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Coaching Knowledge Dimensions in Track and Field: A Model for Coach Education

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Abstract

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Sports coaching requires diverse knowledge forms. While international coach education frameworks exist, they inadequately address context-specific needs, particularly in specialized sports like track and field. In Iran, persistent coaching gaps contribute to a high athlete dropout rate, training injuries, and declining international performance. This study aimed to identify the key knowledge dimensions required by Iranian track and field coaches. Using qualitative thematic analysis, 20 participants—six university professors in sport sciences with a focus on coaching and physical education, 12 experienced coaches, and two veteran athletes—were engaged in semi-structured interviews. Participants were selected through purposive snowball sampling until theoretical saturation was achieved. Data were analyzed using Attride-Stirling's thematic network approach. Four knowledge dimensions emerged: Foundational Knowledge (theoretical and practical sport sciences), Personal Knowledge (values, coaching philosophy, intrapersonal knowledge), Professional Knowledge (supervisory-managerial and technical-tactical skills), and Contextual Knowledge (experiential and behavioral dimensions). These findings extend existing international frameworks by recognizing foundational scientific knowledge and contextual knowledge as distinct and essential dimensions that have been previously underrepresented. This four-dimension model provides a comprehensive framework grounded in the Iranian coaching context. Rather than enforcing uniform certification, coaches and educators may emphasize different dimensions based on their career stage and coaching context. The model guides coaches to assess and respond to dynamic environments while fulfilling multiple roles. It also offers a practical pathway for developing qualified coaches, preventing injuries, reducing dropout, and revitalizing athletics on the international stage.

Keywords:

Coach Education, Coach Knowledge, Coaching, Knowledge Dimensions, Track and Field

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Introduction

Sports coaches play a vital role in achieving athletic success, producing positive outcomes through sport, promoting public health, and fostering enthusiasm and commitment among athletes and society at large (Jiang & Yin, 2022; McCarthy, 2024; Moreno, 2020). As the most influential individuals in developing athletes' skills and creating safe emotional and physical environments, qualified coaches are indispensable to sport systems (Camiré et al., 2011; Gordon & Lavalley, 2004). Yet, when qualified coaches are absent, the consequences ripple throughout entire organizations: financial resources are wasted (Hambrick et al., 2014), time and energy are lost, national and international competitions are failed, and dissatisfaction spreads among fans and media (Wei & Lee, 2017). This reality underscores a fundamental truth: meeting the demand for qualified coaches at various levels is not merely an organizational convenience but an essential prerequisite for talent identification, development, and the broader advancement of sport within a nation (Kouhian Afzali et al., 2021).

Track and field provide a compelling context for examining this challenge. As one of the oldest and most fundamental sports disciplines globally, track and field encompasses diverse physical skills—running, jumping, and throwing—that not only contribute to international competitions but also foster competitiveness, discipline, and social cohesion (Tang et al., 2012). In Iran, the sport holds particular significance: it has long been regarded as prestigious, with a proud history of international medals and achievements. Despite persistent challenges in talent identification and training systems, track and field remains one of the most popular foundational disciplines for developing professional athletes (Askari et al., 2020). Similar studies in other Iranian sports, such as swimming, have highlighted how structural, financial, and educational barriers can affect coaches' ability to develop athletes and achieve international success (Bahrevar et al., 2023). However, this historical success contrasts sharply with current challenges. Over the past decade, Iran's track and field has experienced a significant decline in international competitiveness—a decline that directly correlates with critical shortages in qualified coaching personnel, particularly at youth and development levels (Rezaei Soufi & Shabani, 2021; Shabani, 2011; Shahmansouri & Ballanejad, 2018). The situation is stark: a substantial proportion of clubs operate without certified coaches. This coaching crisis has manifested in multiple interconnected problems: a high athlete dropout rates, especially among young participants; increased training-related injuries stemming from inadequate technical instruction and insufficient foundational sport science knowledge among coaches; a weakened talent pipeline for national teams; and widening performance gaps with regional competitors—Turkey, Qatar, and Bahrain—who have systematically invested in coach education infrastructure in recent years (Ghorbaninejad et al., 2025). Understanding what knowledge coaches fundamentally need has become not a luxury but an urgent necessity.

The challenge is compounded by the inherent complexity of track and field coaching itself. Coaches in this sport do far more than teach technical and tactical skills; they must simultaneously manage athletes' psychological and emotional dimensions while providing supportive environments for talent development (Côté & Gilbert, 2009; Yue et al., 2025). In relay events, coaches must establish coordination and effective communication among team members. They must possess an in-depth understanding of diverse athlete needs and characteristics to design effective training programs and performance strategies tailored to individual contexts (Lara-Bercial et al., 2017; Shabani et al., 2011). This multifaceted role demands a structured, comprehensive knowledge base—one specifically tailored to track and field's technical demands and to the specific Iranian coaching context. Recent Iranian research on coach and teacher education has highlighted the necessity of structured, competency-based training models that integrate specialized professional knowledge, research literacy, and culturally grounded qualifications to enhance coaching effectiveness (Eslami & Bahrami, 2025).

The question of what knowledge coaches require has been addressed through various international frameworks. The International Sport Coaching Framework (ISCF) and the European Sport Coaching Framework (ESCF) are widely adopted in Western contexts (Excellence, 2012; Lara-Bercial et al., 2017). Within these frameworks, two prominent conceptual models have emerged. Côté and Gilbert (2009) identified

three core dimensions—professional, interpersonal, and intrapersonal knowledge—as foundational for coaching expertise: professional knowledge encompasses content-specific and procedural knowledge (sport science, coaching theory, core skills), interpersonal knowledge relates to communication and emotional intelligence in interactions with athletes and stakeholders, and intrapersonal knowledge reflects self-awareness, reflection, and personal coaching philosophy developed through experience. Alternatively, Abraham et al. (2014) proposed a taxonomy that asks coaches to consider the "who" (participant requirements and characteristics), the "what" (specific demands of the sport or activity), and the "how" (methodological and pedagogical approaches necessary to facilitate athlete development) (Abraham et al., 2014).

