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Explaining Professional Expertise in Strength and Conditioning: An IUSCA Position Statement on the International Qualification Framework (IQF) Level Descriptors

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ABSTRACT

The International Qualification Framework (IQF) was introduced to provide a standardised and internationally relevant structure for aligning certifications, qualifications, and professional standards within strength and conditioning (S&C). This position statement further defines the eight IQF levels through explicit descriptors of professional reasoning, judgement, autonomy, complexity management, and error correction. The framework adopts a realist and critical rationalist institutional position. S&C practice is understood as explanatory problem-solving directed at real physical systems, with progress occurring through conjecture, empirical scrutiny, criticism, and the continual identification and correction of error. The descriptors were developed through a two-stage expert consultation comprising an exploratory first stage and a wider second-stage review in which the draft descriptors were refined and pressure-tested. The consultation was intended to ground and scrutinise the descriptors in professional experience and was not designed as a formal consensus or psychometric exercise. The descriptors describe progression from externally guided rule-following, through increasingly conditional and principle-based practice, to scientific, system-level, and field-shaping judgement. The position statement also develops an account of practitioner expertise as physically instantiated knowledge, including knowledge that may not yet be fully articulated, while retaining the requirement that professional judgement remains open to scrutiny

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and improvement. The resulting framework has implications for education, certification, assessment, employment, research, evidence-based practice, open science, professional governance, and the role of universities. The descriptors are presented as theoretically derived conclusions from the IUSCA's institutional position rather than as empirically discovered categories, and remain provisional, criticisable, and open to revision where better explanations or identified problems warrant change.

Keywords: Strength and conditioning; Professional standards; Qualification frameworks; Scientific practice; Practitioner expertise; Error correction.

INTRODUCTION

Introduced in 2024, the International Qualification Framework (IQF) proposed a standardised and internationally relevant structure for aligning certifications, qualifications, and standards within the global strength and conditioning (S&C) profession (Langford et al., 2024). Developed in response to longstanding inconsistencies in the recognition of S&C education and credentials, the IQF drew on stakeholder engagement with regional and international educational authorities and reflected wider efforts to strengthen professionalisation within the field (Altiner et al., 2023; Langford et al., 2024).

Following the establishment of the initial eight-level IQF, which outlined a broad developmental pathway from foundational to the highest levels of professional practice, an independent regulatory council was established in 2025 to provide autonomous oversight of the framework, including its education, accreditation, and certification processes (Langford et al., 2025). This marked an important shift from purely framework development toward independent governance, quality assurance, and longer-term professional credibility within the S&C profession.

In this context, the present position statement seeks to further define the eight IQF levels through the development of more explicit level descriptors. In doing so, it aims to provide a stronger foundation for future application across education, certification, professional development, and wider professional recognition in the global S&C profession. The position statement does not claim that professional development occurs as eight discrete natural stages, nor that the descriptors exhaust all relevant dimensions of expertise. Rather, it makes the existing IQF levels more explicit, interpretable, and open to criticism, empirical scrutiny, and revision.

THE PROBLEM OF DEFINING PROFESSIONAL EXPERTISE IN STRENGTH AND CONDITIONING

A dominant view in S&C is that better practice comes from accumulating more facts, reading more research, learning more fixed methods, and collecting more data. However, this is inadequate for real-world practice, where every environment is contextually distinct. Research findings provide evidence, constraints, and provisional expectations, but they do not uniquely determine what should be done in a new context. Additionally, their practical significance depends on interpretation through explanatory knowledge, practitioner judgement, and the specific problem being addressed (Sackett et al., 1996; Turner, 2024).

In real-world environments, practitioners depend not only on facts, but on explanations of why those facts matter, why observed results occur, and how relevant knowledge can be applied in context. Explanation, theory, and decision-making are therefore central to effective practice. Facts and data are indispensable, but they acquire practical meaning within an account of the problem, the causal processes involved, and the outcomes being pursued.

Research on S&C expertise and professional practice is consistent with this broader account. S&C practitioners operate across broad and context-dependent roles and responsibilities (Weldon et al., 2022). Experienced practitioners report increasingly flexible and athlete-centred practice, with decision-making drawing more heavily on experience-based knowledge and contextual and interpersonal factors as expertise develops (Tod et al., 2012; Grant & Dorgo, 2014). Studies of expert and high-level S&C coaches likewise identify adaptive decision-making, innovative and diverse thinking, multilevel planning, and the integration of professional, interpersonal, and contextual knowledge as distinguishing features of more advanced practice (LaPlaca & Schempp, 2020; Downes & Collins, 2021). These findings are not the basis of the eight-level structure, but they are consistent with the premise that professional development involves changes in how knowledge is interpreted, integrated, and used to solve context-specific problems.

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Many S&C organisations and educational structures continue to embed certification systems and curricula based upon factual recall, fixed methods, and the reproduction of accepted practice. While these may provide useful foundations, particularly where safety and supervision are primary concerns, they are insufficient as a complete model of professional development.

A related difficulty is that whatever falls outside established research findings or formalised methods is often assigned to the "art of coaching" or to practitioner "wisdom", without a clear account of what those terms explain. Such labels may serve as temporary descriptions of knowledge that has not yet been fully understood or articulated, but they provide little explanatory value when treated as permanent categories that are beyond investigation. Critical scrutiny has also been identified explicitly within S&C as a means of detecting errors in reasoning and evaluating professional claims (Ebben, 1999).

If important components of expertise remain undefined, education cannot deliberately support their development, assessment cannot validly evaluate them, and stakeholders cannot clearly explain or defend professional standards. The problem is therefore not merely theoretical, it affects accountability, professional recognition, employment, and the capacity of the profession to improve.

The development of stronger professional standards and regulatory structures has been identified as an important issue for S&C (Altiner et al., 2023). Such standards require more than agreement on accepted methods or the accumulation of research findings. They require an explicit account of what professional expertise consists of, how it develops, and how it can be assessed and improved. For the IUSCA, this account is grounded in the principles and values of science, including explanation, criticism, empirical scrutiny, and continual error correction (Popper, 1963/2002). Because knowledge remains incomplete and fallible, inadequate explanations should be treated as problems for further inquiry rather than as permanent limits on understanding.

This position statement therefore addresses a central question for professional development: what changes as a practitioner progresses from foundational participation to the highest levels of professional practice? The position developed here is that progression is not adequately represented purely by the accumulation of facts, methods, certifications, or years of experience. Instead, it is expressed through the increasing quality of explanation, judgement, implementation, autonomy, complexity management, and error correction.

CONCEPTUAL AND INSTITUTIONAL FOUNDATIONS

The Institutional Position of the IUSCA

The IUSCA is established on the principles and values of science: a commitment to logic and reason, empirical scrutiny, scepticism towards authority, transparency, and the continual identification and correction of error. Consistent with these commitments, the IUSCA has adopted a realist and critical rationalist view of practice as its institutional core (Deutsch, 2011; Miller, 2002; Popper, 1963/2002; Thornton, 2023).

On this view, S&C practice concerns real physical systems that are, in principle, open to understanding and influence; knowledge of those systems is always provisional; and progress depends on conjecture, criticism, and error correction rather than certainty or final justification. Observation, evidence, method, consensus, and expertise are valuable, but none provides final epistemic authority because each is interpreted through existing knowledge and remains capable of containing error.

Additionally, it is recognised that it is not possible for knowledge to enter the practitioner directly from experience (Popper, 1963/2002). Practitioners must generate conjectures, explanations, and possible solutions, which are then constrained by logic, evidence, criticism, and outcomes. Knowledge growth therefore has a Darwinian structure in the abstract sense: variation is generated from within (a conjecture or hypothesis), exposed to selection, and improved through the elimination of error.

