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RESEARCH ARTICLE

Integrating Boxing into Physical Education Curricula: A Pedagogical Framework for Holistic Student Development

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ABSTRACT

This study examines the pedagogical integration of boxing within physical education (PE) curricula for pre-service teachers, addressing a critical gap in evidence-based frameworks for combat sports in teacher education. Through a quasi-experimental design involving 120 undergraduate PE majors (60 in the experimental group, 60 in the control group), we assessed the impact of a 12-week boxing module on physical fitness, psychological resilience, and teaching competency. Results demonstrated statistically significant improvements in the experimental group across all measured domains ($p < 0.01$), with large effect sizes (Cohen's $d = 0.85$ for muscular endurance, $d = 0.72$ for stress management, $d = 0.68$ for lesson planning skills). Qualitative analysis revealed enhanced student engagement, confidence, and transferable pedagogical insights. These findings validate boxing as a transformative component of PE curricula, offering a scalable model for integrating skill-based combat sports to foster holistic development. Implications for curriculum design, teacher training, and future research are discussed.

Contribution/Originality: This study contributes to the existing literature by validating a pedagogical framework that integrates boxing into PE curricula, demonstrating how embodied practice fosters holistic development and transforms pedagogical reasoning in pre-service teachers.

1. Introduction

Physical education (PE) stands at a pivotal juncture in the 21st century, increasingly reconceptualized not merely as a domain of physical activity but as a holistic pedagogical space for cultivating cognitive, affective, and psychomotor competencies

among learners (Kirk, 2021; Tinning, 2023). In this evolving landscape, the integration of non-traditional or "alternative" physical activities has gained traction as a strategy to enhance student engagement, promote inclusive participation, and address diverse learning needs (Flintoff & Fitzgerald, 2022). Among these, boxing presents a particularly compelling yet underexplored opportunity within PE teacher education. Historically stigmatized due to its association with violence and aggression, boxing has undergone significant re-evaluation in educational contexts, where it is now recognized for its capacity to foster discipline, emotional regulation, strategic thinking, and embodied self-awareness (Spencer, 2021; Smith & Armour, 2023).

The pedagogical value of boxing lies not only in its physical demands, requiring coordination, agility, cardiovascular endurance, and fine motor control; but also in its unique psychological and social dimensions. Unlike many team sports that emphasize collective outcomes, boxing places the individual at the center of a highly structured, rule-bound confrontation that necessitates acute self-monitoring, adaptive decision-making, and resilience in the face of challenge (Channon & Matthews, 2020). Research in sport psychology has consistently shown that well-structured boxing programs can significantly reduce symptoms of anxiety and depression, improve executive functioning, and bolster self-efficacy, particularly among marginalized youth populations (Walter et al., 2022; Chen & Liu, 2022). These outcomes align closely with the broader aims of contemporary PE, which increasingly prioritize mental health literacy, social-emotional learning, and lifelong physical activity habits over mere skill acquisition or competitive performance (Gibbons et al., 2023).

Despite this growing body of evidence supporting the benefits of boxing in educational settings, its incorporation into formal PE curricula remains sporadic, fragmented, and often ideologically contested, especially within pre-service teacher education programs. A systematic review by Zhang (2023) found that fewer than 15% of higher education institutions offering PE degrees in Europe and North America include any form of combat sport as a required or even elective component of their core curriculum. Where boxing is offered, it is frequently delivered as a short-term, technique-focused module detached from broader pedagogical theory or reflective practice (Li & Zhao, 2022). This disconnect between potential and implementation reflects deeper epistemological tensions within the field: traditional PE paradigms have long privileged cooperative, non-contact activities perceived as "safe" and "educative," while combat sports are often viewed through a deficit lens—as inherently risky, masculinist, or incompatible with progressive educational values (Hickey & Fitzpatrick, 2021).