These frameworks have undoubtedly advanced the field of coach education. Yet when examined closely, critical limitations emerge—particularly when these models are applied to diverse sporting disciplines and cultural contexts. Consider first the Côté and Gilbert framework. Though widely cited and influential, it has been criticized for insufficiently addressing the foundational scientific knowledge base that underpins safe and effective coaching practice (Drake, 2011). The tripartite model stresses interpersonal and intrapersonal dimensions but does not adequately differentiate between fundamental sport science knowledge—*anatomy, biomechanics, physiology, and exercise science*—and its professional application. This conflation obscures a critical reality: in technical sports like track and field, where biomechanical precision is essential and injury prevention depends directly on scientific grounding, foundational knowledge cannot be treated as secondary to professional application. A second limitation is that both frameworks inadequately address contextual and experiential knowledge—the situated learning that emerges through lived coaching experiences in specific cultural, institutional, and competitive environments (D. B. Drake, 2014; Felder & Silverman, 1988). Research demonstrates that coaching effectiveness is inherently context-dependent, varying substantially across participation levels, cultural norms, organizational structures, and available resources (Ciampolini et al., 2019; Lara-Bercial et al., 2017). Yet existing frameworks offer limited guidance on how coaches develop and apply contextual intelligence, particularly in resource-constrained or non-Western settings.

Recent scholarship has begun to recognize that addressing this gap requires moving beyond existing models. The revised SHAPE America standards (Moreno, 2020; Lara-Bercial et al., 2022) have highlighted that foundational scientific knowledge must be treated as a distinct, essential knowledge dimension rather than being merely embedded within professional knowledge. Foundational knowledge—encompassing theoretical models, scientific principles, and applied understanding—forms the essential and irreplaceable basis for safe, effective, and evidence-based coaching. Recognizing foundational knowledge as a distinct pillar suggests that a more comprehensive, integrated model of coaching knowledge may better capture the multidimensional requirements of contemporary coaching practice, particularly in technical sports and non-Western contexts.

Although derived from a non-Western setting, the four-dimension model holds broader relevance for technically complex sports and for coaching systems operating outside highly resourced Western environments. In this sense, the Iranian context functions not only as a site of application but also as a lens through which the limitations of universalist coaching frameworks become visible. The proposed model therefore offers a transferable conceptual framework for examining coaching knowledge across diverse cultural and institutional settings, contributing to the ongoing refinement of coaching knowledge theory at an international level. To address this need, governing organizations responsible for coach education must understand what specific knowledge coaches require within their particular context (Gano-Overway et al., 2020). What are the essential knowledge dimensions required by track and field coaches in Iran, and how do these dimensions compare to, and extend, existing international frameworks? Which knowledge dimensions do coaches with extensive experience and sport science educators prioritize as most critical for effective coaching in this sport?

By answering these questions, this study pursues three interconnected aims: (a) to identify the essential knowledge dimensions required by track and field coaches, (b) to examine how these dimensions compare

with and extend existing international coaching frameworks, and (c) to offer practical implications for designing coach education programs suited to resource-constrained environments where systematic coach development remains an ongoing challenge. Ultimately, this research aims to provide an evidence-based foundation for developing contextually relevant coach education programs that can address Iran's current coaching challenges and support the advancement of Iranian athletics on the international stage.

Research Methods

The present research is applied in its purpose and qualitative in methodology, employing a thematic analysis strategy. Thematic analysis was selected because it allows for the systematic identification of patterns and themes within qualitative data while remaining flexible enough to accommodate inductive theory development (Braun & Clarke, 2006). This approach is particularly appropriate for exploratory research aimed at developing conceptual frameworks grounded in participants' lived experiences and professional expertise. Thematic network analysis, one of the most systematic approaches to thematic analysis, was utilized to organize findings into hierarchical levels: basic themes (codes and key textual points), organizing themes (themes derived from the synthesis and abstraction of basic themes), and global themes (higher-order themes representing overarching principles). This structured approach enabled the identification of core issues within qualitative data and the recognition of significant patterns across diverse narratives.

Research Design and Data Collection Timeline

The research followed the systematic stages of thematic analysis proposed by Braun and Clarke (2006): (1) designing the thematic analysis process, (2) data collection, (3) data analysis, and (4) presentation of results and evaluation. Data were collected through semi-structured interviews conducted at a single point in time, complemented by a comprehensive review of relevant literature on coaching knowledge frameworks.

Participant Selection and Sampling

The study employed purposive snowball sampling to recruit 20 participants who possessed deep expertise regarding coaching knowledge and practice in track and field. Participants were selected until theoretical saturation was achieved, occurring after the 20th interview. Saturation was monitored through concurrent data collection and analysis. Saturation was largely apparent after the 18th and 19th interviews, and the final two interviews were conducted to confirm saturation and ensure that all perspectives were captured. The participant sample comprised three distinct but complementary groups: university professors in sport sciences with teaching experience in track and field coaching ($n = 6$), coaches with a minimum of 15 years of professional coaching experience in track and field ($n = 12$), and veteran track and field athletes with extensive and substantial competitive experience who could provide informed perspectives on coach effectiveness from the athlete's standpoint ($n = 2$). This composition ensured that perspectives from multiple stakeholders within the coaching ecosystem—those responsible for coach education, those practicing coaching, and those experiencing coaching—were represented. The demographic profile and professional experience of participants across the three groups are presented in Table 1.

