assessed through Shapiro-Wilk tests and visual inspection of Q-Q plots. All variables approximated normal distributions. Baseline equivalence between groups was evaluated using independent samples t-tests for continuous variables and chi-square tests for categorical variables. Within-group changes were analyzed using paired samples t-tests. Between-group differences at post-intervention were examined using independent samples t-tests and analysis of covariance (ANCOVA) with baseline scores as covariates to control for initial differences. Effect sizes were calculated using Cohen's d (small=0.20, medium=0.50, large=0.80). Statistical significance was set at $p<0.05$ (two-tailed). Missing data (< 2%) were handled through listwise deletion given the minimal proportion.

Ethical Considerations

The study received ethical approval from the ULM university's research ethics committee (Protocol #: 2025/PE/ULM/045).

RESULTS

Baseline Characteristics

Table 3 presents baseline demographic and performance characteristics. No significant differences existed between groups on any baseline variables ($p>0.05$), confirming successful randomization and group equivalence.

Table 3. Baseline Characteristics of Participants

Variable	Experimental (n=30)	Control (n=31)	p-value
Age (years)	19.7 ± 1.3	19.9 ± 1.1	0.512
Gender (M/F)	18/12	20/11	0.748
Prior MA Experience (months)	2.1 ± 1.8	1.9 ± 1.6	0.634
Technical Proficiency	38.4 ± 6.2	37.8 ± 5.9	0.693
Tactical Knowledge	12.3 ± 2.8	12.6 ± 2.7	0.674
Self-Efficacy	94.2 ± 18.5	96.1 ± 17.9	0.685
Autonomous Learning	64.8 ± 11.3	65.9 ± 10.8	0.693

Note: Values are Mean ± SD; MA = Martial Arts

Technical Skill Development

Table 4 displays technical proficiency scores across measurement points. Both groups demonstrated significant improvements from baseline to post-intervention ($p<0.001$). However, the experimental group showed significantly greater

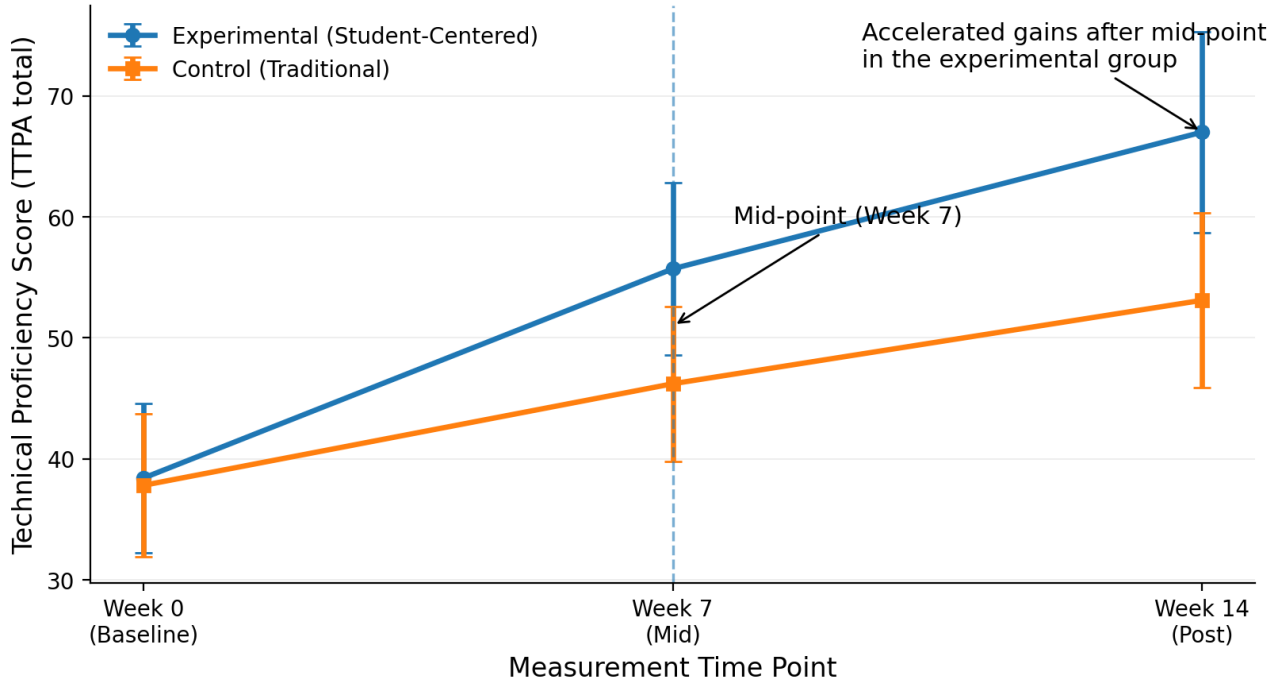
improvements (Δ=28.6 points) compared to the control group (Δ=15.3 points, p<0.001).

