

INTEGRATING OBE AND CDIO APPROACHES INTO UNDERGRADUATE FUTSAL COACH EDUCATION

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Abstract

The increasing professionalization of futsal has intensified demands for coaches capable of operating in interdisciplinary, data-informed, and high-performance environments. However, undergraduate futsal coach education in many institutions remains fragmented and insufficiently aligned with competency-based and practice-oriented frameworks. A coherent competency framework specifically tailored to futsal coaching at undergraduate level remains underdeveloped in existing literature.

This paper explores the integration of Outcome-Based Education (OBE) and CDIO (Conceive–Design–Implement–Operate) as a conceptual model for enhancing undergraduate futsal coach education. Using a narrative conceptual synthesis, the study draws on literature from coaching science, sport pedagogy, and curriculum design. The analysis proposes an integrated framework linking learning outcomes, experiential learning cycles, and professional competency development in futsal coaching.

Key competency domains include tactical and technical competence, sport science application, performance analysis, pedagogical communication, and reflective practice. The paper argues that combining OBE and CDIO strengthens the alignment between curriculum design, learning processes, and labor market demands in modern futsal coaching.

This study proposes a three-layer competency architecture integrating OBE, CDIO, and futsal performance environments into a unified educational system. The framework extends existing applications of OBE and CDIO by contextualizing them within sport-specific coaching competency development.

Keywords: OBE; CDIO; futsal coaching; coach education; competency-based education; learning outcomes

1. Introduction

Futsal has developed into a high-performance sport characterized by rapid tactical transitions, constrained playing space, and high-intensity physiological and cognitive demands (Barbero-Alvarez et al., 2008; Spyrou et al., 2020). These characteristics require coaches to integrate tactical, scientific, pedagogical, and analytical knowledge within dynamic performance environments.

Contemporary coaching research increasingly emphasizes coaching as an integrated profession rather than a collection of isolated technical skills (Cushion et al., 2003; Gilbert & Trudel, 2004). This shift implies that coach education must move toward frameworks that support competency integration and contextual application.

Despite these developments, many undergraduate futsal coach education programs remain structured around traditional content-based models with limited integration between theory and practice. This creates a gap between educational outcomes and professional coaching requirements.

However, existing literature reveals three critical limitations. First, Outcome-Based Education (OBE) in sport coaching is often constrained to curriculum mapping and assessment alignment, without being explicitly connected to experiential learning design and professional practice contexts. Second, the CDIO framework has been predominantly applied in engineering education, with limited adaptation to sport coaching environments characterized by non-linear, uncertain, and dynamically evolving decision-making processes. Third, there is a lack of integrated conceptual frameworks that combine OBE and CDIO to systematically develop coaching competencies in futsal-specific performance environments.

In response, higher education has increasingly adopted Outcome-Based Education (OBE) and experiential models such as CDIO to strengthen

curriculum coherence and professional readiness (Biggs & Tang, 2011; Crawley et al., 2014). However, their specific integration in futsal coach education remains underexplored.

Therefore, this study develops a conceptual framework integrating OBE and CDIO to support competency-based futsal coach education in higher education contexts.

2. Conceptual Review Approach

This study adopts a narrative conceptual synthesis approach aimed at integrating knowledge from multiple interdisciplinary domains, including coaching science, sport pedagogy, competency-based education, and curriculum design frameworks such as Outcome-Based Education (OBE) and CDIO. Narrative synthesis is particularly appropriate in emerging or developing research areas where empirical consensus remains limited and where the primary research objective is theoretical integration rather than statistical aggregation (Baumeister & Leary, 1997; Snyder, 2019).

Unlike systematic reviews that prioritize effect estimation, the present study focuses on constructing a coherent conceptual structure capable of explaining the relationships between educational design principles and competency development in undergraduate futsal coach education. In this sense, the review is oriented toward framework synthesis, where fragmented theoretical perspectives are reorganized into an integrated interpretive model that connects curriculum logic with professional coaching requirements.