Table 1- Participant Characteristics

Characteristic	University Professors (n=6)	Track and Field Coaches (n=12)	Veteran Athletes (n=2)
Gender	4M, 2F	10M, 2F	2M, 0F
Education	1 Master's, 5 Ph. D	3 Bachelor's, 6 Master's, 3 Ph.D.	2 Master's
Experience	10–25 years in coaching education	15–30 years coaching	8–15 years competitive

Interview Protocol Development

The semi-structured interview protocol was carefully developed to explore the multifaceted nature of coaching knowledge. The protocol design was informed by established conceptual models of coaching expertise (Côté & Gilbert, 2009; Abraham et al., 2014) and shaped by the specific research objectives. To ensure the protocol's relevance and clarity, three independent experts reviewed an initial draft: two faculty members with substantial expertise in coach education and development, and one senior coach educator affiliated with the National Athletics Federation. Their feedback proved invaluable in refining the questions for clarity, comprehensiveness, and logical flow. The final protocol consisted of 10 primary questions, each accompanied by 2–3 follow-up probes designed to encourage participants to elaborate on their experiences and perspectives. The questions systematically explored participants' coaching philosophy and professional background; their views on the essential knowledge dimensions required for effective track and field coaching; the role and importance of foundational scientific knowledge such as biomechanics, physiology, and anatomy; how contextual factors—such as athlete characteristics, institutional resources, and cultural contexts—affect coaching practice; the pathways through which coaches acquire and continuously develop their knowledge; the interpersonal and personal qualities necessary for coaching effectiveness; how different knowledge dimensions integrate and support one another in coaching practice; observed gaps in coaching knowledge at different career stages; the components that coach education programs should underline; and the specialized knowledge requirements across different track and field disciplines. This comprehensive questioning approach enabled rich, nuanced responses grounded in participants' lived professional experiences.

Data Collection Procedures

Semi-structured interviews were conducted either in person or via secure videoconference, depending on participant preference and logistical feasibility. Each interview was scheduled in advance, lasted 45–60 minutes, and was conducted in a quiet, comfortable environment to ensure optimal conditions for thorough discussion. Prior to data collection, all participants received detailed information regarding the study's purpose, the confidentiality of their responses, and their right to withdraw at any point without consequence. Informed consent was obtained in either written or verbal form. All interviews were audio-recorded with explicit participant permission. In addition to audio recording, field notes were taken during and immediately after each interview to capture contextual observations, non-verbal communication, and the researcher's initial impressions. Following each interview, audio recordings were transcribed verbatim in Persian, and transcripts were compared against the original recordings to ensure accuracy and completeness.

Data Analysis Process

Data analysis proceeded according to Braun and Clarke's (2006) thematic analysis framework. Initially, each transcript was reviewed line-by-line to extract basic themes—codes representing key concepts, phrases, or ideas salient to the research questions. Each basic theme was assigned a unique code. Subsequently, basic themes were synthesized and abstracted to generate organizing themes, which were organized into a thematic network representing the hierarchical relationships among themes. The thematic network was iteratively refined by returning to the raw data to verify accuracy, coherence, and comprehensiveness. The analysis remained inductive and data-driven, with the final structure emerging from participants' narratives rather than being imposed by any predetermined theoretical frameworks.

Reliability and Validity Procedures

To ensure the reliability (dependability) of the analysis, a test–retest protocol was implemented. Four randomly selected interview transcripts (20% of the total dataset) were recoded independently by the primary researcher after a 30-day interval. A second independent coder also coded these transcripts. Cohen's kappa statistic was calculated, yielding a coefficient of 0.89, indicating high consistency. The agreement between coders was systematically reviewed and incorporated into refinements of the final model, ensuring that coding reliability reflects both stability over time and consensus between coders. For validity

(trustworthiness), multiple strategies were employed. **Expert Validation:** The identified themes and the preliminary thematic network were reviewed by four faculty members in physical education and two senior track and field coaches. These experts were systematically asked to evaluate: (1) whether each identified theme accurately represents the data; (2) whether themes are mutually exclusive and non-overlapping; (3) whether the themes comprehensively address the research questions; (4) whether the organizational structure and hierarchical relationships among themes are logical and coherent; and (5) whether the proposed model is practically applicable for coach education. Their written and verbal feedback was documented and systematically incorporated into refinements of the final model. **Member Checking:** Five randomly selected participants were provided with a concise summary of the identified themes, the thematic network structure, and the preliminary model. They were asked: (1) Do these themes accurately reflect your understanding of coaching knowledge based on your experience? (2) Are any important or frequently discussed themes absent from this model? (3) Do the relationships and hierarchical organization of themes align with your perspective? All five participants confirmed that the identified themes and overall model structure authentically represented their experiences and perspectives, thus affirming the credibility of the findings. **Triangulation of Methods:** A pluralistic approach was applied to data collection and analysis. The integration of in-depth interviews with systematic literature review enabled cross-verification of findings and strengthened the confirmability of results. **Researcher Sensitivity:** Throughout all stages—including literature review, formulation of research questions, methodological design, protocol development, interview execution, transcription, data analysis, and model construction—deliberate attention was paid to accuracy, consistency, and reflexivity. This systematic attention to rigor at each stage ensured that findings were grounded in data and not influenced by researcher bias or researcher assumptions.

Reflexivity

The research team adopted a reflective approach to acknowledge and manage the potential influence of the researchers' positionality on data collection, interpretation, and model development. The primary researcher's extensive experience in track and field coaching and sport sciences provided valuable contextual insight, but also carried the risk of preconceptions affecting coding and theme identification. To address this, the researcher maintained a reflexive journal throughout the study, documenting assumptions, decisions, and reflections after each interview and during coding and model construction.

In addition, the research team engaged in continuous discussions and exchanges of ideas at various stages of the study, including data collection, coding, and analysis. Peer debriefing sessions were used to critically examine emerging themes, considering how the researchers' experiences and expectations might shape the understanding of participants' narratives. This process helped to identify potential biases, challenge initial assumptions, and ensure that interpretations remained grounded in participants' perspectives.

By combining reflexive practices with member checking, expert validation, and methodological triangulation, the study strengthened the credibility, confirmability, and trustworthiness of its findings. Reflexivity ensured that the final thematic model accurately reflected participants' experiences while acknowledging the researchers' active role in constructing knowledge.