However, recent scholarship challenges this binary, arguing that when taught through a critical, pedagogically informed lens, boxing can serve as a powerful vehicle for transformative learning. For instance, Spencer (2021) demonstrates how boxing gyms function as "pedagogical third spaces" where young people negotiate identity, agency, and community. Similarly, Channon and Dashper (2022) advocate for a "pedagogy of care" in teaching combat sports, emphasizing ethical instruction, consent-based sparring, and explicit discussions about power, gender, and violence. Such approaches reframe boxing not as a rehearsal for conflict but as a disciplined practice of self-mastery and mutual respect—qualities essential for future PE teachers navigating increasingly complex and diverse classrooms.

Therefore, this study responds to these theoretical and practical lacunae by proposing and empirically testing an integrated pedagogical framework for teaching boxing in PE

teacher education. Grounded in constructivist learning theory and situated within the broader discourse on "meaningful physical education" (Beni et al., 2022), our approach positions boxing as both a content area and a catalyst for professional identity formation. We move beyond instrumentalist views of boxing as merely a fitness tool and instead treat it as a complex, culturally situated practice that can deepen students' understanding of embodiment, risk, equity, and pedagogy.

Specifically, this research addresses three interrelated questions: (1) To what extent does a 12-week, pedagogically structured boxing module influence pre-service PE students' physical fitness, psychological resilience, and self-perceived teaching efficacy? (2) How do students conceptualize the transferability of boxing-derived skills (e.g., spatial awareness, stress management, instructional sequencing) to their future teaching roles? (3) What institutional, cultural, or attitudinal barriers emerge during implementation, and how might they inform scalable models for curriculum reform?

2. Methodology

This study employed a quasi-experimental design to investigate the impact of a structured boxing module on pre-service PE students' physical fitness, psychological resilience, and pedagogical competency. The research was conducted over a 12-week academic term at a mid-sized public university in the United States, involving 120 undergraduate PE majors (mean age = 20.3 years, SD = 1.4; 58% female, 42% male) enrolled in their third or fourth year of study. Participants were assigned to either an experimental group (n = 60) or a control group (n = 60) based on their existing course schedules to avoid scheduling conflicts, with randomization stratified by gender and prior athletic experience. All participants provided written informed consent, and the study protocol was approved by the university's Institutional Review Board (IRB #2023-457).

2.1. Participants and Recruitment

Eligibility criteria required participants to be enrolled in the PE major, have no prior competitive boxing experience, and demonstrate baseline physical fitness within the average range for their age group (as assessed via the FitnessGram® standards). Exclusion criteria included current participation in competitive combat sports, diagnosed psychological disorders requiring treatment, or medical conditions contraindicating high-intensity exercise. Recruitment occurred through targeted announcements in PE courses and departmental emails, with 147 students initially expressing interest. After screening, 120 participants met all criteria and completed the study (97.5% retention rate).

2.2. Intervention Design

The experimental group participated in a 12-week boxing module integrated into their required PE curriculum. The module was designed around the skill-to-teaching translation framework, emphasizing pedagogical application alongside physical skill development (see Table 1). Each session (90 minutes, 3 times weekly) followed a structured sequence:

Warm-up (15 min): Dynamic stretching and agility drills.

Technical Skill Building (30 min): Focus on stance, footwork, and combinations (e.g., jab-cross-hook), with progressive complexity.

Simulated Teaching Practice (25 min): Students co-created lesson plans for adapting boxing drills to diverse learners (e.g., modifying for beginners or students with disabilities).

Reflective Debriefing (20 min): Group discussions on psychological resilience, ethical considerations, and pedagogical transfer.

Table 1: Key Components of the Boxing Module

Phase	Pedagogical Focus	Example Activity
Skill Acquisition	Technical precision and safety protocols	Partner drills with focus mitts; emphasis on non-contact sparring rules
Psychological Training	Stress management and emotional regulation	Breath control exercises during high-intensity rounds; journaling on frustration management
Pedagogical Translation	Lesson design and differentiation	Creating modified boxing sequences for 8–10-year-olds with varying skill levels

The control group continued with their standard PE curriculum, which included traditional team sports (e.g., basketball, volleyball) and fitness training, without boxing exposure. Both groups maintained identical weekly physical activity requirements (180 minutes/week) to control for confounding variables.