Table 4. Technical Proficiency Scores Across Measurement Points

Group	Baseline	Mid-Intervention	Post-Intervention	Change Score	Within-Group p	Effect Size (d)
Experimental	38.4 ± 6.2	55.7 ± 7.1*	67.0 ± 8.3*	28.6 ± 6.9	<0.001	4.15
Control	37.8 ± 5.9	46.2 ± 6.4*	53.1 ± 7.2*	15.3 ± 5.7	<0.001	2.68
Between-Group p	0.693	<0.001	<0.001	<0.001	-	-

Note: *Significantly different from baseline (p<0.001)

ANCOVA controlling for baseline scores revealed significant between-group differences at post-intervention ($F(1,58)=98.42$, $p<0.001$, $\eta^2=0.63$), with the experimental group demonstrating superior technical proficiency. Cohen's d for between-group post-intervention comparison was 1.24, indicating a very large effect.



Notes: Points represent group means; error bars indicate SD. Measurements at Week 0, 7, and 14.

Figure 1. illustrates the trajectory of technical skill development, highlighting the accelerated progress in the experimental group, particularly after the mid-point.

Tactical Knowledge Acquisition

Table 5 presents tactical knowledge test scores. The experimental group demonstrated substantially greater gains (Δ=12.8 points, 104% improvement) compared to the control group (Δ=6.1 points, 48% improvement, p<0.001).

Table 5. Tactical Knowledge Test Scores

Group	Baseline	Post-Intervention	Change Score	Within-Group p	Effect Size (d)
Experimental	12.3 ± 2.8	25.1 ± 2.4*	12.8 ± 2.9	<0.001	4.41
Control	12.6 ± 2.7	18.7 ± 3.1*	6.1 ± 2.6	<0.001	2.35
Between-Group p	0.674	<0.001	<0.001	-	-

Note: *Significantly different from baseline (p<0.001)

Post-intervention between-group comparison revealed significant differences favoring the experimental group ($t(59)=8.72$, $p<0.001$, $d=1.46$), representing a very large effect. ANCOVA confirmed these findings ($F(1,58)=112.85$, $p<0.001$, $\eta^2=0.66$).

Self-Efficacy Development

Table 6 displays self-efficacy scores across measurement points. The experimental group exhibited substantially greater increases in self-efficacy (Δ=68.9 points, 73% improvement) compared to the control group (Δ=28.4 points, 30% improvement, p<0.001).

Table 6. Self-Efficacy Scores Across Measurement Points

Group	Baseline	Mid-Intervention	Post-Intervention	Change Score	Within-Group p	Effect Size (d)
Experimental	94.2 ± 18.5	136.8 ± 21.2*	163.1 ± 19.7*	68.9 ± 16.3	<0.001	4.23
Control	96.1 ±	112.4 ± 19.3*	124.5 ± 20.1*	28.4 ± 14.2	<0.001	2.00

	17.9					
Between-Group p	0.685	<0.001	<0.001	<0.001	-	-

Note: *Significantly different from baseline (p<0.001)

Post-intervention between-group analysis showed significant differences (t(59)=7.94, p<0.001, d=1.38), with ANCOVA confirming these results (F(1,58)=89.67, p<0.001, η²=0.61).