Findings

After analyzing and examining the data, basic, organizing, and global themes were abstracted based on the initial coding results. Through reorganizing the basic themes at this stage, the researchers aimed to derive more abstract and comprehensive themes to identify overarching patterns of meaning. Ultimately, from the total codes obtained and verified by 20 experts who participated in the interviews, 22 basic themes, 8 organizing themes, and 4 global themes were identified in response to the research question. These themes are presented in Table 2.

Table 2- Themes related to the knowledge required by coaches

Global Themes	Organizing Themes	Basic Themes	Frequency
Foundational Knowledge	Theoretical Knowledge	Broad and In-Depth Knowledge of Sport Sciences	10
		Degree in Sports Science	8
		Deep understanding of Sports Sciences	9
	Practical Knowledge	Practical training and assessment	15
		Motor learning	13
		Physical and motor skills	10
Personal Knowledge	Values and Coaching Philosophy	Coach charisma	6
		Emotional and spiritual growth	10
	Intrapersonal Knowledge	Personal maturity and capability	10
		Role modelling	9
		Communication and motivational skills	7
	Professional Knowledge	Supervisory and Managerial Skills	Decision-making and leadership style
Procedural knowledge			7
Cognitive learning			9
Technical–Tactical Knowledge		Technical standards maintenance	8
		Correct technique transmission	10
Contextual Knowledge	Experiential Knowledge	Experiential impact	8
		Situated learning	6
		Awareness of proficiency levels	7
	Behavioural Knowledge	Situational awareness	7
		Adaptation to the environment	7
		Familiarity with the context	6

The frequency column in Table 2 indicates the number of participants (out of 20) who explicitly mentioned each Basic Theme. Themes with higher frequencies represent widely shared perceptions, while those with lower frequencies capture specialized or context-specific insights. The minimum threshold for inclusion was set at 25% (5 participants); all themes in the table meet or exceed this threshold. To illustrate the coding process, Participant 7's statement, "Without deep understanding of anatomy and physiology, you're coaching blindly," was first coded as the Basic Theme "Broad and In-Depth Knowledge of Sport Sciences," then grouped under the Organizing Theme "Theoretical Knowledge of Sport Sciences," and finally integrated into the Global Theme "Foundational Knowledge." This example demonstrates how Basic Themes were systematically abstracted into Organizing and Global Themes while maintaining alignment with participants' experiences as discussed in the Discussion section.

Foundational Knowledge encompasses both theoretical and practical sport sciences, forming the bedrock of coaching competence, preventing errors and injuries, and enabling evidence-based decision-making. In contrast, Professional Knowledge underlines applied coaching skills, technical-tactical competencies, and managerial capabilities, highlighting the distinction between acquiring knowledge and applying it in coaching practice.

The thematic network of coaching knowledge derived from the analysis is illustrated in Figure 1. This figure visually represents the hierarchical relationships among basic, organizing, and global themes identified from the interview data (Table 2). The conceptual model of coaching knowledge extracted from this study, grounded in the theoretical foundations of the findings, is presented in Figure 2.

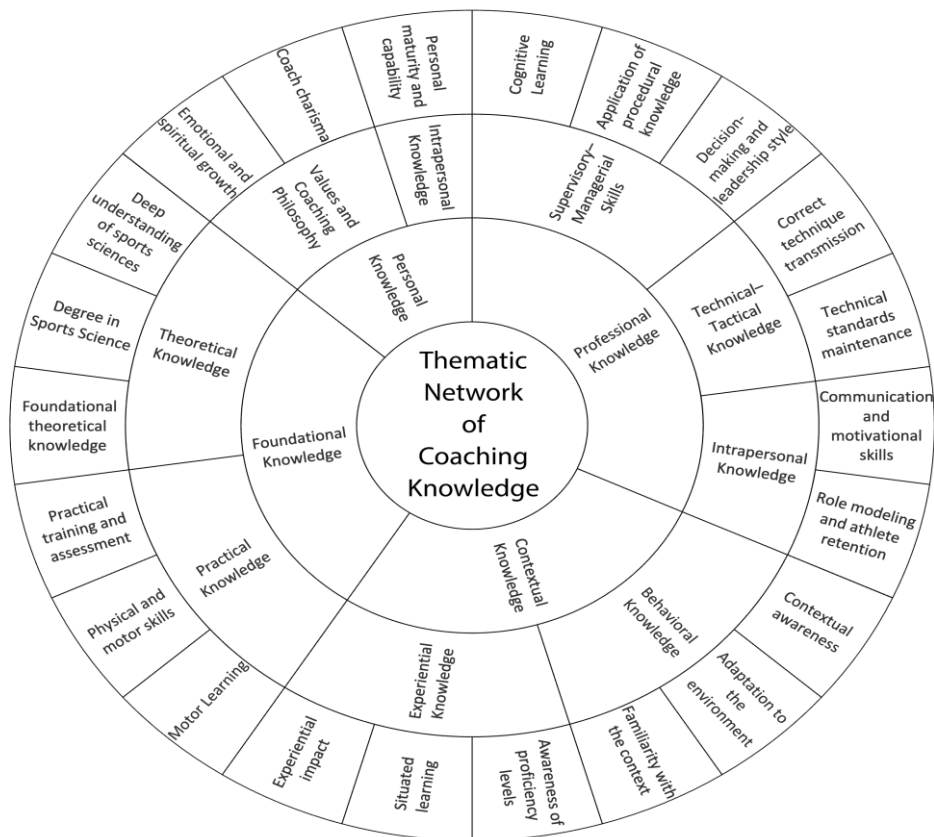


Figure 1. Thematic network of coaches' knowledge requirements

This circular thematic network illustrates the hierarchical organization of coaching knowledge derived from the qualitative analysis. Basic themes are positioned in the outer layer, organizing themes occupy the intermediate layer, and the global theme (Thematic Network of Coaches' Knowledge) is located at the center. The figure should be read from the periphery toward the center, demonstrating how individual interview codes were progressively clustered and abstracted into higher-order conceptual dimensions.