It should be acknowledged that alternative accounts of professional knowledge and reasoning also exist. Pragmatist approaches place greater emphasis on practical consequences; Bayesian methods represent uncertainty through degrees of belief updated within specified models; and social accounts emphasise the role of professional communities and institutions in the development of knowledge and competence (Dewey, 1938; Howson & Urbach, 2006; Longino, 1990). Each account captures something relevant to professional

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practice, such as the importance of outcomes, the use of probabilistic models to support judgement, and the need for institutions in collective error correction.

Bayesian methods are not treated here as a competing metaphysics and may be used within a realist framework. The distinction concerns their epistemological role. Probabilistic updating may revise estimates within an existing model, but it does not by itself explain how new explanatory hypotheses are generated, whether the relevant possibilities have been represented, or why a model captures the causal structure of the problem. Within the IQF, such methods are therefore treated as tools within explanatory problem-solving rather than as a complete account of knowledge growth (Deutsch, 2011; Popper, 1963/2002).

This is a considered institutional position. It does not imply that alternative philosophical accounts of practice are without value or beyond defence. It is adopted because, in our judgement, it provides the most coherent and productive foundation for maximising the growth of knowledge and for defining, developing, and assessing professional expertise in S&C. Consistent with the position itself, this foundational choice is not exempt from scrutiny. The philosophical commitments underpinning the IQF, like the descriptors they inform, remain open to criticism, revision, or replacement should better arguments emerge.

Strength and Conditioning as Explanatory Problem-Solving

The framework begins from the position that an objective physical reality exists and is, at least in part, open to understanding. All S&C practice concerns physical systems. Athletes are biological systems operating within physical, social, and organisational environments, and their capabilities may be influenced through appropriately designed interventions. This does not imply that complex living systems can be understood exhaustively, reduced to simple models, or predicted with complete precision. Rather, it means that the phenomena relevant to S&C are not beyond explanation in principle, even where current knowledge is incomplete and available models remain limited.

The task of S&C practice is therefore to identify the problems that matter, construct explanations of the relevant system and process, design and implement interventions capable of producing desired changes, and continually identify and correct errors in planning, delivery, monitoring, and interpretation. Practice is therefore best understood as explanatory problem-solving directed at real physical systems, rather than as the simple application of accepted methods.

Since humans are fallible, error is unavoidable. The practitioner's responsibility is therefore not to claim complete understanding, but to move continually towards a better account of the reality they are attempting to affect. This knowledge grows through conjecture, criticism, testing, and error correction, rather than through certainty or the authority of established doctrine (Popper, 1963/2002; Thornton, 2023).

This position rests on five core claims. Key terms within these claims, including knowledge and error, are used in the specific senses defined in the following section:

- There is an objective and potentially comprehensible reality.
- All S&C concerns physical systems that can, in principle, be understood and influenced.
- The aims of S&C can be framed as problems to be solved.
- Better knowledge allows for better solutions.
- Error is inevitable and must be continually identified and corrected.

An effective practitioner is therefore someone who can identify which problems matter, construct and criticise explanations, design interventions that act on the relevant system, and deliver those interventions through effective coaching and implementation. Practitioners do not need to solve every problem at once, and not all problems are necessarily solvable at a particular time. They must therefore be able to define priorities, distinguish uncertainty from unsupported assumption, and improve the quality of explanation, intervention, and error correction over time. These foundational principles are summarised in Figure 1.

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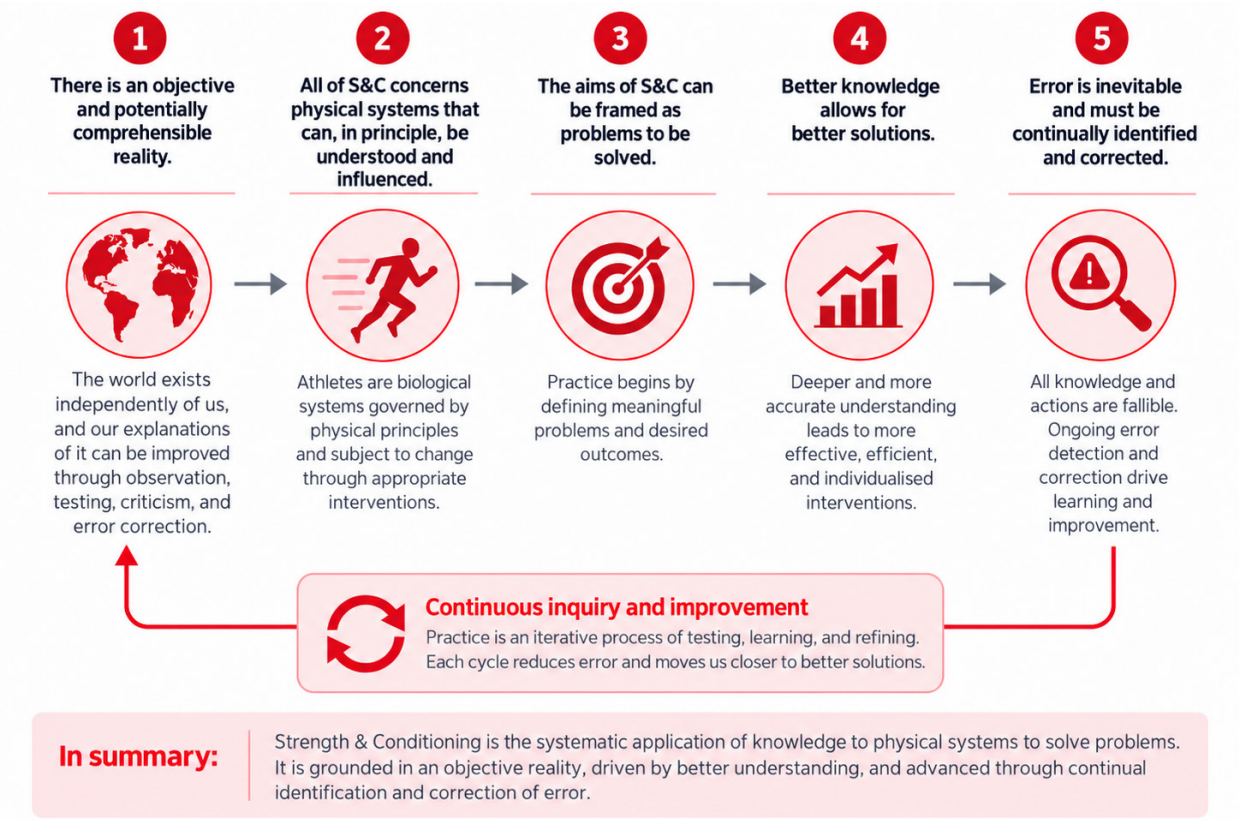


Figure 1. Foundational principles of strength and conditioning practice.

Core Definitions

Several terms used throughout this position statement carry specific meanings that may differ from their use in other professional or philosophical contexts. The following definitions identify the meanings intended within the IQF and establish concepts that perform significant explanatory work throughout the position statement. Subsequent sections, including the level descriptors, should therefore be interpreted in relation to these definitions rather than through alternative or assumed meanings of the same terms.

Science

Science is a systematic way of understanding reality through conjecture, logical reasoning, empirical evidence, and criticism. It develops explanations that can be scrutinised so that errors can be identified and corrected over time.

In applied practice, science is expressed as systematic problem-solving under uncertainty. Practitioners construct explanatory theories, derive testable predictions, and use observation, measurement, evidence, and feedback to refine their understanding and actions.