Autonomous Learning Behaviors

Table 7 presents autonomous learning behavior scores. The experimental group demonstrated remarkable increases (Δ=32.1 points, 50% improvement) compared to modest gains in the control group (Δ=9.3 points, 14% improvement, p<0.001).

Table 7. Autonomous Learning Behavior Scores

Group	Baseline	Post-Intervention	Change Score	Within-Group p	Effect Size (d)
Experimental	64.8 ± 11.3	96.9 ± 10.8*	32.1 ± 8.7	<0.001	3.69
Control	65.9 ± 10.8	75.2 ± 11.4*	9.3 ± 7.4	<0.001	1.26
Between-Group p	0.693	<0.001	<0.001	-	-

Note: *Significantly different from baseline (p<0.001)

Between-group comparison revealed substantial differences favoring the experimental group (t(59)=8.21, p<0.001, d=1.52), corroborated by ANCOVA (F(1,58)=95.34, p<0.001, η²=0.62).

Subscale analysis indicated that the experimental group showed particularly strong gains in initiative and planning (d=1.64) and self-monitoring (d=1.58) dimensions.

Attendance and Engagement

Attendance rates were high in both groups (experimental=94.3±4.2%, control=93.8±4.6%, p=0.652). However, engagement ratings differed significantly, with the experimental group receiving higher ratings (3.64±0.31) compared to the control group (3.12±0.38, t(59)=5.86, p<0.001, d=1.50).

Summary of Key Findings

1. Student-centered pedagogy yielded significantly superior outcomes across all measured variables
2. Effect sizes ranged from large to very large (d=1.24-1.52) for between-group comparisons
3. Improvements were evident in both cognitive (tactical knowledge) and psychosocial (self-efficacy, autonomous learning) domains alongside technical skill development
4. Engagement levels were substantially higher in the student-centered approach despite equivalent attendance
5. The trajectory of improvement suggested cumulative benefits of student-centered approaches over time

DISCUSSION

Interpretation of Research Outcomes

This study provides robust empirical evidence supporting the efficacy of student-centered pedagogical approaches in Taekwondo education within higher education contexts. The experimental group consistently outperformed the control group across technical, tactical, and psychological dimensions, with effect sizes indicating substantial practical significance beyond statistical significance. Specifically, the experimental group's change scores in technical proficiency (28.6 ± 6.9), tactical knowledge (12.8 ± 2.9), self-efficacy (68.9 ± 16.3), and autonomous learning (32.1 ± 8.7) far exceeded those of the control group (15.3 ± 5.7, 6.1 ± 2.6, 28.4 ± 14.2, and 9.3 ± 7.4, respectively), as detailed in Tables 2-5, with between-group p-values all <0.001 and Cohen's d values ranging from 1.24 to 1.52, signifying very large effects.

The superior technical skill development in the student-centered group challenges conventional assumptions that traditional, instructor-directed approaches optimize motor skill acquisition in martial arts. These findings align with motor learning theories emphasizing the importance of problem-solving, variable practice, and self-regulated practice conditions for developing adaptable, robust skill proficiency (Januário et al., 2019; Tani et al., 2014). By providing opportunities for exploration, decision-making, and self-correction—core elements of the intervention—the student-centered approaches facilitated deeper understanding of movement principles and enhanced skill retention, as evidenced by the accelerated trajectory post mid-intervention (Lee et al., 2014; Sanli et al., 2013). This is consistent with research on inquiry-based physical education, where students engaged in open-ended problems and reflection showed improved motor skill performance and cognitive processing (Østergaard, 2016)