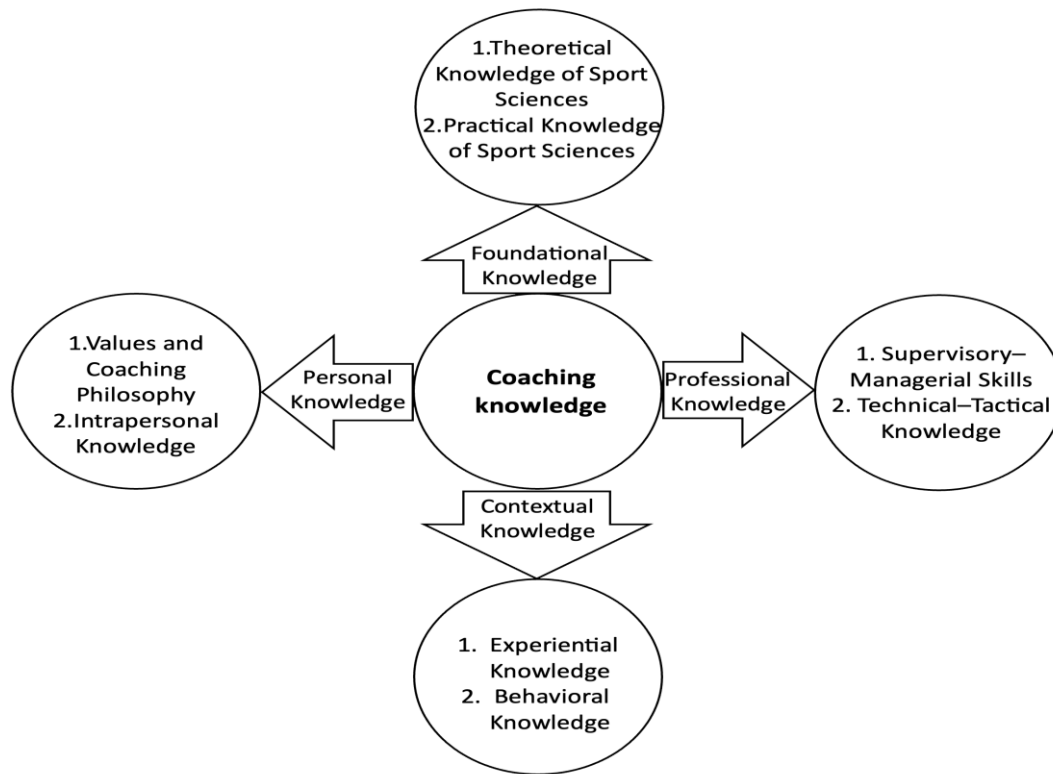


Figure 2. Conceptual model of coaching knowledge

As illustrated in Figure 2, the knowledge required by sports coaches is represented through four global themes— Foundational Knowledge, Personal Knowledge, Professional Knowledge, and Contextual Knowledge —and eight organizing themes: theoretical knowledge of sport sciences, practical knowledge of sport sciences, values and coaching philosophy, intrapersonal knowledge, supervisory–managerial skills, technical–tactical knowledge, experiential knowledge, and behavioral knowledge. The following section elaborates on each global theme and its corresponding organizing themes. The figure demonstrates how basic interview codes were aggregated into organizing themes and then integrated into the overarching global themes, providing a comprehensive conceptual framework for understanding the multidimensional knowledge coaches need to perform effectively. Each type of knowledge is important individually, but they also interact with and reinforce one another, reflecting the integrated and context-sensitive nature of coaching expertise.

Discussion

International coaching frameworks, such as the ISCF and ESCF, have provided valuable guidance. However, they were developed primarily within Western institutional and cultural contexts, which include distinct assumptions about resources, infrastructure, and coaching pathways. Applying these frameworks directly to contexts such as Iran, which are characterized by different economic constraints, institutional structures, and cultural values, requires careful examination and adaptation. The present study addresses this need by investigating coaching knowledge through the lens of Iranian coaching realities, engaging directly with coaches, educators, and athletes operating within the Iranian system. The resulting four-dimension model emerged empirically from this contextualized inquiry, offering a framework specifically grounded in and responsive to the needs of Iranian athletics.

In the Iranian context specifically, this study identified four interconnected dimensions of coaching knowledge that directly address the challenges facing the nation's athletics system: Foundational Knowledge, Personal Knowledge, Professional Knowledge, and Contextual Knowledge. Each of these dimensions is discussed in detail below.

Foundational Knowledge

The findings demonstrated that acquiring Foundational Knowledge of Sport Sciences is one of the most essential needs for coaches. According to the interview data, the foundational dimension encompasses theoretical aspects such as anatomy, physiology, first aid, and exercise science, as well as practical skills related to basic motor abilities, including manipulation, stability, locomotion, and physical conditioning. Essentially, foundational knowledge represents a broad and deep base of both theoretical and practical understanding in sport sciences. Although the European Sport Coaching Framework (2017) refers to such competencies under the professional knowledge dimension, emphasizing foundational knowledge as an independent educational pillar not only helps prevent physical and psychological injuries but also acts as a catalyst for the acquisition of other types of knowledge.

Previous researchers such as Côté and Gilbert (2009), Townsend et al. (2022), and Milistetd et al. (2017) have also highlighted, the importance of physiological, biomechanical, psychological, and motor dimensions of coaching practice. Similarly, Widdowson et al. (2020) highlighted the continued significance of foundational education, including theoretical frameworks and applied guidelines in coaching sciences. Hence, developing coaches' competencies in both theoretical and practical aspects of sport sciences—especially in the early stages of their professional journey—is essential. This dimension enables coaches to create safe training environments, make informed decisions, and continuously improve their coaching practices through evidence-based understanding.

