Proceedings of the 4th International Conference on Software Engineering and Machine Learning
DOI: 10.54254/2755-2721/2026.32032

Construction of an Evaluation Indicator System for Blended Teaching Competency of Skill-Dominated Physical Education Teachers

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Abstract. In this era of advanced information technology, it is common to observe that our university facing demands for blended teaching skills in physical education (PE). This study aimed to qualitatively analyze Blended Teaching Competency based on five exemplary sports course (including dance, martial arts, and yoga) in Hubei Province. According to human-computer collaborative thoery, we propose a four-dimensional evaluation framework: covering teaching integration, technology application, adaptive intelligence, and smart feedback. This framework support not just skill acquisition but the holistic psychological, physical, and emotional development of university students. Our analysis, obviously, revealed that tools like ARs and motion recognition instruments are game-changer. More interesting, these tools allowed for dynamic group coordination exercises and personalized learning paths based on real-time task for student. Ultimately, this framework embodies three core principle: "student-computer-teacher collaboration," "data-driven instruction," and "intelligent PE." We believe it offers a concrete, practical roadmap for enhancing PE teachers' competence in designing and executing blended learning environments.

Keywords: PE teachers, Indicator construction, Qualitative research, Blended teaching competency

1. Case selection

A review of relevant literature reveals that most case studies select 3 to 6 cases [1]. This study comprehensively considered factors such as region, school type, and organizational model. From the list of provincial first-class undergraduate courses scheduled for recognition in Hubei Province in 2023, courses dominated by performance-aesthetic skills were selected following the principle of theoretical sampling. Based on the criteria of case variation, completeness, and innovativeness, five representative cases were ultimately identified: Basic Dance (Hanjiang Normal University), Martial Arts Tai Chi (Hubei Polytechnic University), National Fitness Exercise (Hubei Minzu University), Yoga (Wenhua College), and Aerobics (Hubei Polytechnic University). Following the criteria of purposive sampling, five PE teachers were selected as interview subjects. With their consent,

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interviews were conducted separately. The interviewees were five frontline PE teachers with extensive teaching experience, including two males and three females.

2. Analysis process and theoretical framework

This study adopted a problem-solved-centered interview approach, which efficiently gathered qualitative data and material through a structured process. We assume the key strength of this method is its ability to keep PE teachers focused during interviews, while also aiding researchers in extracting core themes for subsequent semi-structured questionnaires. According to research plan, we followed four concrete steps: preliminary interviews, questionnaire design, in-depth interviews, and flexible follow-ups. Meanwhile, we try to preserve data integrity.

At the theoretical level, we introduced the theory of "human-computer collaborative embodied cognition" [2,3], which is very useful to analysis traditional three-dimensional frameworks. This perspective argues that, with smart technology as an enabler, physical education teaching becomes a process of tight holding among the body, technology, and environment. Here, teacher competency manifests in building an "enhanced embodied experience field," achieveing technology-extended bodily capacities, humen-computer collaborative cognition, and heightened emotional engagement.

During analysis, we combined case observations with interview data, concentrating on how PE teachers applied technology, articulated instruction, and interacted with students. Data came from observing actual teaching settings followed by tailored interviews. Using qualitative analysis software, we eventually cross-integrated behavioral and narrative inputs to derive blended-teaching competency evaluation system. A comparative multi-cases analysis were then conducted to examine how PE teaching cases replicated and extended findings, thereby strengthening case-study robustness [4].

We carefully checked on course goals, content, evaluation, and outcomes across selected performance-aesthetic first-class PE cases. Common traits across these cases underscore blended teaching's unique values on practical courses. For instance, In the investigation, we found that all institutions employed a tightly coordinated online-theory/offline-practice model, while online portions kept deliberately within 20%-40% of total hours. Regarding evaluation, diverse assessment mechanisms covere the entire teaching process, skillfully blending skill demonstration with ideological-political elements [5,6]. Technically, platforms like Chaoxing Learning Pass and KEEP were leveraged for interaction and data tracking as we assumed. In terms of outcomes, not only students' professional skills and competition results improve, but their sports-cultural confidence and lifelong exercise awareness also grew.