Scientific Practitioner

The term Scientific Practitioner does not imply that the practitioner is an academic researcher, nor that advancement through the IQF depends on conducting or publishing formal research. The Scientific Practitioner is a professional who applies science as a systematic approach to problem-solving. They do not merely consume research or reproduce established methods. They identify practical problems, develop possible explanations and solutions through reasoning grounded in relevant scientific principles, and use research evidence to constrain and refine them.

The expected consequences of actions and interventions are treated as testable predictions. Observation, measurement, reflection, and critical scrutiny are used to challenge assumptions, generate feedback, identify discrepancies, and correct error. Proficiency is measured not by the volume of facts known, but by the ability to generate context-sensitive solutions and improve explanatory models of reality over time.

Knowledge

Knowledge is defined here as information, understanding, or capability with explanatory or practical significance. It includes knowledge of

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concepts and principles, knowledge of how to apply them effectively, and operational capability that may be instantiated within perceptual, cognitive, motor, biological, or socially distributed systems. Knowledge may therefore be propositional, procedural, or embodied in forms that are not yet fully represented in language.

Within the IQF, progression concerns the development and increasingly effective use of knowledge in this broader sense, including greater explanatory depth, practical capability, and effectiveness in action.

Explanation

An explanation is an account of why something has happened, is happening, or is likely to happen, grounded in claims about relevant structure and causal processes.

A good explanation is clear, coherent, criticisable, and consistent with the relevant evidence. Its key details are not freely adjustable without reducing its ability to account for the phenomenon it seeks to explain (Deutsch, 2011). A good explanation also has the potential for reach beyond the problem situation from which it arose, supports context-sensitive and counterfactual predictions, and exposes its assumptions sufficiently clearly for error to be identified. Its practical value lies in supporting better problem definition, intervention design, prediction, implementation, and revision rather than in guaranteeing outcomes.

Problem

A problem is understood broadly as a conflict between ideas, expectations, goals, constraints, or observed states of the world.

Problems may concern immediate matters of practice, such as exercise selection, loading parameters, programme structure, coaching cues, or the interpretation of monitoring data. They may also concern wider questions that cannot be resolved immediately but provide a basis for future inquiry, research, or professional development.

Error and Error Correction

An error is any discrepancy between our knowledge, decisions, or actions and the reality they are intended to represent or affect. Errors are not confined to failed training outcomes. They may occur in factual or mechanistic knowledge; in problem definition; in the explanation adopted; in intervention design; in delivery, coaching, and communication; in measurement, technology, or data handling; or in the interpretation of feedback. Every stage of practice depends on fallible knowledge and is therefore a potential source of error.

Error correction refers to the processes through which such discrepancies are identified, interpreted, and reduced. It encompasses reflection, monitoring, testing, measurement, criticism, and revision across planning, implementation, and evaluation. It operates within a session, across a programme, over a career, and at the level of teams, organisations, and the profession.

Progression across the IQF is not defined by reaching an error-free state. It is characterised by increasing sophistication in detecting error earlier, locating it more accurately, and correcting it more effectively.

The Value of Explanatory Knowledge

A defining feature of the IQF is the value it places on explanatory knowledge. Data and observations describe aspects of what has occurred, whereas explanations seek to account for why an outcome occurred, the processes and conditions on which it depends, and what should be expected if the explanation is correct. Explanatory knowledge can therefore have reach beyond the particular observation or research finding from which a problem arose.

For example, research may show that individuals with greater three-repetition maximum squat strength relative to body mass tend to sprint faster than individuals with lower relative squat strength (Baker & Nance, 1999). A surface-level interpretation might conclude that increasing relative squat strength will make athletes run faster. However, such a conclusion has limited reach. The finding arose from a particular cohort, test, and set of conditions. It does not establish that the same relationship applies to every athlete, that increasing performance in the test will necessarily cause the desired change, or that the same training method is appropriate under different constraints.

The practitioner therefore requires an explanation of why greater squat strength might be associated with faster sprinting. One relevant explanatory

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component may concern muscular force capability and the force-velocity relationship: during concentric muscle action, shortening velocity decreases as force demand increases (Hill, 1938). Greater maximal force capability may arise through several processes, including changes in neural activation, muscle cross-sectional area, intermuscular coordination, motor learning, and muscle-tendon behaviour. If maximal force capability increases, a given external force demand may represent a smaller proportion of the athlete's maximum capability. Under appropriate conditions, this may allow force to be expressed more rapidly or permit greater impulse to be generated within the available time (Cormie et al., 2011; Suchomel et al., 2016).

This provides an explanation with greater reach than the original association. The relevant principles are not specific to a particular squat test or even to squatting itself. They concern more general relationships between force capability, force-velocity behaviour, time constraints, and the production of movement. The important practical consequence is that the explanation expands the range of possible solutions. Rather than assuming that the observed association implies a need to train the squat itself, the practitioner can conjecture different interventions capable of influencing the relevant determinants of force capability and force expression, according to the specific problem being addressed.

An explanation of sprint performance, however, cannot end with the concentric force-velocity relationship. This represents one component within a broader explanatory model of the problem. Force must be coordinated across joints, transmitted through muscle-tendon structures, oriented effectively against the ground, and expressed within the temporal and technical constraints of sprinting. Sprint performance may therefore depend on additional factors including eccentric muscle capability, elastic behaviour, sprint mechanics, posture, ground-contact time, coordination, and the direction and timing of force application (Ross et al., 2001; Suchomel et al., 2016). These can be incorporated into a progressively fuller explanatory model.

This deeper explanation provides still greater reach. The relevant claim is no longer that a particular squat test causes faster sprinting. The test becomes one possible indicator, and the squat one possible training intervention, within a broader explanatory account involving force capability, force-velocity behaviour, impulse, coordination, tissue behaviour, and movement-specific force transmission. In some contexts, squatting may remain a central proposed solution to the problem being addressed. In others, it may be secondary, unnecessary, or inappropriate. Components of the same explanatory model may then be conjectured to have relevance to other problems in which force capability, impulse, coordination, or movement-specific power matter, including jumping, throwing, changing direction, and accelerating. Empirical research cannot reproduce every feature of every unique practical case, nor can a research finding independently specify what should be done in a new situation. Practitioners therefore use explanatory knowledge to conjecture what may matter, why it may matter, and how it might be influenced under the present constraints. Those conjectures remain open to criticism through existing knowledge, research evidence, observation, measurement, outcomes, and alternative explanations.

Good explanations also constrain interpretation. Their important details cannot be changed arbitrarily to accommodate every possible outcome while retaining the same explanatory content. This distinguishes an explanation from an ad hoc account that is continually adjusted after the event. Research findings, measurements, established scientific knowledge, and competing explanations are therefore indispensable because they provide means through which explanations can be criticised. They may expose contradictions, reveal failed predictions, identify relevant boundary conditions, or show that an explanatory model is inadequate.

In applied practice, explanatory theory also provides an organising framework for action. It helps frame the problem situation and informs which problems warrant attention, which observations and measurements may be relevant, which interventions are plausible, what outcomes should be expected, and how those interventions should be implemented and evaluated.

Taken together, the practical value of explanatory knowledge is that the practitioner is not restricted to reproducing the particular relationships, methods, or interventions that have previously been observed. Explanations provide the reach required to conjecture new solutions to new problems, while those conjectures remain constrained by evidence and open to criticism and error correction. This places practitioner explanatory knowledge and

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judgement at the centre of S&C practice, while retaining empirical evidence, measurement, theory, and professional criticism as indispensable means through which that knowledge is improved.

Effective practitioners must also implement, test, criticise, refine, and adapt explanations in practice. The knowledge involved in doing so may not be fully represented in language, raising a further question for the IQF: how practitioner knowledge is expressed, transmitted, enacted, and developed.