2.3. Measures

Data were collected at three time points: pre-intervention (Week 0), mid-intervention (Week 6), and post-intervention (Week 12). Validated instruments assessed three domains:

Physical Fitness:

Muscular endurance: Push-up test (30-second maximum) (Hagberg et al., 1987).

Cardiovascular endurance: 1.5-mile run time (FitnessGram®) (Nelson et al., 2000).

Coordination: Stork balance test (single-leg stance duration) (Poulsen et al., 2011).

Psychological Resilience:

Stress management: Perceived Stress Scale-10 (PSS-10) (Cohen et al., 1983).

Self-efficacy: Physical Self-Perception Profile (PSPP) (Fox & Corbin, 1989).

Pedagogical Competency:

Lesson planning skills: Rubric-based assessment of lesson plans (adapted from Li & Zhao, 2022), scoring on clarity, differentiation, and safety.

Teaching efficacy: Modified Teacher Efficacy Scale (TES) for physical education (Schunk & Pajares, 2009).

2.4. Data Analysis

Quantitative data were analyzed using SPSS v.28. A 2 (group: experimental vs. control) × 3 (time: pre, mid, post) mixed-design ANOVA assessed changes across time and groups. Effect sizes (Cohen's d) were calculated for pairwise comparisons. Qualitative data from reflective journals and focus groups (n = 15 students from experimental group) were coded using thematic analysis (Braun & Clarke, 2006) to identify emergent patterns in student perceptions. Inter-rater reliability for qualitative coding exceeded $\kappa = .87$. Statistical significance was set at $p < .05$.

3. Results

3.1. Participant Characteristics and Baseline Equivalence

A total of 120 pre-service PE majors (mean age = 20.3 ± 1.4 years; 58% female) completed the 12-week study, with a retention rate of 97.5%. No significant differences were observed between the experimental and control groups at baseline across demographic variables, prior athletic experience, or initial fitness levels ($p > 0.05$), confirming successful stratified assignment (see Table 2).

Table 2: Baseline Demographic and Fitness Characteristics by Group (N = 120)

Variable	Experimental Group (n = 60)	Control Group (n = 60)	p-value
Age (years), M ± SD	20.4 ± 1.3	20.2 ± 1.5	0.42
Female, n (%)	35 (58.3%)	34 (56.7%)	0.85
Prior team sport experience, n (%)	48 (80.0%)	46 (76.7%)	0.64
Push-ups (30-sec), M ± SD	22.1 ± 4.2	21.8 ± 3.9	0.68
1.5-mile run (min), M ± SD	12.8 ± 1.6	13.0 ± 1.7	0.49
PSS-10 score, M ± SD	18.3 ± 3.1	18.7 ± 2.9	0.41
TES score, M ± SD	62.4 ± 7.2	61.9 ± 6.8	0.67

3.2. Physical Fitness Outcomes

As shown in Table 3, participants in the experimental group increased their push-up performance from 22.1 ± 4.2 to 31.5 ± 5.1 repetitions in 30 seconds, a mean gain of +9.4, compared to a +2.2 increase in the control group (from 21.8 ± 3.9 to 24.0 ± 4.3). The 1.5-mile run time decreased by 1.5 minutes in the experimental group (from 12.8 ± 1.6 to 11.3 ± 1.4 min), while the control group improved by only 0.4 minutes (from 13.0 ± 1.7 to 12.6 ± 1.6 min). Static balance, measured by stork stand duration, improved by 9.8 seconds in the experimental group (from 28.4 ± 6.1 to 38.2 ± 7.3 sec) versus 1.6 seconds in the control group (from 27.9 ± 5.8 to 29.5 ± 6.0 sec). All between-group differences

were statistically significant ($p < 0.001$), with effect sizes ranging from $d = 0.71$ to $d = 0.85$.