The elevation of foundational knowledge to a distinct global theme in our model represents a significant departure from existing frameworks. While Côté and Gilbert (2009) subsume sport science knowledge under "Professional Knowledge", our findings suggest that the theoretical and scientific foundations of coaching warrant separate emphasis. This distinction is particularly important in contexts like Iran, where formal education systems may not adequately prepare coaches with strong scientific backgrounds, and where traditional or experiential knowledge may sometimes conflict with evidence-based practice. By foregrounding foundational knowledge as an independent dimension, coach education programs can ensure that all coaches—regardless of their entry pathway—develop the scientific literacy necessary for safe and effective practice.

Personal Knowledge

Personal knowledge points up the emotional, physical, and spiritual development of coaches, enabling them to maintain balance and effectiveness amid the complexity and diversity of their coaching roles. The findings indicated that this type of knowledge involves two major aspects: "how a coach is" and "how a coach acts." The critical importance of authentic, supportive coach-athlete relationships is supported by empirical research demonstrating that when coaches develop emotional closeness and mutual commitment with athletes, athlete burnout significantly decreases (Shams et al., 2025). Conversely, coaches who lack emotional awareness and relational authenticity create climates of conflict and emotional distance that undermine athlete psychological well-being and increase burnout symptoms. The first dimension—how a coach is—refers to self-awareness and individual characteristics including commitment to athletes, confidence, the ability to build positive relationships, motivational skills, honesty, empathy, and a sense of responsibility.

Many scholars have underscored the coach's influence on athlete attraction and retention, particularly in early stages of participation (Allan et al., 2017; Berntsen & Kristiansen, 2019; Duffy & Lara-Bercial, 2013). This underscores the importance of personal knowledge in preparing coaches to work effectively with athletes at both beginner and elite levels. Furthermore, numerous researchers have highlighted the psychological

dimensions of coaching and the role of personal maturity in enhancing athlete performance (Allan et al., 2017; Côté & Gilbert, 2009; Duffy & Lara-Bercial, 2013; Harvey et al., 2023; Kjær, 2019; Moreno, 2020). Magrum and McCullick (2019), in their study on the role of emotions in coaching, described emotional competence as a critical skill for coaching effectiveness. Similarly, Potrac et al. (2013) and Jones (2019) argued that personal knowledge is on par with technical expertise, as it determines a coach's ability to apply specialized knowledge within real-world contexts. The second aspect of personal knowledge pertains to coaching philosophy and approach. A coach's philosophy reflects their personal style of leadership, evaluation methods, capacity for self-reflection, and commitment to lifelong learning. In the context of competitive sports, the coach's mindset and demeanor can be decisive factors in athletes' success or failure. Studies by Ghahfarokhi et al. (2012, 2020, in Persian) also indicated that the psychosocial characteristics of coaches are often overlooked compared to their technical attributes.

Moreover, Galvan et al. (2012) found that the content of formal coaching education programs often prioritizes biological sciences such as physiology and nutrition, while neglecting psychological and interpersonal skills. Yet, coaching effectiveness largely depends on interpersonal and group relationships that require regular interaction with athletes, assistants, managers, parents, and other stakeholders. This imbalance in coach education was echoed by several participants who noted that their formal training prepared them well technically but left them unprepared for the emotional demands and relational complexities of coaching. This gap highlights the need for more comprehensive development of personal knowledge within coach education curricula. Given these insights, it is strongly recommended that coach education curricula incorporate targeted training in both subdimensions of personal knowledge—Values and Coaching Philosophy and Intrapersonal Knowledge—to enhance the holistic development of future coaches.

Professional Knowledge

Although numerous scholars—like Potrac et al. (2013) and Côté and Gilbert (2009, 2013)—have acknowledged the importance of professional knowledge, its multiple dimensions have not been equally underlined in prior research (Côté & Gilbert, 2009; Gilbert & Côté, 2013; Potrac et al., 2013). Among the factors that directly or indirectly influence athletic success, coaches serve as the primary agents of leadership and performance direction. Coaches working in high-performance environments often identify leadership skills as one of the most critical aspects of their profession. The term "leader" in sports refers broadly to individuals who seek to influence others—players, staff, and organizational members—toward achieving shared objectives (Bennie & O'Connor, 2011). Beyond resource coordination, supervisory-managerial competence requires coaches and managers to understand and address athletes' motivational needs. Research demonstrates that managerial actions—including respecting athlete dignity, addressing basic needs, ensuring distributive justice, and providing timely recognition—significantly reduce athlete disengagement and enhance training commitment (Rahmati et al., 2025). This highlights how effective managerial leadership extends beyond operational tasks to encompass empathetic understanding of athlete motivation and well-being.

While few studies, for instance Townsend and Cushion (2017), have explicitly discussed managerial or leadership competencies for coaches, many others—including Lara-Bercial et al. (2017), Moreno (2020), and Kjær (2019)—have emphasized the importance of strategic planning, vision setting, and situational leadership. Similarly, Milistetd et al. (2017) highlighted preparation and competition management as essential components of coaching expertise, while Koh and Tan (2022) and Taylor et al. (2024) underscored the necessity of developing interpersonal and relational skills to interact effectively with key stakeholders. These findings collectively reinforce that supervisory–managerial skills are integral to the broader construct of professional knowledge. The second organizing category, Technical–Tactical Knowledge, represents the core foundation of coaching expertise (Côté & Gilbert, 2009). Scholars such as Kennedy et al. (2023), Schempp et al. (2006), and Milistetd et al. (2017) have recognized technical and tactical competence as a defining

criterion of coaching mastery. Accurate demonstration of technical elements and the ability to translate them into effective performance instruction are vital for athlete development. Morris-Eyton and Coopoo (2014) also identified technical analysis and tactical decision-making as key priorities in coaching education programs.

While previous research has typically limited professional knowledge to technical and instructional abilities, the present study suggests that Professional Knowledge should be conceptualized more comprehensively to include both Supervisory–Managerial Skills and Technical–Tactical Knowledge. A coach's ability to plan, lead, and manage, alongside their mastery of sport-specific techniques, forms the dual foundation for effective and influential coaching. This bifurcation is particularly evident in the Iranian context, where coaches often operate with limited institutional support and must simultaneously function as technical experts, program administrators, resource managers, and organizational leaders. The integration of these two dimensions addresses a practical reality: modern coaches cannot succeed through technical expertise alone, nor can managerial competence compensate for technical deficiencies. This perspective aligns with Schempp et al. (2006), who conceptualized "Professional Knowledge" as encompassing technical expertise, planning, anticipation, decision-making, leadership, and supervision.