Practitioner Knowledge, Transmission, and Expertise

Strength and conditioning practice involves a continuous process through which practitioners identify problems, construct explanations, design interventions, implement them through coaching and environmental organisation, observe athlete responses, and revise their understanding and actions. Every part of this process depends on knowledge. That knowledge may concern scientific concepts, causal mechanisms, athlete characteristics, training methods, communication, organisation, or the practical capability to perceive and respond effectively in context. It may be explicit and readily articulated, or operationally expressed without being fully represented in language. In every case, knowledge must be physically instantiated to have effects within practice.

Practitioner knowledge may initially be instantiated within perceptual, cognitive, motor, and decision-making systems. It may then be expressed through other physical forms, including written programmes, spreadsheets, demonstrations, verbal instructions, coaching behaviour, technologies, organisational procedures, and features of the training environment. These forms are not identical to the practitioner's knowledge, but they may represent and transmit aspects of it. Through them, the practitioner attempts to influence athlete activity and, ultimately, biological adaptation and athletic capability.

This account treats the practitioner process as continuous. Explanation, programme design, communication, implementation, athlete activity, adaptation, monitoring, and revision are not isolated from one another. They are connected stages through which knowledge is represented, acted upon, tested, and changed. The usefulness of this framing lies not in redescribing coaching through informational language, but in clarifying how knowledge operates across the complete process and where limitations or failures may arise.

Different forms of knowledge impose different demands on representation and transmission. A loading prescription may be represented in a spreadsheet with relatively little loss of detail. A scientific principle may be communicated through writing and discussion, although its practical application remains dependent on context. By contrast, the capability to recognise a subtle deterioration in movement, act appropriately in a live interaction, or identify that an athlete is responding differently from expectation cannot be reduced to a complete and practically usable propositional description.

This helps explain why demonstration, apprenticeship, supervised practice, and guided exposure persist in a profession containing extensive written and digital information. These conditions can support the development of perceptual, interpersonal, and practical capabilities that written instruction alone may not establish. A mismatch between the knowledge to be developed and the means used to represent, transmit, or assess it is therefore a predictable source of failure. Articulability and development must also be distinguished. A practitioner may understand a verbal description of a movement feature while remaining unable to recognise it reliably in practice. Knowing that athlete feedback should influence a programme does not establish the capability to determine what should change, when it should change, or whether no change is warranted. Development may therefore require structured exposure to contrasting cases, guided attention, demonstration, repeated practice, and timely feedback. Explicit explanation may support this process without replacing the experiences through which operational capability develops (Crandall et al., 2006; Nelson et al., 2006).

The transmission and application of knowledge can also fail at multiple points. An inadequate outcome may originate in a weak explanation of the problem, but this is only one possibility. A defensible conjecture may be translated poorly into an intervention, represented inadequately in a programme, communicated ineffectively, delivered inconsistently, interpreted differently by the athlete, or disrupted by constraints that were not recognised. Conversely, an imperfect programme may produce a favourable result because it is implemented skilfully, interpreted constructively by the athlete, and revised responsively.

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Rather than returning a single verdict that a programme worked or failed, this framing encourages practitioners to locate the source of discrepancy. The relevant error may lie in problem definition, the explanation or explanatory model adopted, intervention design, communication, coaching behaviour, athlete interpretation and enactment, measurement, interpretation, or the use of feedback. These possibilities require different forms of correction. Changing the programme will not resolve a communication failure, just as improving delivery will not correct a fundamentally inadequate explanation.

The athlete is not a passive recipient within this process. Programmes, instructions, demonstrations, and environmental constraints are interpreted and enacted through the athlete's own perceptual, cognitive, motor, and biological systems. The athlete's activity therefore represents an active response to the intervention rather than a direct reproduction of the practitioner's intention. Performance, athlete-reported feedback, behavioural responses, fatigue, resistance, error, recovery, and adaptation provide information through which the practitioner can criticise and revise the original conjecture.

Practice is consequently recursive rather than one-directional. In some settings, explanation, delivery, observation, and revision may occur across weeks or training cycles. In live coaching, they may occur concurrently, with the practitioner modifying an intervention while it is being delivered. Replication of the initial plan is therefore not, by itself, an adequate criterion of quality. Adjustment may represent warranted error correction rather than inconsistency, while precise delivery of a flawed intervention remains a failure regardless of procedural compliance.

Practitioner judgement becomes especially important within this recursive process. A coach who recognises that movement is deteriorating, that an athlete has not recovered, that a cue is ineffective, or that a planned progression is no longer appropriate is discriminating between states of the athlete and environment. Those discriminations alter attention, decisions, and intervention. What is commonly described as tacit expertise may therefore be understood as operational knowledge, some components of which are not currently represented in explicit linguistic form. Some may become articulable through investigation, others only partially, and others may remain closely bound to perceptual, motor, interpersonal, or socially distributed processes (Collins, 2010; Polanyi, 1966). Physical instantiation does not establish that such judgement is correct. Practitioners may attend to misleading cues, misunderstand why an intervention appears to work, or mistake favourable outcomes for evidence of expertise. Reliable intuition is more likely to develop where environments contain sufficiently valid cues and provide timely, interpretable feedback (Kahneman & Klein, 2009). Confidence in practitioner judgement should therefore reflect its demonstrated reliability, the quality of the environment in which it developed, and its openness to criticism and revision.

Practitioner expertise may consequently be understood as physically instantiated knowledge that increases the range of desirable athletic transformations a practitioner can reliably help to produce through explanatory problem-solving, effective intervention and implementation, feedback, and continual error correction. Across the IQF, progression is therefore reflected not only in the sophistication of practitioners' explanations, but in their increasing capacity to represent, communicate, implement, monitor, and revise knowledge across progressively more complex systems. The IQF does not presume that all expertise can be reduced to examinable propositions. Education and assessment should address not only what practitioners can state, but also what they can perceive, explain, implement, monitor, and revise in context. Because such expertise is physically instantiated, causally effective, and fallible, it remains a legitimate object of research, deliberate development, professional scrutiny, and improvement.

Relation to Other Accounts of Professional Expertise

The account of expertise developed in this position statement is not the only available framework for understanding professional development. Clarifying its relationship with influential alternatives exposes the assumptions of the IQF to comparison and criticism, while identifying areas of compatibility and disagreement.

The skill acquisition model of Dreyfus and Dreyfus (1986) describes a progression from novice rule-following through competence and proficiency to expert practice characterised by dynamic, intuitive, and situation-specific response. The IQF shares important features with this model, including progression away from context-free rules, the

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increasing role of situational discrimination, and the recognition that expert performance is not simply faster and more faithful rule application. The frameworks differ in their treatment of expert intuition. In the Dreyfus account, expertise ultimately becomes substantially arational: the expert sees what to do, and demands for explicit justification are associated with lower stages. The IQF understands effective intuitive judgement as physically instantiated knowledge that tracks real features of the world. It therefore remains open, in principle, to articulation, scrutiny, and improvement. The endpoint of development is not the replacement of explanation by intuition, but the integration of increasingly rapid discrimination with the continued capacity to expose judgement to criticism.

Ecological dynamics understands skilled behaviour as the attunement of a performer-environment system, with expertise reflecting sensitivity to affordances and the capacity to exploit constraints rather than the execution of fixed internally stored programmes (Araújo & Davids, 2011; Renshaw et al., 2019). The IQF is compatible with the insistence that practice is context-dependent, that variability can be functional, and that fixed methods transfer poorly across environments. These insights are reflected in the method-agnostic character of the descriptors. However, the IQF rejects the stronger claim that explanatory modelling of underlying mechanisms is without benefit. The performer-environment system is itself a physical system whose behaviour has explanations, and the practitioner's capacity to design effective constraints depends on the quality of their explanatory knowledge, whether explicit or tacit.