3. Constructing evaluation indicators

To obtain a more detailed theoretical framework, We analyzed the data through the lens of human-computer collaborative embodied cognition. Starting with 449 free nodes from open coding, we (2 authors) grouped, refined, and conceptualized them iteratively—first into 8 broader categories, then distilled down to 4 core competencies. These four, which structure our proposed system (see Table 1), are: AI-infused lesson design, hands-on AI tool application, adaptive teaching in smart environments, and intelligent assessment/feedback.

First, teachers must thoughtfully weave AI into their lesson plan. The goal are to craft tailored learning journeys—for example, by charting individual student pathways or skillfully mixing digital and in-person tasks. This level of personalization isn't just about efficiency; it's crucial for grabbe and holding student engagement in today's classrooms.

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Second, practical, hands-on skill with AI tools are non-negotiable. Teachers must grow comfortable not just operating smart classroom systems or parsing data dashboards, but also interpreting that data to inform their next move and strategy. Imagine a PE teacher using motion-tracking to give instant form feedback—that's the level of data-driven teaching we're talking about. This is big progress with small step for promoting qulity of PE lesson.

Third, flexibility is paramount in AI-augmented classrooms of Blended PE lesson. When a tool suggest an alternative explanation for a tricky concept, the teacher should feel empowered to pivot, not just obliged to follow. Leveraging emotionally-aware designs—like adaptive feedback that encourages rather than frustrates—can foster a more supportive and motivating climates where students actually want to engage.

Finally, AI-enhanced assessment and feedback closes the loop. It moves beyond simple scoring (whether AI-assisted or hybrid) to delivering personalized guidance that targets each student's specific gaps. This precision helps to turn feedback into genuine understanding.

Table 1. Coding information for PE teachers' blended teaching competency

Core Code (Reference Count)	Related Code (Reference Count)	Open Coding
Teaching Integration Ability (92)	Intelligent PE Course Design (48)	Intelligent generation of personalized learning paths (22), Intelligent matching of online theory and offline practice (16), Adaptive generation of teaching content (10)
	Human-Computer Collaborative Skill Teaching (44)	Intelligent teaching assistant co-teaching (18), Intelligent design of PE practice groups and activities (15), Construction of virtual-real integrated teaching scenarios (11)
Intelligent Application Ability (85)	Mastery of Intelligent Sports Tools (52)	Intelligent platform operation and optimization (24), Intelligent generation and analysis of skill videos (18), Application of virtual simulation tools (10)
	Data-Driven PE Teaching (33)	Intelligent analysis of movement techniques (15), Intelligent real-time feedback and warning on movement norms (11), Multi-scenario data fusion processing (7)
Teaching Adaptability (76)	Dynamic Adjustment of Sports Strategies (41)	Teaching adjustment based on learning diagnosis (23), Intelligent recommendation of learning methods (12), Adaptive differentiated guidance (6)
	Construction of Intelligent Sports Environment (35)	Relevance matching of sports resources (17), Creating human-computer collaborative learning spaces (11), Management of intelligent interactive environments (7)
Assessment & Feedback Ability (68)	Intelligent Assessment Skill System (43)	Design of intelligent generative evaluation (20), Intelligent analysis of skill movements (15), Machine-teacher dual-track evaluation (8)
	Intelligent Feedback Intervention Skills (25)	Diagnosis of skill learning (12), Generation of personalized skill feedback (9), Intelligent strategies for learning promotion intervention (4)

4. Evaluation practice

The way we blend teaching methods has evolved dramatically. It's less about simply combining online and offline parts, and more about stitching them into a single, smart experience. Consider a modern Yoga class: instructors pull real-time heart rate data from wearables to craft posture sequences that fit each student's state, and AR can pop up visual cues exactly when someone falters. Switch to Aerobics, and you'll find smart software tweaking routines based on real-time movement analysis, while apps like "Learning Pass" serve up personalized exercise tiers. This isn't just mixing tools—it's creating a tight cycle where data shapes the content, and digital aids meet physical practice.