The literature was retrieved from major international databases, including Scopus, Web of Science, Google Scholar, and SPORTDiscus. Selection criteria prioritized peer-reviewed publications in coaching science, sport pedagogy, curriculum studies, and higher education, alongside foundational works on competency-based education, OBE, and CDIO frameworks (Biggs & Tang, 2011; Crawley et al., 2014). Additional attention was given to studies addressing sport coaching as a professional practice, particularly those emphasizing experiential learning, reflective practice, and performance-oriented education.

The analysis followed a structured thematic coding process across three interrelated analytical dimensions. The first dimension focuses on competency conceptualization in coaching education, particularly how coaching competence is defined, structured, and operationalized in contemporary literature. The second dimension examines curriculum structure and learning outcome alignment, with emphasis on how educational frameworks translate competencies into measurable and assessable outcomes. The third dimension addresses experiential and practice-based learning mechanisms, highlighting how learning is enacted through interaction with authentic coaching environments and applied performance contexts.

Together, these analytical layers enable the development of an integrated conceptual model that links curriculum design principles with the formation of professional competencies in futsal coaching. This synthesis provides the foundation for the OBE–CDIO framework proposed in the following sections.

This approach enables the construction of a theoretically grounded yet practice-oriented framework for competency development in futsal coaching education.

3. Theoretical Foundations of OBE and CDIO in Coach Education

3.1 Outcome-Based Education (OBE)

Outcome-Based Education (OBE) is grounded in the principle that curriculum design should be structured around clearly defined and assessable learning outcomes rather than the transmission of disciplinary content (Biggs & Tang, 2011). Within this approach, educational effectiveness is judged by the extent to which learners can demonstrate intended competencies in authentic and performance-relevant contexts.

In professional education, OBE is particularly significant because it shifts the focus from teaching inputs to demonstrated capabilities. This shift is especially relevant in coaching education, where professional competence is not determined by theoretical knowledge acquisition alone, but by the ability to

apply knowledge effectively in dynamic and uncertain performance environments.

In futsal coaching, this outcome-oriented logic aligns closely with the realities of professional practice, where coaches are continuously evaluated through their capacity to design training interventions, manage tactical decisions under time pressure, and facilitate athlete development in competitive contexts. As such, OBE provides a structural foundation for ensuring that curriculum design reflects the actual performance expectations of modern futsal coaching.

In this context, assessment plays a central role in OBE by ensuring that learning outcomes are operationalized through observable and measurable coaching performance indicators.

3.2 CDIO Framework

The CDIO framework (Conceive–Design–Implement–Operate), originally developed in engineering education, has been widely recognized as a structured model for experiential and practice-oriented professional learning (Crawley et al., 2014). It conceptualizes learning as a cyclical process in which knowledge is progressively constructed through iterative engagement with real-world problems.

The CDIO cycle consists of four interconnected stages: identifying and conceptualizing problems (Conceive), developing intervention strategies (Design), executing solutions in practice (Implement), and evaluating outcomes for continuous improvement (Operate). This structure emphasizes learning as an active and iterative process rather than a linear accumulation of knowledge.

In futsal coaching education, this cycle closely reflects authentic coaching behavior. Coaches continuously interpret match situations, design tactical and training solutions, implement interventions during practice and competition, and adjust strategies based on performance feedback.

In sport coaching contexts, CDIO must be interpreted as a non-linear and adaptive cycle, reflecting the unpredictable and dynamic nature of competitive performance environments.

This alignment makes CDIO particularly suitable for sport education, where professional competence emerges through repeated cycles of action, reflection, and adaptation in real performance environments.

3.3 Integration Logic

The integration of OBE and CDIO establishes a dual-layer curriculum architecture in which outcome specification (OBE) and experiential learning processes (CDIO) are structurally and functionally interdependent.

At the structural level, OBE defines what competencies learners are expected to achieve, expressed through measurable and performance-based learning outcomes. At the process level, CDIO defines how these competencies are developed through iterative engagement with authentic problem-solving and practice-based learning cycles.

This integration is theoretically important because it resolves a common limitation in professional education: the separation between curriculum objectives and learning processes. In many traditional coaching education models, learning outcomes are defined without sufficient alignment to experiential pathways through which competencies are actually developed.