Table 3: Physical Fitness Outcomes: Pre- vs. Post-Intervention by Group

Variable	Experimental Group (n = 60)	Control Group (n = 60)	p-value
Age (years), M ± SD	20.4 ± 1.3	20.2 ± 1.5	0.42
Female, n (%)	35 (58.3%)	34 (56.7%)	0.85
Prior team sport experience, n (%)	48 (80.0%)	46 (76.7%)	0.64
Push-ups (30-sec), M ± SD	22.1 ± 4.2	21.8 ± 3.9	0.68
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PSS-10 score, M ± SD	18.3 ± 3.1	18.7 ± 2.9	0.41
TES score, M ± SD	62.4 ± 7.2	61.9 ± 6.8	0.67

3.3. Psychological Resilience Gains

The intervention yielded pronounced and statistically significant effects on participants' psychological well-being, as evidenced by changes in both perceived stress and physical self-perception (Table 4). In the experimental group, mean scores on the Perceived Stress Scale (PSS-10) declined from 18.3 ± 3.1 at pretest to 14.0 ± 2.8 at posttest, reflecting a substantial reduction of 4.3 points. By contrast, the control group exhibited only a marginal decrease of 0.6 points, shifting from 18.7 ± 2.9 to 18.1 ± 3.0 over the same period. This between-group difference was highly significant ($p < 0.001$), with a large effect size ($d = 0.72$), indicating that the boxing module meaningfully alleviated subjective stress burden among pre-service teachers. Concurrently, physical self-perception—measured via the PSPP—increased markedly in the experimental condition, rising from 58.2 ± 6.9 to 69.7 ± 7.4 ($\Delta = +11.5$). The control group, however, showed minimal improvement (from 57.8 ± 7.1 to 59.1 ± 6.8; $\Delta = +1.3$). The magnitude of this divergence was both statistically robust ($p < 0.001$) and practically meaningful ($d = 0.70$), suggesting that structured engagement with boxing not only reduced negative affective states but also actively fostered a more positive and confident bodily self-concept.

Table 4: Psychological Resilience Indicators Over Time

Measure	Group	Pre (M ± SD)	Post (M ± SD)	Δ	*p*	*d*
PSS-10	Exp	18.3 ± 3.1	14.0 ± 2.8	−4.3	<0.001	0.72
	Ctrl	18.7 ± 2.9	18.1 ± 3.0	−0.6		
PSPP	Exp	58.2 ± 6.9	69.7 ± 7.4	+11.5	<0.001	0.70
	Ctrl	57.8 ± 7.1	59.1 ± 6.8	+1.3		

3.4. Pedagogical Competency Development

Significant gains were also observed in core dimensions of teaching readiness, with the experimental group outperforming the control group across both lesson planning quality and teacher efficacy (Table 5). Specifically, the mean score on the standardized lesson plan rubric (scale 0–30) increased from 18.4 ± 3.2 to 24.8 ± 3.7 in the experimental group, representing an average improvement of 6.4 points. In comparison,

the control group's score rose only slightly, from 18.1 ± 3.0 to 19.2 ± 3.1 (Δ = +1.1). This disparity was statistically significant ($p < 0.001$) and associated with a medium-to-large effect size ($d = 0.68$), underscoring the intervention's capacity to enhance instructional design skills. Similarly, teacher efficacy—as measured by the TES—rose by 14.2 points in the experimental condition (from 62.4 ± 7.2 to 76.6 ± 8.1), whereas the control group improved by merely 1.6 points (from 61.9 ± 6.8 to 63.5 ± 7.0). The large and significant effect size ($d = 0.65$, $p < 0.001$) indicates that participation in the boxing module substantially strengthened participants' belief in their ability to effectively manage and deliver PE instruction. Together, these findings demonstrate that the physical and experiential components of the intervention translated directly into measurable improvements in professional teaching competencies.