Naturalistic decision-making has documented how experienced professionals make decisions in real settings through recognition-primed processes. Situations are matched rapidly to patterns acquired through experience, and candidate actions are mentally simulated rather than exhaustively compared (Klein, 1998). This research informs the characterisation of the upper IQF levels, where pattern recognition and anticipatory judgement become increasingly important. It also establishes conditions under which recognition-based expertise can and cannot be trusted, which has direct implications for error correction in S&C.

The IQF does not seek to ignore or replace these traditions. Each captures real features of professional development. The IQF adds an explicit epistemological account of what develops: increasingly effective, physically instantiated knowledge, expressed through explanation, judgement, implementation, and error correction, and at no level exempt from criticism.

Complexity, Variability, and Uncertainty

Complexity, variability, and uncertainty are unavoidable features of S&C practice. However, the presence of these factors should not be conflated with the absence of causal structure or with irreducible randomness. A system may be nonlinear, sensitive to initial conditions, and difficult to predict with precision while still being governed by real physical processes (Lorenz, 1963). In applied settings, uncertainty may reflect incomplete knowledge, changing conditions, measurement limitations, or interactions that cannot be modelled comprehensively. Recognising these limits, along with our fallibility, should encourage humility while preserving the expectation that explanations, knowledge, and practical solutions can continue to improve.

Probabilistic, statistical, and mathematical models can be valuable within this process. Where sufficient relevant data exist, models are appropriately calibrated, and their assumptions are adequately understood, they may help practitioners represent measurement uncertainty, estimate plausible ranges, compare specified outcomes, and evaluate interventions (Hernán & Robins, 2020; Pearl, 2010; Spiegelhalter, 2019). Their outputs can provide useful constraints on judgement, particularly where signal and noise are difficult to distinguish.

However, all models remain selective approximations to aspects of reality. Their usefulness depends on the variables included, the population and context from which they were derived, the assumptions imposed, and the quality of the available data. A model may be mathematically precise while representing the wrong problem, omitting an important variable, or transferring poorly to a different athlete or environment. Probabilistic outputs should inform practice without being treated as complete explanations or automatic instructions for action.

To act effectively, the practitioner must construct an explanation of the problem. A poor adaptation response following a training programme may be conjectured to reflect insufficient dose, inadequate recovery, inappropriate exercise selection, poor technical execution, measurement error, or

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an incorrectly defined performance limitation. Each explanation leads to different predictions, interventions, and forms of monitoring. A probability may indicate that an outcome is more or less likely within a specified model, but it does not by itself explain why the outcome may occur, which causal factor should be targeted, or what intervention should be selected.

The central integrative agent is the human practitioner, who determines which problem is being addressed, which outcomes matter, which evidence and models are relevant, and when the potential benefits of intervention justify the associated risks and costs. Additionally, the practitioner is not confined to choosing among possibilities already represented within an existing model. They may conclude that the problem has been framed incorrectly, that the model's assumptions are inappropriate, or that an important explanation or intervention is absent. They can modify the model, reject it, and propose a different account, provided that the revised account remains open to explicit prediction, empirical scrutiny, and correction.

The ability to define, explain, and continually revise the frame through which practice is understood should therefore be placed at the centre of professional competence. Models can support explanatory problem-solving, but they cannot direct it independently.

DEVELOPMENT AND STATUS OF THE IQF LEVEL DESCRIPTORS

Relationship to Prior IQF Development

The Level 1–8 descriptors presented here build upon the earlier development of the International Qualification Framework, which established the broader rationale for a standardised and internationally relevant structure for aligning S&C certifications, qualifications, and standards (Langford et al., 2024). They also build upon the subsequent establishment of the IQF Independent Regulatory Council (IQF-IRC), which provides autonomous oversight of the framework and its education, accreditation, and certification processes (Langford et al., 2025).

The eight levels were established in that earlier work and align broadly with the stages of intellectual and professional demand reflected in established qualification frameworks such as the European Qualifications Framework (EQF). The task of the present position statement is therefore to provide a more explicit foundational account of the levels: to articulate what practitioner expertise means across the eight levels when practice is understood through the institutional position set out above.

The Expert Consultation

The descriptors were developed through a two-stage expert consultation led by Alex Wolf on behalf of the IUSCA and the IQF-IRC. Contributors were identified by members of the IUSCA and IQF-IRC as experienced practitioners, academics, and educators with substantial expertise in S&C and related disciplines.

Contributors were not asked to validate the eight-level structure, which had been established in prior work, or to endorse the philosophical position of the IUSCA. They were invited to articulate how practitioner expertise develops in real settings: how effective practitioners reason under conditions of complexity and uncertainty, how they define outcomes and interpret adaptation, how they prioritise interacting variables, how they use evidence, and how judgement progresses from externally guided behaviour towards independent and system-level decision-making. The purpose was to ground the descriptors in professional practice and to shape, refine, and pressure-test them, rather than to generate empirical research findings or a formal consensus statement.

The first-stage consultation was exploratory and developmental rather than a formal consensus exercise. Nineteen contributors were invited to provide written input in response to structured questions addressing first-principles reasoning, outcome definition, adaptation, scientific understanding, developmental progression, domain-specific reasoning, distinguishing features of expertise, and common professional assumptions. The responses received were reviewed by the consultation lead, Alex Wolf, to identify recurring developmental themes, which were then synthesised with the conceptual and philosophical framework described in this position statement. These themes concerned the movement from externally guided to increasingly autonomous reasoning; clearer and more conditional outcome definition; progression from method-led to intent-led intervention; increasingly deliberate management of adaptation, interacting variables, and trade-offs; more critical interpretation of evidence; and

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movement from externally prompted or reactive correction towards proactive and system-level error correction. Because this synthesis was interpretive and was not independently coded by multiple researchers, it should be regarded as an author-mediated synthesis of expert input rather than as a formally validated qualitative taxonomy. The questions and accompanying response prompts are reproduced in Appendix A.

In the second stage, the draft Level 1–8 descriptors and accompanying overview table were circulated to thirty contributors, including those from the first stage and additional reviewers. This review examined conceptual clarity, internal consistency, interpretability in real-world settings, and the defensibility of distinctions between adjacent levels. Feedback was incorporated through essential and recommended refinements that strengthened clarity while preserving the underlying logic of the descriptors.

The IQF Level Descriptors are presented as a theoretically derived institutional interpretation of professional expertise within the pre-existing eight-level IQF architecture, rather than as empirically discovered categories requiring subsequent psychometric or criterion validation. Their coherence, explanatory adequacy, and capacity to provide a useful account of professional progression remain open to criticism and revision. Empirical research may nevertheless examine questions arising from their interpretation, operationalisation, and application, including assessor reliability, educational implementation, and consequences within professional practice.

The descriptors therefore represent the institutional position of the IUSCA, informed and pressure-tested through expert consultation.

Status of This Position Statement and Openness to Criticism

This position statement should be read as a transparently developed and reasoned institutional position rather than as externally validated empirical research.

Consistent with the framework's commitments, the appropriate response to this status is critical engagement rather than deference. The IUSCA invites commentaries, formal responses, and criticism of the descriptors, definitions, and underlying philosophical position. The descriptors will be treated as provisional and revised in versioned form as better arguments and evidence emerge. A framework that calls for transparency and continual error correction must apply the same standards to itself.

At publication, the descriptors presented here supersede earlier wording where differences exist. The current official version of the IQF Level Descriptors and their revision history are maintained on the IUSCA IQF Level Descriptors webpage (IUSCA, 2026).