In futsal coaching education, where performance requires the simultaneous integration of tactical cognition, sport science application, and real-time decision-making, such separation becomes particularly problematic.

As a result, the OBE–CDIO integration ensures both structural clarity in curriculum design and experiential authenticity in learning implementation, establishing a coherent competency-driven education system in which learning outcomes, pedagogical processes, and professional practice are systematically aligned.

4. Integrated OBE–CDIO Framework for Futsal Coach Education

The proposed framework conceptualizes undergraduate futsal coach education as an integrated competency system in which curriculum design, learning processes, and professional practice are systematically aligned within a unified educational logic. Rather than treating Outcome-Based Education (OBE)

and CDIO as independent pedagogical models, the framework positions them as complementary mechanisms that jointly structure competency development in futsal coaching education.

The proposed framework represents a shift from fragmented competency-based training to an integrated system of outcome-driven and experience-based coach education.

The model is organized into three interdependent layers. The first layer is the OBE layer, which defines the expected learning outcomes and professional competencies that graduates must demonstrate upon completion of the program. The second layer is the CDIO layer, which structures the experiential learning process through which these competencies are progressively developed. The third layer is the futsal performance layer, which represents the authentic professional environment in which coaching competencies are enacted, tested, and validated.

These three layers form a continuous and iterative system in which curriculum design, learning experience, and professional practice are dynamically connected. Importantly, the framework does not treat these layers as hierarchical stages, but as mutually reinforcing components of a single competency development ecosystem.

4.1 Competency Domains

Within the proposed framework, three core competency clusters are identified as the foundational structure of undergraduate futsal coach education.

The first cluster is Performance Competence, which encompasses both tactical competence and technical competence. This domain reflects the coach's ability to understand game structures, interpret tactical situations, and apply technical knowledge in the design and execution of training and competitive strategies.

The second cluster is Analytical Competence, which includes sport science application competence and performance analysis competence. This domain highlights the coach's capacity to integrate interdisciplinary knowledge

from sport science and to utilize performance data in evaluating, interpreting, and improving both individual and team performance.

The third cluster is Pedagogical and Reflective Competence, which consists of pedagogical communication competence and reflective practice competence. This domain emphasizes the coach's ability to communicate effectively with athletes, facilitate learning processes, and critically reflect on coaching actions in order to continuously improve professional practice.

These competencies should not be interpreted as independent or modular knowledge categories. Instead, they function as interdependent dimensions of professional capability that are simultaneously activated in real coaching practice. In futsal environments, coaching performance is not determined by isolated skill execution, but by the continuous integration of multiple knowledge systems under conditions of time pressure, spatial constraint, and tactical uncertainty.

From a conceptual perspective, coaching competence is inherently systemic, where tactical interpretation, analytical reasoning, pedagogical interaction, and reflective adaptation operate in an integrated manner within dynamic performance contexts.

4.2 CDIO Learning Cycle in Futsal Coaching Context

In the context of futsal coach education, the CDIO framework operationalizes competency development through a structured yet flexible experiential learning cycle embedded within authentic coaching environments.

The Conceive stage involves the identification, interpretation, and contextual analysis of tactical or performance-related problems derived from match observation, performance data, or training feedback. The Design stage refers to the formulation of coaching interventions, including tactical structures, training tasks, and pedagogical strategies that respond to identified performance constraints. The Implement stage involves the execution of coaching plans within real or simulated training environments, where coaches must manage time pressure, athlete interaction, and situational variability. The Operate stage

focuses on evaluating outcomes through performance analysis, athlete feedback, and self-reflection, leading to adaptive refinement of subsequent coaching decisions.

This cyclical structure transforms learning from a linear, content-driven process into a recursive professional development mechanism, enabling continuous cycles of action, feedback, and adaptation that mirror coaching practice in real competitive environments.

This cycle operationalizes experiential learning as a structured yet adaptive process embedded in authentic coaching contexts.