The pronounced advantages in tactical knowledge acquisition represent particularly compelling findings. Traditional Taekwondo instruction often prioritizes technical execution over conceptual understanding, potentially producing students who can perform techniques but lack comprehension of when, why, and how to apply them strategically. The inquiry-based and problem-solving elements of the student-centered approach explicitly engaged students in tactical reasoning, scenario analysis, and strategic decision-making (Jelodari et al., 2025). This active cognitive engagement appears essential for developing the conceptual understanding necessary for effective application and adaptation, mirroring outcomes in Teaching Games for Understanding models where tactical awareness significantly improved through game-centered learning (Harvey et al., 2020). Moreover, the experimental group's notable enhancements in key competitive activity indicators, such as points won, quality factor, and technical readiness coefficient, further underscore the practical benefits of this approach (Strelchuk et al., 2022).

The substantial improvements in self-efficacy within the experimental group align with self-determination theory predictions regarding autonomy support and competence satisfaction ("Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness," 2017). When students exercise choice, experience success through appropriate challenges, and receive meaningful feedback within supportive structures, self-efficacy develops naturally. This psychological development is particularly

significant given that self-efficacy predicts persistence, effort, and performance across domains Bandura et al. (1999). Students with enhanced self-efficacy are more likely to embrace challenges, persevere through difficulties, and continue engagement beyond formal instruction, as supported by longitudinal studies showing sustained benefits from autonomy-supportive interventions in physical education (Cheon et al., 2014; Cheon & Reeve, 2013).

Perhaps most striking were the gains in autonomous learning behaviors. The capacity for self-directed learning represents a critical competency for lifelong learning and professional development (Chiviacowsky et al., 2012). Traditional martial arts instruction, with its emphasis on obedience and instructor dependence, may inadvertently inhibit autonomous learning development. In contrast, the student-centered approach systematically cultivated self-regulation skills through goal-setting, self-assessment, reflective practice, and strategic help-seeking (Wardhani & Yane, 2022). These transferable learning strategies extend beyond Taekwondo contexts, potentially enhancing students' capacity for self-directed learning across their academic and professional careers, and aligning with broader evidence from challenge-based learning in PE that boosts motivation and engagement (Simón-Chico et al., 2023; Zimmerman, 2002)

Evaluation in Relation to Antecedent Studies

These findings resonate with broader physical education literature demonstrating benefits of student-centered approaches. Hastie et al. have extensively documented that Sport Education models enhance student engagement, competence development, and skill/tactical gains compared to traditional instruction, with reviews spanning 2004-2011 confirming consistent positive outcomes across various sports (Bessa et al., 2020; Farias et al., 2022; Layne et al., 2022) Similarly, Harvey and Jarrett found that TGfU approaches promote tactical awareness and decision-making skills, particularly through small-sided games and tactical prioritization Harvey et al. (2020). The current study extends this evidence base specifically to martial arts contexts, demonstrating that principles effective in team sports and game-based activities translate successfully to individual combat disciplines like Taekwondo (Ardha et al., 2025; Barrientos et al., 2021)

The tactical knowledge findings align with research by Memmert and Harvey indicating that inquiry-based approaches in physical education foster creative thinking and tactical creativity. By engaging students in problem-solving rather than prescribing solutions, instructors facilitate deeper cognitive processing and conceptual understanding. This pedagogical shift from "telling" to "facilitating discovery" appears particularly powerful for developing transferable tactical knowledge, as seen in studies where TGfU led to measurable improvements in game performance and decision-making (Harvey et al., 2020; Todd et al., 2016)

Regarding self-efficacy and autonomous learning, these results parallel research by Cheon et al. demonstrating that autonomy-supportive teaching enhances intrinsic motivation, psychological need satisfaction, and self-regulated behaviors in physical education (Cheon et al., 2023; Cheon & Reeve, 2013; Sánchez-Oliva et al., 2017). The current study extends this work by examining specific autonomous learning behaviors beyond motivation alone, providing evidence that pedagogical approaches shape metacognitive and self-regulatory capacities, with enduring effects up to one year post-intervention (Cheon et al., 2014).