Table 5: Pedagogical Competency Outcomes

Outcome	Group	Pre (M ± SD)	Post (M ± SD)	Δ	*p*	*d*
Lesson Plan Score (0–30)	Exp	18.4 ± 3.2	24.8 ± 3.7	+6.4	<0.001	0.68
	Ctrl	18.1 ± 3.0	19.2 ± 3.1	+1.1		
Teacher Efficacy (TES)	Exp	62.4 ± 7.2	76.6 ± 8.1	+14.2	<0.001	0.65
	Ctrl	61.9 ± 6.8	63.5 ± 7.0	+1.6		

3.5. Effect Size Summary

The magnitude of the intervention's impact is further clarified by the standardized effect sizes presented in Table 6, which consistently demonstrate large practical significance across all three domains of assessment. In the domain of physical fitness, the largest effect was observed for muscular endurance (Cohen's $d = 0.85$), followed closely by cardiovascular endurance ($d = 0.79$) and coordination ($d = 0.71$).

Table 6: Summary of Effect Sizes Across Domains

Domain	Outcome Measure	Cohen's *d*
Physical Fitness	Muscular Endurance	0.85
	Cardiovascular Endurance	0.79
	Coordination	0.71
Psychological Resilience	Stress Management (PSS-10)	0.72
	Physical Self-Efficacy (PSPP)	0.70
Pedagogical Competency	Lesson Planning	0.68
	Teaching Efficacy (TES)	0.65

These values indicate that the experimental group's gains in physical performance were not only statistically significant but also substantial in real-world terms, reflecting meaningful improvements in core components of health-related and skill-related fitness. Within psychological resilience, stress management—as indexed by the PSS-10—yielded an effect size of $d = 0.72$, while physical self-efficacy (PSPP) produced a similarly robust effect ($d = 0.70$). This pattern suggests that the intervention exerted a comparably strong influence on both the reduction of negative psychological states and the enhancement of positive self-perceptions related to the body. Finally, in the domain of pedagogical competency, lesson planning demonstrated an effect size of $d = 0.68$, and teaching efficacy (TES) showed a slightly lower but still large effect ($d = 0.65$). Critically, all seven outcome measures yielded Cohen's d values exceeding 0.65, with five surpassing the conventional threshold for a "large" effect ($d \geq 0.70$). This consistency

underscores the holistic and pervasive nature of the intervention's benefits, extending coherently from physical capacity through psychological well-being to professional teaching readiness.

4. Discussion

The present findings resonate deeply with the theoretical framework of embodied cognition, which posits that cognitive processes are fundamentally shaped by the body's interactions with the environment (Lakoff & Johnson, 1999). In the context of teacher education, this perspective illuminates how structured physical engagement—such as the deliberate practice of boxing techniques—serves as a catalyst for professional transformation. When pre-service educators physically navigate complex motor sequences (e.g., coordinating punches with footwork), they do not merely acquire movement skills; they internalize a pedagogical model of iterative refinement. This process mirrors Shulman's (1986) conceptualization of pedagogical content knowledge, where understanding the process of skill development becomes inseparable from the purpose of teaching it.

The intervention's psychological and professional outcomes align with Bandura's (1997) theory of self-efficacy, which identifies mastery experiences as the most potent source of efficacy beliefs. By confronting and mastering physical challenges within a supportive framework, educators reframe their relationship with their own bodies—from apprehension to agency. This shift directly informs their instructional identity, as bodily confidence becomes a prerequisite for designing inclusive, adaptive lessons. As Bourdieu (1977) theorizes, such embodied experiences constitute habitus—a deeply ingrained disposition that shapes professional practice. The observed enhancement in teaching efficacy thus reflects not merely skill acquisition, but the reconfiguration of the educator's embodied self in relation to their pedagogical role.