AI's role is changing, too. It's becoming less of a handy assistant and more of a real-time decision driver. Look at Tai Chi: algorithms now catch those tiny form slips we might miss, whip up a corrective animation, and send it straight to the student's device. Offline, the teacher can then focus

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on explaining the why behind the movement—turning a correction into a deeper lesson. In group National Fitness classes, video feeds combined with wearable data let coaches adjust intensity and exercises on the spot. We're finally swapping guesswork for data-backed guidance.

Adaptive teaching proves its worth the moment it reacts to live input. Take a Dance class: by checking an AI motion tracker, one instructor saw a common problem—students wobbling on landings after jumps. She responded by weaving targeted strength drills into the session and sharing extra tutorial clips. Spot the problem, tweak the lesson, link the resources—just like that. Over in Aerobics, "movement heatmaps" highlighted confusing transitions for learners, which led the teacher to run multi-approach drills face-to-face to lock those moves down.

Assessment is now following a dual track: cold, hard metrics from machines, warmed up by a teacher's qualitative judgment. In Yoga, AI can scan posture videos and spit out a performance report, but the instructor layers on personalized adjustments and that crucial pep talk—marrying data with empathy. With Tai Chi, motion capture gives a score on movement consistency, sure, but teachers then weave in the cultural background and qualitative notes, sometimes even setting up online peer feedback. The result? An evaluation that feels multi-dimensional, not one-dimensional.

5. Conclusion

This study, from the theoretical perspective of "human-computer collaborative embodied cognition," constructs a four-dimensional evaluation framework for PE teachers' blended teaching competency through in-depth observation and qualitative coding of multiple cases. The dimensions are: teaching integration ability, artificial intelligence technology application ability, teaching adaptability, and assessment and feedback ability. This framework not only breaks through the limitation of "lack of technology integration dimension" in traditional competency evaluation but also, within the embodied teaching scenario of "body-technology-environment", interprets how intelligent technology shifts from tool assistance to cognitive collaboration, promoting the paradigm evolution of physical education from "interpersonal instruction" to "human-machine co-education."

Funding information

2023 Hubei Provincial Undergraduate Teaching Reform Research Project, No. 2023243. Project Title: Research on the Current Status and Optimization of Blended Teaching in Skill-Dominated Physical Education Courses at General Universities in Hubei Province; Teaching and Research Project of Wuhan University of Science and Technology in 2024. No.2024Z029. Project Title: Improving Public Physical Education in Colleges and Universities Based on Precise Measurement, Analysis and Intervention Experimental Research on the Quality of Classroom Teaching

References

[1] Yin, R. K., Zhou, H. T., et al. Case Study Research: Design and Methods [M]. Chongqing University Press, 2017.
[2] Zhang, Z., Ji, L. The Autonomous Knowledge Construction of the Discipline of Physical Education: An Examination Based on Embodied Cognition [J]. Journal of Shanghai University of Sport, 2023, 47(06): 1-11+75.
[3] Chen, G., Sun, Y. T. Knowledge "Affordance": How "Dual-Intelligence Drives" Human-Computer Collaborative Knowledge Production [J]. E-education Research, 2025, 46(11): 25-32.
[4] Zhang, J., Liu, F. Construction of Physical Education Course Evaluation System under Blended Teaching Mode: Based on Multi-Institution Case Analysis [J]. Sports Culture Guide, 2023, (8): 110-115.
[5] Li Z .Analysis of the Application Effect of Online and Offline Hybrid Teaching Mode in Physical Education Teaching of Undergraduates [J].Journal of Higher Vocational Education, 2025, 2(6).

DOI: 10.54254/2755-2721/2026.32032

[6] Xu Y .Research on the Development and Application of Digital Resources in College Physical Education under the Background of Blended Teaching: Taking the Empirical Study of Swimming Teaching as an Example [J].International Education Forum, 2025, 3(8): 80-85.