What the Descriptors Describe

The level descriptors describe progression in professional reasoning, judgement, autonomy, responsibility, and complexity management. They do not define progression solely through tasks, methods, qualifications, job titles, or years of experience. Across all levels, the same scientific principles apply. What changes is the robustness of reasoning, the degree of autonomy, the scale of responsibility, and the ability to operate effectively under increasing complexity and uncertainty.

The descriptors are intentionally method-agnostic and task-independent. They focus on how practitioners think, interpret, decide, implement, and revise practice. The overview table is the primary representation of the levels and shows progression across reasoning orientation, outcome definition and intent, adaptation and stimulus reasoning, relationship to evidence and scientific reasoning, complexity and variable management, autonomy and responsibility, and error detection and correction. The written descriptors provide explanatory depth and should be read alongside Table 1 rather than as separate or independent criteria.

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Table 1. IQF Level 1–8 Descriptor Overview.

IQF Level	Level Title	Reasoning Orientation	Outcome Definition & Intent	Adaptation & Stimulus Reasoning	Relationship to Evidence & Scientific Reasoning	Complexity & Variable Management	Autonomy & Responsibility	Error Detection & Correction
1	Foundational Learner	Rule-following; reasoning largely external. Begins to recognise simple cause–effect relationships in isolation.	Outcomes defined by others; practitioner follows direction rather than setting purpose. Intent is externally supplied and largely unquestioned.	Understands that training creates change but not how or why. Adaptation assumed rather than evaluated.	Scientific knowledge treated primarily as facts to be learned and recalled. Little independent interpretation or criticism.	Focuses on isolated, immediate variables. Assumes direct and linear cause–effect relationships.	Operates under direct supervision. No independent decision-making responsibility.	Errors identified externally. Limited self-reflection.
2	Supervised Practitioner	Applies rules with basic understanding. Begins asking "why" when prompted.	Can name intended outcomes when prompted; defaults to method-led decisions under pressure, prioritising familiar procedure over outcome alignment.	Recognises different stimuli produce different effects. Limited sensitivity to dose.	Applies simple scientific explanations. Science treated as authoritative.	Manages a small number of immediate variables in a structured setting.	Makes decisions within structured tasks under supervision. Limited responsibility for outcomes.	Responds to feedback. Rarely anticipates issues.
3	Developing Practitioner	Conditional reasoning begins. Adapts rules to context, but rationale may be fragile under uncertainty.	Outcomes clearer but inconsistently prioritised. Methods sometimes selected before intent.	Adjusts load and structure reactively. Over-responds to short-term signals.	Begins interpreting evidence. Correlation vs causation inconsistently distinguished.	Manages several interacting factors; beginning to recognise trade-offs.	Makes independent decisions within a clearly defined role boundary; refers beyond that boundary to a supervisor or senior practitioner.	Reflects after failure. Limited proactive monitoring.
4	Practitioner	Uses principles to adapt practice. Can clearly explain rationale for decisions.	Outcomes explicit and appropriately defined. Competing outcomes acknowledged.	Matches stimulus to intent deliberately. Balances stress and recovery intentionally.	Evidence interpreted contextually. Understands limitations and uncertainty.	Manages multiple interacting factors across a defined scope; prioritises consistently and manages relevant trade-offs.	Makes independent decisions within role scope. Accountable for outcomes within that scope.	Builds feedback into practice. Adjusts without defensiveness.
5	Developing Scientific Practitioner	Integrates multiple principles simultaneously. Reasoning resilient under pressure.	Outcomes framed conditionally. Trade-offs managed explicitly.	Anticipates delayed and indirect effects. Recognises when intervention may create unnecessary cost, risk, or interference.	Considers evidential relevance, quality, causal bearing, uncertainty, and decision risk. Avoids over-interpretation.	Manages multiple competing and non-linear demands; anticipates indirect consequences.	Leads a defined practice area with autonomy; begins to shape the reasoning environment and decision-making conditions for junior practitioners within it.	Proactively tests assumptions. Adjusts before failure escalates.
6	Scientific Practitioner	Robust, transferable, and defensible reasoning across contexts.	Manages systems of outcomes. Balances short- and long-term effects.	Manipulates stimulus strategically. Deliberately selects intervention, modification, or non-intervention according to the problem and available evidence.	Integrates multiple evidence sources. Acts effectively with incomplete information.	Manages extensive system-level complexity; anticipates second-order effects.	Full professional accountability for outcomes. Supports multi-practitioner systems, including staff, processes, and athlete cohorts.	Designs environments for learning. Makes the revision of assumptions, explanations, and decisions visible to others.
7	Advanced Scientific Practitioner	Pattern recognition and anticipatory judgement, calibrated to the validity and quality of available feedback. Recognises interactions and indirect effects across disciplines.	Shapes environments to support outcomes. Recognises and manages unavoidable trade-offs among competing objectives.	Manages adaptation across complex systems or organisational contexts. Coordinates intervention thresholds and trade-offs across interacting priorities.	Critiques models and assumptions. Uses science to explain, test and criticise decisions rather than merely legitimise them retrospectively.	Manages organisational complexity across disciplines; second-order awareness throughout.	Holds strategic responsibility for decision-making across teams. Accountable for others' decision quality.	Establishes error-correcting cultures. Prevents dogma formation.
8	Field-Shaping Practitioner	Meta-reasoning about reasoning. Challenges underlying assumptions of the field.	Frames outcomes at policy and paradigm level. Balances competing values and impacts.	Influences systems shaping adaptation beyond individual programmes.	Develops, refines, or challenges explanatory frameworks. Advances understanding.	Manages complexity across evolving professional systems; anticipates interactions and consequences arising from changes to standards, structures, policy, and practice.	Influences standards, policy, governance, or professional practice at field level. Accepts responsibility for the consequences of that influence.	Safeguards scientific integrity. Ensures mechanisms for ongoing revision.

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IQF LEVEL DESCRIPTORS

Level 1: Foundational Learner

At Level 1, the practitioner operates within a highly structured and supervised environment and follows instructions and established procedures without yet recognising them as choices among possible methods. Behaviour is compliance-driven rather than reasoning-led, with decisions guided externally and explanations provided by others.

The practitioner recognises simple cause-and-effect relationships but does not yet reliably connect actions to outcomes without guidance. Intended outcomes are broad, implicit, or defined by supervisors, and the practitioner relies on direction to understand purpose and intent.

Training and practice are understood to create change, but adaptation is assumed rather than evaluated. The practitioner follows prescribed instructions without independently adjusting stimulus, dose, or structure.

Scientific knowledge is treated primarily as factual information to be learned and recalled, with no expectation of independent interpretation or critique. Complexity is experienced as linear, with attention typically limited to a single variable at a time.

Autonomy is minimal. The practitioner acts under direct supervision and does not hold responsibility for decision outcomes. Errors are identified and corrected externally, with limited reflective capability.

Level 2: Supervised Practitioner

At Level 2, the practitioner applies simple rules and procedures to routine situations with increasing familiarity and demonstrates emerging awareness of underlying principles. Reasoning remains constrained but is no longer entirely passive. The practitioner begins to recognise that methods are choices rather than fixed rules, although they may revert to method-led behaviour under pressure or in unfamiliar contexts. This reversion is characteristic of the stage rather than a failure of competence.

The practitioner can articulate simple outcomes when guided, although decision-making may default to familiar methods rather than intent under pressure. There is increasing recognition that different stimuli produce different effects, but sensitivity to dose and context remains limited.

Scientific information and established principles are applied through straightforward explanations and are generally treated as authoritative rather than interpretive. The practitioner manages a small number of variables but experiences difficulty prioritising when multiple factors are present.