Limited martial arts pedagogical research makes direct comparison challenging. However, (Moore et al., 2021) investigation of martial arts programs emphasizing personal and social responsibility showed positive psychological outcomes, suggesting that martial arts contexts can successfully accommodate innovative pedagogical approaches when traditional frameworks are reconceptualized. The current study provides specific evidence regarding instructional strategies and learning outcomes, contributing substantively to this emerging literature on student-centered martial arts education (Januário et al., 2019; Li & Zeng, 2025).

Elucidating Ramifications of the Discoveries

These findings carry significant implications for martial arts education, physical education teacher preparation, and higher education pedagogy more broadly. First, they challenge entrenched assumptions regarding the necessity of traditional hierarchical instruction in martial arts. While respecting martial arts traditions and cultural values remains important, pedagogical conservatism need not constrain instructional innovation. Student-centered approaches can coexist with traditional values of respect, discipline, and mastery pursuit when thoughtfully implemented, as evidenced by hybrid models integrating SE and TGfU for equitable learning (Arias et al., 2017; Shen & Shao, 2022). Second, the results suggest that physical education students benefit from experiencing innovative pedagogies during their professional preparation. As future educators, their instructional beliefs and practices are shaped substantially by their learning experiences. Exposing them to student-centered approaches in Taekwondo courses provides both conceptual understanding and experiential knowledge they can apply in their teaching careers. This "modeling effect" represents an important mechanism for disseminating pedagogical innovations across generations, particularly in contexts like higher education where future teachers are trained (James et al., 2015; Waychunas, 2023).

Third, the substantial gains in autonomous learning behaviors suggest that physical education courses, including martial arts instruction, can contribute meaningfully to broader higher education goals of developing self-directed, lifelong learners. Rather than viewing physical education as peripheral to academic development, these findings position it as a valuable context for cultivating transferable learning competencies, supported by SDT applications showing enhanced well-being and resilience (Moore et al., 2021; White et al., 2020).

Fourth, the findings have practical implications for curriculum design and instructor preparation in Taekwondo and other martial arts. Professional development programs should equip instructors with knowledge and skills for implementing student-centered strategies while maintaining technical standards and safety protocols. Curricular frameworks should explicitly incorporate opportunities for student choice, collaborative learning, inquiry-based problem-solving, and self-assessment, drawing from successful interventions like those promoting self-controlled feedback in skill learning (Januário et al., 2019; Naseer et al., 2025).

Recognizing Constraints of the Research

Several limitations warrant acknowledgment. First, the quasi-experimental design with intact classes limits causal inference

strength compared to true randomization. While matched-pair assignment and statistical controls mitigated this concern, unmeasured confounding variables could potentially influence outcomes. Future research employing randomized controlled designs would strengthen causal claims. Second, the 14-week intervention duration, while substantial for an academic semester, represents a relatively brief period in martial arts development timelines. Longitudinal research examining sustained effects over multiple semesters or years would provide valuable insights into long-term outcomes and retention of learning gains. Third, implementation fidelity monitoring, while systematic, relied on limited observation sessions. Continuous video recording or more frequent observations would provide more comprehensive fidelity assessment. Additionally, student perceptions of implementation quality were not formally assessed, limiting understanding of how participants experienced the pedagogical approaches. Fourth, the study context—Indonesian higher education, specific university, physical education students—limits generalizability. Cultural factors, institutional contexts, and student characteristics may influence pedagogical effectiveness. Replication across diverse settings, countries, student populations, and martial arts disciplines would enhance external validity. Fifth, outcome measures, while validated and reliable, represent limited aspects of martial arts learning. Broader outcomes including character development, ethical reasoning, philosophical understanding, and long-term participation were not assessed. Additionally, performance measures in competitive or self-defense scenarios would provide ecological validity beyond controlled assessments. Sixth, instructor expertise and characteristics could influence outcomes beyond pedagogical approach differences. While instructors received training and fidelity was monitored, individual teaching effectiveness, enthusiasm, and student rapport likely varied. Future research should examine instructor variables as moderators of pedagogical effectiveness. Seventh, the study focused on group-level effects without examining individual differences in responsiveness to pedagogical approaches. Some students may thrive with student-centered methods while others prefer structured guidance. Investigating learner characteristics that moderate pedagogical effectiveness would inform differentiated instruction approaches.