4.3 Conceptual Model of the OBE–CDIO–Futsal Competency System

The integrated conceptual model can be represented as a vertically aligned competency development system linking curriculum design, learning processes, and professional performance:

OBE (Learning Outcomes) → CDIO (Experiential Learning Cycle) → Integrated Coaching Competency

OBE defines the intended professional competencies, CDIO operationalizes the learning process through which these competencies are developed, and the futsal performance environment serves as the final validation context where competencies are enacted and evaluated.

At the structural level, OBE ensures clarity, transparency, and measurability of learning outcomes. At the process level, CDIO ensures that these outcomes are not merely theoretical constructs but are developed through iterative, practice-based learning cycles. At the application level, the futsal performance environment functions as an authentic validation space in which coaching competencies are tested under real competitive conditions.

The conceptual strength of this model lies in its ability to resolve a common limitation in traditional coach education systems, namely the disconnection between curriculum objectives and professional practice. By integrating outcome definition (OBE) with experiential learning design (CDIO), the framework ensures coherence across all stages of educational design,

delivery, and assessment. This alignment strengthens the relevance of coach education programs in responding to the evolving demands of modern futsal coaching and high-performance sport systems.

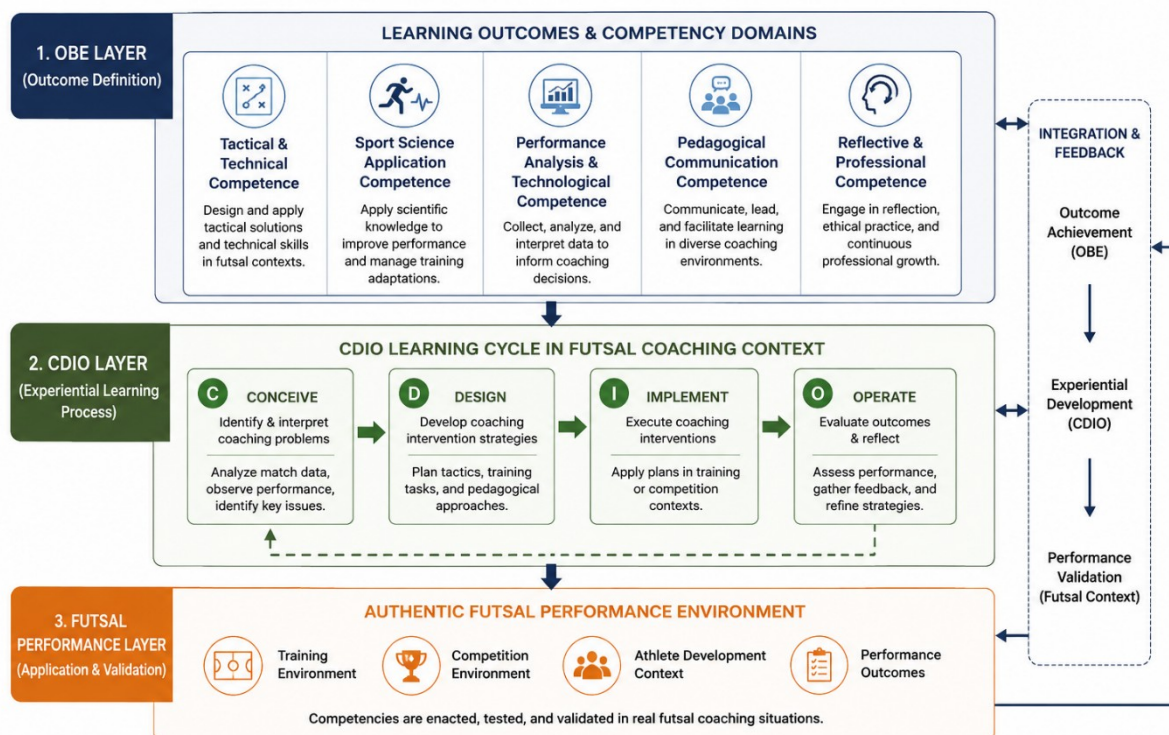


Figure 1. Integrated OBE-CDIO-Futsal Competency System for Undergraduate Futsal Coach Education.