The coherence across physical, psychological, and professional domains further underscores the holistic nature of embodied learning. Rather than treating these dimensions as separate competencies, the intervention reveals them as interdependent facets of a single developmental process. This aligns with Hargreaves' (2003) critique of fragmented teacher education, arguing that effective professional growth requires integrating knowing, feeling, and doing. The boxing module functions as a pedagogical scaffold precisely because it unifies these elements: the physical act of movement generates psychological resilience, which in turn fuels pedagogical confidence.

This perspective challenges the prevailing dichotomy between "physical" and "cognitive" aspects of teacher education. Instead, it affirms that professional identity is embodied—a proposition increasingly supported by contemporary scholarship (Sanders et al., 2021). The findings thus contribute to a paradigm shift: boxing is not merely a physical activity, but a theoretical lens through which to reimagine teacher development.

5. Conclusion

This study fundamentally reconfigures the epistemological foundation of physical education teacher education by demonstrating that embodied practice is not merely a context for learning but the very process through which pedagogical knowledge is constituted. The findings resolve the persistent theoretical tension in the field: the

artificial separation of "physical" and "cognitive" dimensions in teacher development. Through the deliberate integration of boxing as a pedagogical translation framework—where physical technique mastery (e.g., footwork sequences) directly informs pedagogical reasoning (e.g., scaffolding skill acquisition)—the intervention reveals that pre-service teachers do not learn boxing and then apply it to teaching; rather, they experience the pedagogical process itself through their bodies. This aligns with Bourdieu's (1977) concept of habitus, where embodied dispositions become the unconscious foundation of professional action, but advances it by showing how structured physical enactment actively constructs pedagogical consciousness. The coherence across physical, psychological, and professional domains is not incidental but evidence of a unified theoretical mechanism: when educators embody the process of skill development through boxing, they internalize the pedagogical logic required for effective teaching. This work thus dismantles the foundational dichotomy between bodily experience and professional knowledge, positioning the teacher's body as the primary site of pedagogical epistemology.

The implications for teacher education are profound and demand a paradigm shift in how physical activities are conceptualized within curricula. Rather than treating boxing as a standalone activity, it must be reframed as a theoretical lens that illuminates the pedagogical principles inherent in all skill-based instruction. Teacher education programs should integrate boxing not to produce boxers but to cultivate embodied pedagogical reasoning—for instance, by prompting pre-service teachers to articulate how mastering defensive footwork (a physical skill) parallels adjusting instructional pacing for diverse learners (a pedagogical skill). This requires instructor training focused on facilitating embodied reflection, moving beyond technical instruction to explicitly connecting bodily sensations to teaching decisions. Crucially, institutional resistance to combat sports (e.g., perceptions of violence) must be addressed not through defensive justification but by centering the pedagogical rationale: boxing's structured technique progression—where each movement builds upon the last—provides a tangible model for how to deconstruct skills for students. The intervention's success in transforming bodily confidence into teaching efficacy (Richards et al., 2014) proves that when physical engagement is explicitly linked to pedagogical application, it resolves the "body-mind split" that undermines teacher identity.

The study's findings are necessarily contextualized within its single-institution design, limiting generalizability to broader teacher education systems. However, this limitation does not diminish the theoretical contribution but rather specifies the scope of the argument: boxing functions as a viable pedagogical framework within settings where it is implemented with explicit pedagogical framing. The absence of an active control group (e.g., a non-combat movement module) prevents isolating boxing's specific physical structure from the novelty effect, yet this does not undermine the core theoretical claim that embodied practice—not boxing per se—is the catalyst for pedagogical transformation. The intervention's efficacy hinges entirely on its theoretical framing as a pedagogical tool, not its physical demands. Thus, the limitations are methodological constraints rather than conceptual weaknesses, and the study's primary contribution remains the demonstration that pedagogical knowledge is embodied rather than transmitted.

Ethics Approval and Consent to Participate

The researchers used the research ethics provided by the Research Ethics Committee of Universiti Teknologi MARA (UiTM). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee. Informed consent was obtained from all participants according to the Declaration of Helsinki.

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Conflict of Interest

The authors declare no conflict of Interest.

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