



Enhancing marksmanship proficiency in national defense and security education: A comprehensive analysis of pedagogical and technological interventions for AK-47 training

Tran Van Hieu, Nguyen Thao Nguyen

Faculty of National Defense and Security Education, Ho Chi Minh City University of Education, 280 An Duong Vuong Str.,
Cho Quan Ward, Ho Chi Minh City, Vietnam

Corresponding Author: Tran Van Hieu

Abstract

This study evaluates the enhancement of marksmanship proficiency among students specializing in National Defense and Security Education (NDSE) at Ho Chi Minh City University of Education (HCMUE). Recognizing the critical role of AK-47 proficiency for future military educators, the research identifies technical, psychological, and pedagogical gaps in traditional training models. Through a survey of 90 students across three cohorts (Courses 47, 48, and 49) and a synthesis of international data on simulation-based training (SBT), the analysis reveals significant deficiencies in initial motor skill acquisition and stress management. Results indicate a high institutional readiness for innovation, with 85% of students supporting the implementation of peer-led "model teams" and over 90% approving the reliability of the MBT-03 shooting simulator. Quantitative data suggests that SBT can lead to a 94% increase in hit accuracy compared to traditional methods. The study concludes by proposing a strategic roadmap that integrates the MBT-03 system with Social Cognitive Theory-based peer coaching to produce resilient, highly capable defense educators.

Keywords: National Defense and Security Education, AK-47 marksmanship proficiency, Simulation-based training, Social Cognitive Theory, Peer-led coaching

Introduction

The strategic landscape of national defense training within Southeast Asian higher education, particularly in Vietnam, is currently navigating a pivotal transition characterized by the integration of modern pedagogical frameworks and sophisticated simulation technologies. At the center of this transformation is the discipline of National Defense and Security Education (NDSE), a compulsory and foundational component of the Vietnamese national education system designed to cultivate well-rounded characters capable of meeting the demands of national construction and defense (Phong, 2025) [8]. According to Circular No. 05/2020/TT-BGDĐT, students are required to master the technical operation of the AK-47 submachine gun, which serves as a cornerstone of their future professional identity as educators and military training officers. Proficiency in marksmanship fundamentals directly influences their ability to serve as "force multipliers" in the broader educational system, where they will eventually be responsible for training subsequent generations of citizens in the principles of national defense (Henderson *et al.*, 2025) [5].

Despite the clear importance of this skill, the current state of training often reveals a significant gap between theoretical comprehension and practical execution. Preliminary studies at HCMUE suggest that many students encounter substantial difficulties in achieving standardized proficiency levels. These challenges emerge from a complex interplay of traditional teaching methods that emphasize passive learning, limited access to modern simulation infrastructure, and the inherent physiological stressors associated with high-recoil weapon systems like the AK-47 (Pritchett, 2017) [9]. To address these deficiencies, it is necessary to conduct a deep analysis of the marksmanship acquisition process, integrating perspectives from motor learning science and cognitive psychology with advancements in virtual reality

and laser-based simulation training (Aristeo C. Salapa, 2025) [3].

Methods

This research utilizes a mixed-methods approach to evaluate the factors influencing marksmanship academic results and practical performance among NDSE students. The primary quantitative data was derived from a comprehensive survey of 90 students at the Ho Chi Minh City University of Education, representing 67.67% of the total NDSE major population. This sample included 28 students from Course 47 (final year), 40 from Course 48 (junior year), and 22 from Course 49 (sophomore year), providing a longitudinal perspective on skill acquisition (Table 1). The survey employed a three-level scale to assess perceptions of training feasibility and technical importance, supplemented by direct observations of practical training sessions.

Table 1: Student demographic participation at HCMUE

Cohort	Survey participants	Total population	% of Class
Course 47 (Final Year)	28	55	50.91%
Course 48 (Junior Year)	40	48	83.33%
Course 49 (Sophomore Year)	22	30	73.33%
Total	90	133	67.67%

In addition to the institution-specific survey, the study incorporates a systematic review of international empirical data regarding the efficacy of simulation-based training (SBT) systems, specifically the MBT-03 shooting machine developed by the Military Technical Academy (Trong & Thanh, 2023) [14]. The analysis utilized the "stages-of-skill-development" model and Social Cognitive Theory as theoretical frameworks to evaluate pedagogical interventions (Chung *et al.*, 2009) [4]. Statistical comparisons

were made between traditional dry-fire control groups and SBT experimental groups to quantify the potential impact on live-fire accuracy and student engagement (Altintas *et al.*, 2025)^[1].

Results

The analysis of the NDSE program at HCMUE reveals a strong readiness for innovation within the student body. Data indicates that 50% of students rated the measure of "learner research and teaching method innovation" as very feasible, while 85% viewed the construction of "model teams" for peer-led observation and execution as a highly feasible solution for improving skills (Table 2). Regarding technological integration, students and lecturers provided high approval ratings for the MBT-03 system across ten critical variables (Table 3). Specifically, 90% of students recognized its high reliability and accuracy (within ±1 cm at 100 m range), and 92.4% of lecturers emphasized its enhanced safety compared to live ammunition (Trong & Thanh, 2023)^[14]. Furthermore, the system's "Error Analysis" feature (YT8) received 86.8% approval for its ability to provide diagnostic feedback on muzzle wobble and cant (Trong & Thanh, 2023)^[14].