CONCLUSION

This research provides compelling evidence that student-centered pedagogical approaches significantly enhance learning outcomes in Taekwondo education within higher education contexts. Compared to traditional instructor-centered methods, student-centered pedagogies yielded substantial advantages across technical skill development, tactical knowledge acquisition, self-efficacy, and autonomous learning behaviors. Effect sizes ranging from large to very large indicate meaningful practical significance beyond statistical differences.

These findings challenge conventional assumptions that traditional hierarchical instruction optimally facilitates martial arts learning. Rather, providing students with autonomy support, inquiry-based learning opportunities, collaborative practice structures, and self-assessment experiences cultivates deeper engagement, enhanced competence development, and self-regulated learning capacities. Such outcomes align with contemporary educational goals emphasizing critical thinking, creativity, and lifelong learning.

The study reinforces broader pedagogical principles indicating that student-centered approaches benefit diverse physical education contexts, including traditional individual sports and martial arts disciplines. Physical education programs preparing future teachers should model innovative pedagogies that students can subsequently implement in their professional practice. Martial arts instruction within higher education represents valuable opportunities for cultivating both discipline-specific competencies and transferable learning skills.

Practitioners are encouraged to thoughtfully integrate student-centered strategies into martial arts instruction while respecting traditional values and maintaining technical standards. Professional development supporting instructors in developing autonomy-supportive behaviors, designing inquiry-based activities, facilitating collaborative learning, and implementing self-assessment protocols represents a critical need. Curricular revisions should explicitly incorporate these pedagogical elements rather than treating them as optional supplements.

Future research should investigate long-term effects of student-centered pedagogies on continued participation, teaching practices, and character development. Comparative studies across different martial arts disciplines, cultural contexts, and student populations would enhance understanding of boundary conditions and generalizability. Examination of implementation mechanisms, optimal dosage, and individual difference moderators would provide practical guidance for effective implementation.

Author Suggestions for Future Research:

1. Conduct longitudinal investigations tracking students across multiple semesters and into their professional teaching careers
2. Examine student-centered pedagogies in diverse martial arts disciplines (Judo, Karate, Aikido) and cultural contexts
3. Investigate specific mechanisms through which student-centered approaches enhance learning (e.g., cognitive processing, motivational pathways, social dynamics)
4. Explore optimal combinations and sequencing of student-centered strategies for different learning phases
5. Assess character development outcomes including ethical reasoning, conflict resolution, and social responsibility
6. Investigate individual difference variables moderating responsiveness to pedagogical approaches
7. Develop and validate instructor professional development programs for student-centered martial arts pedagogy
8. Examine student-centered approaches in competitive training contexts and elite performance development

In conclusion, this research demonstrates that innovation and tradition need not conflict in martial arts education. Student-centered pedagogies enhance learning while maintaining respect for martial arts heritage, discipline, and mastery pursuit. Embracing evidence-based pedagogical approaches positions martial arts education to meet contemporary learners' needs while preserving the profound physical, cognitive, and ethical development opportunities that martial arts traditions offer.

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to this research. The study was conducted without financial support or involvement from commercial entities, and no relationships exist that could inappropriately influence the research findings or interpretation.

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