5. Discussion

The integration of Outcome-Based Education (OBE) and CDIO offers a coherent and systematic response to the persistent fragmentation that characterizes many undergraduate futsal coach education programs. By explicitly linking competency definition with experiential learning processes, the proposed framework addresses a fundamental limitation in traditional curriculum structures, where theoretical knowledge, pedagogical practice, and performance application are often treated as separate domains rather than an integrated professional system.

This aligns with the shift from input-driven coach education to competency-integrated professional formation models in contemporary sport pedagogy.

In futsal coaching, professional competence is inherently multidimensional and context-dependent. Coaches are required to

simultaneously interpret tactical configurations, apply sport science principles, communicate effectively with athletes, and make rapid decisions under conditions of uncertainty. This reflects a form of situated and integrated expertise rather than isolated skill execution. Accordingly, the OBE–CDIO framework is particularly relevant because it conceptualizes competence as an emergent property of interaction between knowledge, action, and reflection within authentic performance environments.

Existing literature in coaching science consistently emphasizes that coaching expertise develops through a dynamic interplay between experiential knowledge, formal education, and reflective practice (Cushion et al., 2003; Gilbert & Trudel, 2004). From this perspective, competence cannot be adequately developed through content transmission alone, but requires iterative engagement with practice-based contexts where knowledge is continuously tested, adapted, and reconstructed. The CDIO cycle operationalizes this principle by structuring learning as a recursive process of problem identification, solution design, implementation, and evaluation, thereby embedding learning within authentic coaching activity.

Furthermore, the integration of OBE ensures that this experiential process is not fragmented or directionless, but explicitly guided by clearly defined, measurable, and performance-oriented learning outcomes. This dual alignment between “what is to be achieved” (OBE) and “how it is developed” (CDIO) strengthens curriculum coherence and enhances transparency in competency development pathways.

From a pedagogical standpoint, the CDIO component aligns closely with ecological and constructivist learning theories, which emphasize that skill acquisition emerges through interaction with representative learning environments (Davids et al., 2013). In futsal coaching education, this implies that learning environments must replicate the perceptual, cognitive, and temporal constraints of real coaching situations, enabling learners to develop adaptive decision-making capabilities under realistic performance conditions.

However, the proposed framework remains conceptual and requires empirical validation in real undergraduate coaching programs to assess its pedagogical effectiveness and implementation feasibility.

Overall, the integrated model enhances the alignment between higher education systems and the evolving professional demands of modern futsal coaching. It shifts the focus from knowledge accumulation to competence integration, from passive learning to active problem-solving, and from decontextualized instruction to authentic professional practice. This contributes to a more coherent and practice-relevant approach to coach education in high-performance sport contexts.

6. Conclusion

This study has developed and proposed an integrated Outcome-Based Education (OBE) and CDIO framework for undergraduate futsal coach education. The model conceptualizes coach education as a structured yet dynamic competency system in which clearly defined learning outcomes are systematically developed through iterative, practice-based learning cycles and ultimately validated within authentic futsal performance environments.

By integrating OBE and CDIO, the framework establishes a dual-layer educational logic that simultaneously ensures curriculum clarity and experiential authenticity. OBE provides the structural foundation for defining professional competencies in measurable and outcome-oriented terms, while CDIO operationalizes these competencies through a cyclical process of experiential learning grounded in real coaching contexts. This integration enables a more coherent alignment between curriculum design, pedagogical processes, and professional practice demands.

The proposed framework contributes to sport coaching education literature by offering a conceptual model that addresses the persistent gap between theoretical instruction and applied coaching competence. In the specific context of futsal, where coaching performance requires rapid decision-making,

tactical flexibility, and interdisciplinary knowledge integration, such alignment is particularly critical for preparing adaptive and practice-ready professionals.

However, as a conceptual study, the proposed framework requires further empirical validation. Future research should examine its implementation in undergraduate coaching programs, assess its effectiveness in enhancing competency acquisition, and evaluate its impact on graduate readiness and employability in professional sport environments. In addition, comparative studies across different sport disciplines may further clarify the transferability and scalability of the OBE–CDIO integration model.

Ultimately, the OBE–CDIO integration provides a transferable model for competency-based sport coach education beyond futsal, particularly in high-performance and interdisciplinary sporting contexts.

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