Contextual Knowledge

The fourth overarching theme identified in this study is Contextual Knowledge, which consists of two interrelated categories: Experiential Knowledge and Behavioral Knowledge. Experiential Knowledge refers to the insights and competencies coaches acquire through accumulated experience, including prior athletic participation, professional engagement, and learning through situational challenges. Behavioral Knowledge, in contrast, involves the conscious application of learned principles within specific coaching contexts, including adaptation to environmental, cultural, and resource constraints. However, contextual knowledge has not been explicitly conceptualized as a distinct dimension in prior sport coaching literature; its importance is increasingly recognized in contemporary coaching scholarship. The European Sport Coaching Framework (2017) implicitly acknowledges contextual knowledge through several of its six core coaching functions—specifically, shaping the environment, reading and responding to context, and reflecting and learning (Lara-Bercial et al., 2017). However, these functions are dispersed across the framework rather than unified under a coherent conceptual dimension. Our findings suggest that contextual knowledge deserves explicit recognition as a foundational pillar of coaching expertise, particularly in environments characterized by resource constraints, cultural diversity, and institutional variability.

One of the most evident outcomes of contextual knowledge is the coach's ability to identify and effectively recruit athletes. Coaches who possess strong contextual awareness can evaluate athletes' potential within their specific environmental and cultural settings, ensuring both performance enhancement and injury prevention. This was particularly evident in participants' descriptions of working across different regions of Iran, where socioeconomic conditions, facility quality, cultural attitudes toward sport, and family involvement varied significantly. One coach noted: "What works in Tehran doesn't necessarily work in rural provinces. You have to understand the local culture, the family dynamics, the available resources. Effective coaching is as much about adaptation as it is about technique." (Participant 11) This illustrates how contextual knowledge enables coaches to navigate the complex interplay between universal coaching principles and local realities.

A case study conducted by Gearity et al. (2013) on the career pathway of coach Philip Fulmer also emphasized the crucial role of experiential learning during both athletic and assistant coaching phases. The findings revealed that experiential knowledge gained through prior participation significantly influenced his professional growth and coaching success. Contextual adaptability and cultural awareness foster what can be termed situational expertise, reflecting a coach's capacity to apply theoretical and technical knowledge flexibly within dynamic environments.

Given the limited attention to contextual knowledge in the existing literature, the present study highlights

the necessity of further exploration in this area. Understanding how coaches integrate experience, environmental awareness, and cultural competence can provide valuable insights for designing more comprehensive and context-sensitive coach education programs. The emergence of contextual knowledge as a distinct global theme represents one of the most significant contributions of this study. While Western coaching frameworks have increasingly recognized the importance of "reflective practice" (Côté & Gilbert, 2009) and "context-specific coaching" (Lara-Bercial et al., 2017), these concepts remain underdeveloped theoretically and are rarely operationalized in coach education curricula. Our findings suggest that contextual knowledge is not merely an optional enhancement to coaching competence but a fundamental requirement for effective practice—particularly in diverse, resource-constrained, or culturally complex environments like Iran. This dimension bridges the gap between abstract knowledge and situated practice, enabling coaches to function effectively across the varied contexts they encounter throughout their careers.

Conclusion

The results of this study highlight the importance of all four dimensions of coaching knowledge—Foundational, Personal, Professional, and Contextual Knowledge—for the holistic development of coaches. Effective coach education must therefore provide an integrated framework of knowledge that enables coaches to assess, adapt, and respond to dynamic and unique contexts while fulfilling multiple roles in the complex and ever-changing environment of sport (Williams & MacNamara, 2020).

This study makes several theoretical and practical contributions to the field of coaching science. Theoretically, it extends existing frameworks by proposing a four-dimension model that addresses critical gaps in current conceptualizations of coaching knowledge. Specifically, the model: (1) elevates foundational scientific knowledge to an independent dimension, emphasizing its role as the basis for evidence-based practice and athlete safety; (2) explicitly incorporates contextual knowledge, recognizing the situated and adaptive nature of coaching expertise; (3) bifurcates professional knowledge into supervisory-managerial and technical-tactical dimensions, acknowledging the dual roles modern coaches must fulfill; and (4) maintains the importance of personal knowledge, aligning with recent emphasis on coach well-being, authenticity, and reflective practice. This four-dimension structure provides a more comprehensive and nuanced understanding of coaching expertise than previous tripartite models.

This study underscores the necessity of adopting a holistic and systemic perspective toward coaching knowledge. The proposed model can serve as a practical foundation for designing comprehensive coaching education programs, as both coaches and coach educators may prioritize different dimensions of knowledge according to their professional stage and coaching context. For instance, a novice coach working with beginner athletes may require greater emphasis on Foundational and Contextual Knowledge, whereas an elite or national-level coach may need to deepen their Professional and Personal Knowledge. This developmental perspective suggests that coach education should not be conceived as a one-size-fits-all certification process but rather as a career-long journey through which coaches progressively deepen their mastery across all four knowledge dimensions in response to evolving professional demands.

Moreover, this model offers valuable applications for the evaluation and professional development of coaches. It can raise awareness among coaches regarding potential imbalances in their knowledge base—such as overdeveloping one area while neglecting another. For example, a coach may invest considerable effort in theoretical study (Foundational Knowledge) but struggle to translate that knowledge into effective and timely practice (Professional Knowledge). Conversely, another coach may demonstrate strong situational understanding and environmental adaptation (Contextual Knowledge) but face challenges in maintaining appropriate professional boundaries and self-awareness (Personal Knowledge). By providing a diagnostic framework for self-assessment and professional development planning, this model empowers coaches to take ownership of their learning trajectories and identify specific areas for growth. Coach education organizations can similarly use this framework to design targeted interventions, mentorship

programs, and continuing education opportunities that address identified knowledge gaps.