Autonomy remains limited, with decisions subject to supervision and approval. The practitioner responds appropriately to feedback but does not routinely anticipate errors or unintended consequences without prompting.

Level 3: Developing Practitioner

At Level 3, the practitioner demonstrates conditional reasoning and adapts established rules to context, although reasoning remains inconsistent under uncertainty. Temporary regression under pressure is characteristic of this stage and reflects the normal demands of developing independent judgement rather than a deficit in the practitioner. Decision-making shows increasing independence but lacks robustness.

Outcomes are articulated with greater clarity, although prioritisation remains variable and methods may still be selected before intent is fully resolved. Adaptation is managed reactively, with adjustments commonly driven by short-term signals rather than longer-term considerations.

The practitioner begins to interpret scientific evidence but does not consistently distinguish correlation from causation. Complexity is experienced through the interaction of multiple variables, and trade-offs are recognised but not yet managed reliably.

Autonomy is partial and bounded by role scope. The practitioner takes responsibility for assigned work within that scope and adapts their approach when solving problems. Reflection typically occurs after errors rather than through proactive monitoring or anticipation.

Level 4: Practitioner

At Level 4, the practitioner demonstrates defensible judgement grounded in relevant principles. Decisions are explicitly justified: the practitioner can state why a course of action was chosen in relation

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to the intended outcome and accepts accountability for that choice within a defined scope. Reasoning is deliberate and articulable, although delayed or indirect effects are not yet anticipated consistently.

Outcomes are explicitly defined at an appropriate level of resolution, with competing objectives acknowledged and managed. The practitioner deliberately matches stimulus, dose, and structure to intended adaptation and balances stress and recovery with intent.

Scientific evidence is interpreted contextually, with recognition of its limitations and uncertainty. Evidence informs decisions rather than directing them automatically.

The practitioner manages multiple interacting variables and demonstrates effective prioritisation. Autonomy is established within role scope, with clear accountability for decisions and outcomes. Where applicable, the practitioner may supervise routine activities of others and contribute to evaluation and improvement within their area of practice.

Errors are identified through embedded feedback processes, and adjustments are made without defensiveness or reliance on external correction.

Level 5: Developing Scientific Practitioner

At Level 5, the practitioner integrates multiple principles simultaneously and demonstrates reasoning that remains robust under pressure. Decision-making reflects conditional logic and explicit management of trade-offs. The practitioner moves beyond justifying individual decisions to anticipating delayed and indirect consequences. Reasoning is provisional and conditional, acknowledging what cannot yet be known.

Outcomes are framed provisionally and adjusted as conditions evolve. The practitioner anticipates delayed and indirect effects and demonstrates deliberate restraint, including choosing not to intervene where the risks or costs outweigh the expected benefit.

Scientific evidence is weighed according to relevance, quality, uncertainty, and decision risk. The practitioner avoids over-interpretation and recognises when available evidence is insufficient to warrant action.

Complexity is managed through prioritisation rather than simplification, with an expectation of non-linear responses. The practitioner leads a defined practice area and reviews and develops their own and others' performance and decision quality.

Assumptions are tested actively, and error correction is applied proactively before problems escalate, with reduced reliance on external intervention.

Level 6: Scientific Practitioner

At Level 6, the practitioner demonstrates consistently robust and defensible judgement across complex and unpredictable contexts. Reasoning is transferable and resilient, with its relevant rationale, assumptions, and limitations made sufficiently explicit to permit scrutiny. Explanations are conjectured using relevant scientific principles and existing knowledge, and are constrained, tested, and criticised through evidence. The practitioner also shapes the reasoning conditions for less experienced colleagues by designing structured learning opportunities, surfacing assumptions, and modelling deliberate decision-making.

Outcomes are managed as interconnected systems rather than isolated targets, balancing short- and long-term effects. Intervention is strategic, with deliberate selection of intervention, modification, or non-intervention according to the problem and available evidence.

Scientific evidence from multiple sources is integrated with explicit attention to uncertainty, causal relevance, and decision risk. Probabilistic models are used where appropriate without being treated as substitutes for explanation. The practitioner acts effectively with incomplete information and revises explanations and decisions when new evidence, criticism, or changing conditions expose error or alter the problem being addressed.

Complexity is characterised by anticipation of second-order effects and indirect consequences. The practitioner holds full professional responsibility and supports multi-practitioner systems, teams, or performance environments.

Learning environments are intentionally designed to support reflection, criticism, and the revision of assumptions, explanations, and decisions, both personally and across others.

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Level 7: Advanced Scientific Practitioner

At Level 7, the practitioner operates increasingly through pattern recognition and anticipatory judgement, including at the interfaces between disciplines. Reasoning reflects deep understanding of system behaviour and interaction. Expert judgement, however rapid or experience-based, remains open to explanation, scrutiny, and criticism. The practitioner can expose the relevant rationale, assumptions, and limitations of the judgement, even where not every component is fully articulable.

Outcomes are shaped by influencing environments, structures, and processes rather than through isolated interventions. Trade-offs are accepted as unavoidable features of complex systems and are managed transparently.

Adaptation is managed across complex systems or organisational contexts, with deliberate judgement applied to when intervention is and is not warranted. Scientific models and assumptions are critically evaluated and used to explain decisions rather than to provide post hoc justification.

The practitioner manages extensive complexity through system-level prioritisation and holds strategic responsibility for the quality of decision-making across teams. Responsibility may include contributing to the development of professional practice beyond the practitioner's immediate area of work.

The practitioner establishes error-correcting cultures in which near-misses are surfaced, decisions are reviewed without blame, and challenges to dominant professional narratives are judged according to standards of rigour, transparency, and evidence. Dogmatic practices are actively challenged.

Level 8: Field-Shaping Practitioner

At Level 8, the practitioner demonstrates meta-reasoning about professional practice and contributes to shaping how the field understands quality, judgement, and evidence. They influence field-wide developmental structures, including training pathways, mentoring frameworks, professional standards, policy, and governance. This level represents a shift from operating within existing systems to shaping how those systems are defined. It is a qualitatively different mode of practice rather than a simple extension of Level 7.

Outcomes are framed at policy, governance, or paradigm level, with competing values, impacts, risks, and long-term consequences considered. Influence extends beyond individual organisations to the profession as a whole.

The practitioner extends and, where necessary, redefines professional practice and its underpinning explanatory frameworks. Field-shaping influence does not exempt the practitioner from standards of rigour. Paradigm-level challenges must be transparent in reasoning, accountable in process, and open to peer scrutiny.

Complexity is managed across evolving professional systems, with attention to interactions and consequences arising from changes to standards, structures, policy, and practice. The practitioner recognises that some uncertainty may remain practically unresolved under current constraints, while continuing to treat explanations, assumptions, and models as open to improvement.

Responsibility includes stewardship of professional standards and scientific integrity. Structures for ongoing criticism, error correction, learning, and revision are established to support the continued credibility and development of the profession.

DISCUSSION

Progression in Practitioner Reasoning

The descriptors represent a progression from

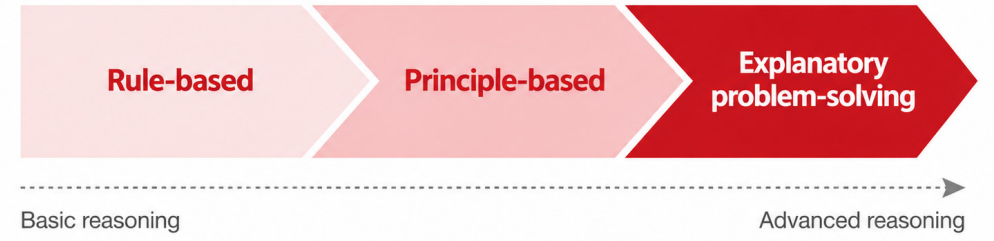


Figure 2. Development of practitioner reasoning across the International Qualification Framework (IQF).