Table 2. Perceived feasibility of proposed training solutions

Proposed Measure	% Very Feasible	% Feasible
Learner Research & Method Innovation	50%	50%
Research on Practice Content & Logic	60%	40%
Building Model Teams for Observation	85%	15%
Extracurricular Activities	72%	28%
Facility & Material Improvement	80%	20%

Table 3: Approval ratings for MBT-03 system variables

Observed Variable for Efficacy	Lecturer approval (%)	Student approval (%)
Simple Operation (YT1)	78.6%	95.3%
Realistic Feel/Trigger Force (YT3)	92.8%	91.2%
Sound & Visual Effects (YT4)	89.3%	88.8%
High Accuracy (±1cm/100m) (YT5)	N/A	90.0%
Detailed Error Analysis (YT8)	85.7%	86.8%
Enhanced Safety (YT10)	96.4%	92.4%

Quantitative gains from simulation-based training are substantial when compared to traditional methods. Experimental data from controlled studies of novice shooters show that those who utilized simulation systems before moving to a live range exhibited a 94% increase in hit accuracy (from 0.875 to 1.70 at 25m) and a 112% improvement in overall scores compared to a control group using only traditional dry-fire methods (Table 4). Common technical errors identified at HCMUE included incorrect shoulder-rest placement, "jerking" the trigger due to anticipation of recoil, and irregular breathing patterns (Shen, 2025)^[5]. These deficiencies persist despite theoretical knowledge, suggesting that traditional instruction fails to stabilize motor patterns effectively before live-fire qualification (Stephens & Temby, 2014)^[13].

Table 4: Impact of simulation on marksmanship performance

Performance Metric (25m Range)	Control (Dry fire)	Test (Simulation)	% Improvement
Hit accuracy	0.875	1.70	94%
Overall Score	3.30	7.00	112%

Discussion

The findings underscore a fundamental disconnect between the cognitive understanding of marksmanship and its psychomotor execution. According to the stages-of-skill-development model, most students at HCMUE remain in the "cognitive phase," where limited cognitive resources are consumed by the mechanics of the task, leaving them vulnerable to "cognitive-motor interference" (CMi) (Chung *et al.*, 2009)^[4]. In high-stress scenarios, this load increases task initiation times significantly, from 1.27s to 3.39s in some paradigms, which compromises tactical efficiency (Rao *et al.*, 2020)^[10]. The MBT-03 simulation system addresses this by acting as a "scaffolding" tool, allowing students to transition into the "associative phase" where motor patterns stabilize through immediate, data-driven feedback on aim traces and trigger pressure profiles (Amburn *et al.*, 2014)^[2].

From a pedagogical perspective, the integration of Albert Bandura's Social Cognitive Theory (SCT) offers a transformative path. The high feasibility rating for "model teams" suggests that observational learning and reciprocal determinism are powerful drivers of success. When students observe peers successfully performing a task, their self-efficacy—the belief in their own capability to succeed—increases, which research correlates strongly with higher precision (r = 0.39) and lower subjective stress (r = -0.30) (Ibrahim *et al.*, 2026)^[6]. Peer-led coaching also serves as a force multiplier for institutional readiness; advanced students acting as teaching assistants not only improve the procedural knowledge of novices but also undergo "professional identity formation," viewing themselves as future military educators (Henderson *et al.*, 2025)^[5]. This dual benefit is critical for a teacher-training institution like HCMUE.

Psychological stressors, such as "state worry," are negatively correlated with marksmanship success (r = -0.59) (Chung *et al.*, 2009)^[4]. Traditional training often neglects "stress inoculation," leading to the "flinching" response noted in student surveys (Navickienė & Vasiliauskas, 2024)^[7]. Simulation provides a safe environment to build mastery experiences without the physiological arousal of live fire, effectively buffering students against future stress (Navickienė & Vasiliauskas, 2024)^[7]. Furthermore, a holistic approach must include "functional motor competence" (FMC), as upper body strength and core stability are essential for maintaining the 3.5 kg AK-47 in a steady firing position over time (Sobhani *et al.*, 2022)^[12].

Conclusions

The advancement of marksmanship proficiency at Ho Chi Minh City University of Education requires a comprehensive shift toward a "Hybrid Training Model" that integrates technological precision with advanced pedagogical strategies. The study demonstrates that institutional success is predicated on moving beyond classroom-based theory to intensive, diagnostic simulation using systems like the MBT-03. This technological investment must be paired with the formalization of peer-mentoring programs to leverage the high feasibility of "model teams" identified by the student body.

To achieve long-term excellence, HCMUE should standardize a simulation curriculum that prioritizes error correction through after-action reviews (AAR) and integrates psychological skills training, such as arousal

regulation and visualization. By treating marksmanship as a high-level cognitive and psychomotor skill rather than a simple mechanical drill, the university can effectively produce defense educators who possess the confidence and technical expertise required to lead national security efforts. The high levels of student consensus and the empirically proven efficacy of SBT provide a clear mandate for these institutional reforms.

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