Given the long-established recognition of the coach's pivotal role in athlete performance and development, the findings of this study call for a careful re-examination of coaching education curricula. Each dimension of knowledge should be addressed as a complementary component of a larger gestalt, ensuring that coaches are prepared not only technically but also intellectually, emotionally, and contextually to meet the demands of modern sport. While previous frameworks—such as those proposed by Côté and Gilbert (2009) and Abraham et al. (2014)—provided valuable foundations for understanding coaching knowledge, they primarily focused on professional, interpersonal, and intrapersonal aspects. The present study extends and refines this understanding by introducing Foundational Knowledge (scientific and theoretical competencies) and Contextual Knowledge (environmental, experiential, and behavioral dimensions) as equally essential dimensions. This comprehensive model therefore contributes to a more nuanced and context-sensitive conceptualization of coaching expertise, better reflecting the real-world complexities of sport coaching in diverse cultural and professional settings. It challenges the implicit universalism of Western-developed frameworks and demonstrates that coaching knowledge requirements may vary systematically across cultural, institutional, and resource contexts.

From a practical standpoint, the findings have several important implications for coach education program design in Iran and similar contexts. First, programs should ensure that foundational sport science education receives adequate emphasis, particularly for coaches entering the profession without formal university education in sport sciences. This might involve mandatory coursework in anatomy, physiology, biomechanics, motor learning, and sport psychology. Second, personal knowledge development should be explicitly incorporated into curricula through reflective practice exercises, mentorship relationships, values clarification activities, and training in emotional intelligence and communication skills. Third, professional development pathways should differentiate between technical-tactical knowledge (sport-specific expertise) and supervisory-managerial knowledge (leadership and organizational skills), offering specialized training tracks for coaches seeking to advance into head coaching or administrative roles. Fourth, experiential learning opportunities—such as apprenticeships, peer observation, case-based learning, and guided practice—should be integrated throughout coach education to facilitate contextual knowledge development. Finally, assessment and certification processes should evaluate coaches across all four knowledge dimensions rather than focusing exclusively on technical competence, ensuring that credentialed coaches possess comprehensive and balanced expertise.

The four-dimension coaching knowledge model developed in this study provides not only a theoretical framework but also a practical blueprint for systematic reform of Iran's coach education system. By addressing foundational, personal, professional, and contextual knowledge dimensions through coordinated immediate actions, medium-term reforms, and long-term structural changes, Iran can resolve its coaching crisis, revitalize its track and field programs, and restore its position as a regional athletics power. The success of these initiatives depends on sustained commitment from the Athletics Federation, governmental support, university partnerships, and recognition that investing in coach education is ultimately an investment in athlete development, public health, and national sporting prestige.

Research Limitations and Suggestions for Future Research

This study was limited to the field of track and field and to a specific group of expert coaches and sport science academics in Iran. Therefore, the generalizability of the findings to other sports disciplines or cultural contexts should be approached with caution.

Several methodological limitations warrant acknowledgment. First, the reliance on self-reported perceptions through interviews may not fully capture the tacit or unconscious dimensions of coaching knowledge. Observational studies examining coaches' actual practices could provide complementary insights. Second, the sample, while purposefully selected and theoretically saturated, consisted entirely of

experienced coaches and academics. The perspectives of novice coaches, athletes, and other stakeholders (parents, administrators) were not included, potentially limiting the comprehensiveness of the model. Third, the cross-sectional design captures knowledge perceptions at a single point in time and does not examine how coaching knowledge evolves across career stages. Longitudinal research tracking coaches' knowledge development over time would enhance understanding of developmental trajectories. Fourth, while the study identified four knowledge dimensions, it did not empirically test the relationships among these dimensions or their relative importance for coaching effectiveness. Quantitative studies employing structural equation modeling or other statistical techniques could examine these relationships more rigorously.

Future research could extend this framework to other sports to examine whether the same four dimensions of coaching knowledge—foundational, personal, professional, and contextual—emerge across different athletic environments. Comparative studies across sports (e.g., individual vs. team sports, technical vs. strategic sports) and across cultural contexts (e.g., Western vs. non-Western nations) would help determine the universality versus context-specificity of the proposed model. Additionally, research could investigate whether the relative importance of these knowledge dimensions varies systematically by coaching level (youth vs. elite), sport type, or cultural setting. Moreover, experimental or applied studies could design and evaluate coach education programs based on this model to explore effective strategies for transferring and integrating these types of knowledge into real-world coaching practice. Action research or design-based research approaches could be particularly valuable for iteratively developing, implementing, and refining coach education interventions grounded in the four-dimension framework. Such studies could examine questions such as: What pedagogical approaches are most effective for developing each knowledge dimension? How can contextual knowledge be systematically cultivated rather than left to chance accumulation of experience? What assessment methods validly measure coaches' competence across all four dimensions? Finally, research examining the relationships between coaches' knowledge profiles (their strengths and weaknesses across the four dimensions) and athlete outcomes (performance, development, satisfaction, retention) would provide crucial evidence for the practical significance of the model and help prioritize resource allocation in coach education systems.

Additionally, future research should specifically examine:

- Implementation Studies: Pilot testing of the proposed coach education reforms in selected provinces to evaluate feasibility, effectiveness, and cost-effectiveness
- Longitudinal Impact Assessment: Tracking cohorts of coaches through the tiered certification system to measure knowledge development and athlete outcomes over time
- Comparative Effectiveness Research: Comparing outcomes between coaches educated under the four-dimension model versus traditional programs
- Stakeholder Perspectives: Investigating athletes', administrators', and parents' perceptions of coaching quality before and after reforms
- Scalability Analysis: Assessing whether the Iranian model can be adapted to other developing nations facing similar coaching shortages

Conflict of Interest Statement

No conflicts of interest to declare.

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