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externally guided, rule-following behaviour through increasingly conditional and context-sensitive reasoning, to scientific, system-level, and field-shaping judgement. Progression is defined by increasing quality in interpretation, prioritisation, adaptation, implementation, and error correction.

The first major thread is movement from rule-based practice, through principle-based practice, to explanatory problem-solving (Figure 2). At the early levels, practitioners rely heavily on instructions, accepted procedures, and externally supplied reasoning. Methods and outcomes may be conflated, protocols may be treated as inherently correct, and unfamiliarity may produce a strong desire for certainty. These are normal developmental starting points, particularly where safety and structure appropriately constrain autonomy.

As practitioners progress, conditional reasoning emerges. Methods are examined in relation to the problem, mismatches between intended and observed outcomes become more visible, and adaptation in context becomes possible. At higher levels, reasoning becomes increasingly explanatory. Practitioners work from problem, mechanism, and intent towards intervention, rather than from preferred method towards an assumed outcome.

The Practitioner's Relationship with Science

A second thread concerns the practitioner's relationship with science. At the early levels, science is treated primarily as a body of facts or a source of authoritative instruction. Evidence is applied rather than interpreted, and uncertainty may be experienced as weakness. As practitioners progress, science becomes an interpretive and critical tool. Higher-level practitioners are distinguished by how effectively they use evidence and relevant scientific principles to define and explain problems, test assumptions, navigate uncertainty, and revise decisions under real-world constraints. Selected dimensions of this progression are summarised in Figure 3. This is consistent with the original formulation of evidence-based practice as the integration of research with expertise and context, rather than the mechanical application of findings (Sackett et al., 1996; Turner, 2024).

Outcomes, Adaptation, and Intervention

The descriptors also identify a shift in how practitioners relate to outcomes and adaptation. Lower-level practitioners are more likely to focus on completing prescribed work, infer adaptation rather than evaluate it, and treat methods as if they are inherently connected to outcomes. Higher-level practitioners work increasingly from intent, explanatory mechanism, and adaptation. They define outcomes more precisely, recognise competing demands, expect variability in response, and manage adaptation across multiple timescales.

At the more advanced levels, professional competence includes knowing when not to intervene. Strategic restraint is not passivity. It reflects an assessment that the likely benefit of action does not justify its risks, costs, or disruption to the wider

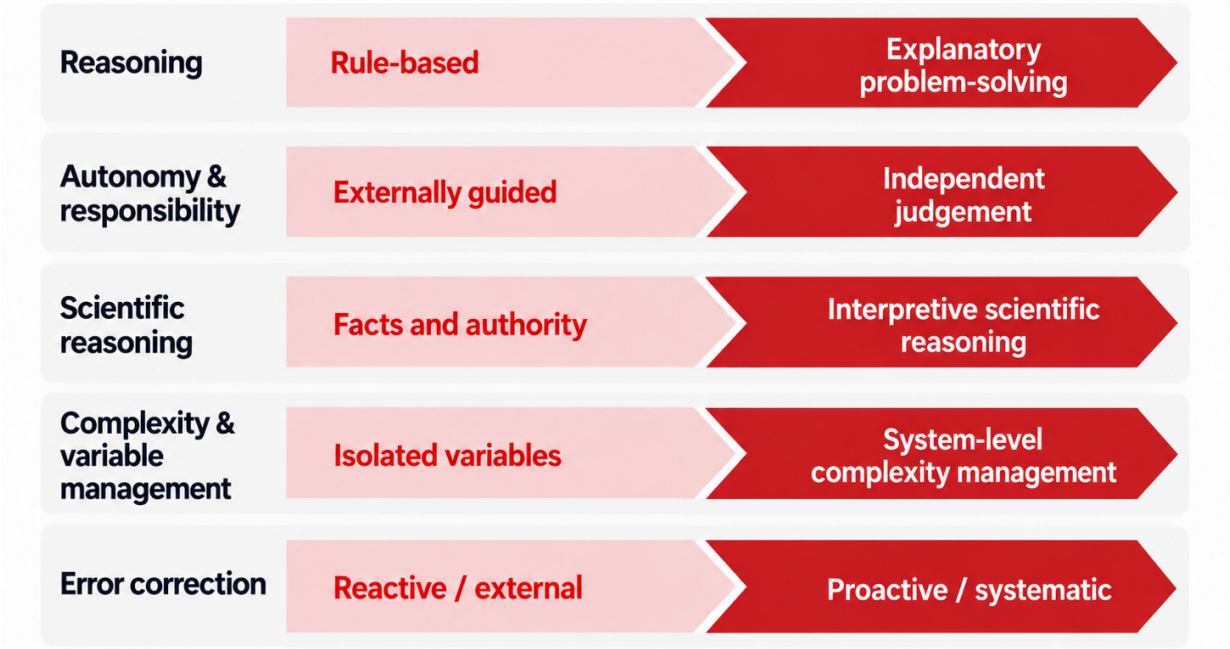


Figure 3. Selected dimensions of progression across the International Qualification Framework (IQF).

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system. This becomes increasingly important as the practitioner's decisions affect multiple athletes, practitioners, disciplines, organisations, and longer-term structures.

Error Correction as a Mechanism for Progress

Within the present framework, error correction is treated as the clearest single differentiator across the levels. At the lowest levels, errors are identified largely by others and reflective capability is limited. At intermediate levels, reflection frequently occurs after problems emerge. At higher levels, practitioners build feedback into decision-making, actively seek disconfirming information, and revise explanations without defensiveness. At the most advanced levels, this expands beyond the individual to the design of error-correcting environments, cultures, and professional structures.

The growth of scientific knowledge has depended on the willingness to expose ideas to criticism rather than treating them as true because they are inherited, authoritative, or widely accepted. Science progresses through conjecture, scrutiny, testing, and improvement. What matters is not that a claim is protected from error, but that it remains open to correction (Popper, 1963/2002; Thornton, 2023).

In applied practice, progress does not arise from rigid adherence to protocols or from the uncritical application of published findings. It arises through the capacity to formulate explanations, derive predictions, design interventions, communicate and implement them effectively, observe athlete enactment and response, monitor outcomes, identify discrepancies, and revise decisions. Error correction is therefore not a discrete final stage. It operates throughout problem definition, explanatory reasoning, intervention design, communication and implementation, athlete enactment and response, and monitoring and assessment. This continuous process is illustrated in Figure 4.

Locating error is itself a non-trivial inferential task. When a prediction fails, the failure does not identify which component was at fault: the explanatory model, the intervention design, its delivery, the athlete's adherence to it, the measurement process, or the background assumptions connecting them. A failed outcome refutes this conjunction of elements rather than any single one. This difficulty has long been recognised in the philosophy of science (Duhem, 1954; Quine, 1951). This is why the descriptors treat error localisation as a distinct and developing competence rather than an automatic consequence of monitoring. Progression includes learning to design interventions, predictions, and measurements so that, when expectations fail, the failure is as diagnostic as possible about where the error lies.

Within the IQF, early stages involve learning foundational principles, accepted methods, and basic structures for feedback. As practitioners advance, they are expected to interpret information critically, recognise uncertainty, evaluate competing explanations, and determine whether existing explanations or decisions should be retained, revised, or rejected when failed predictions, criticism, or new information expose error. At the highest levels, they establish structures through which errors can be surfaced and corrected across teams, organisations, and the profession.

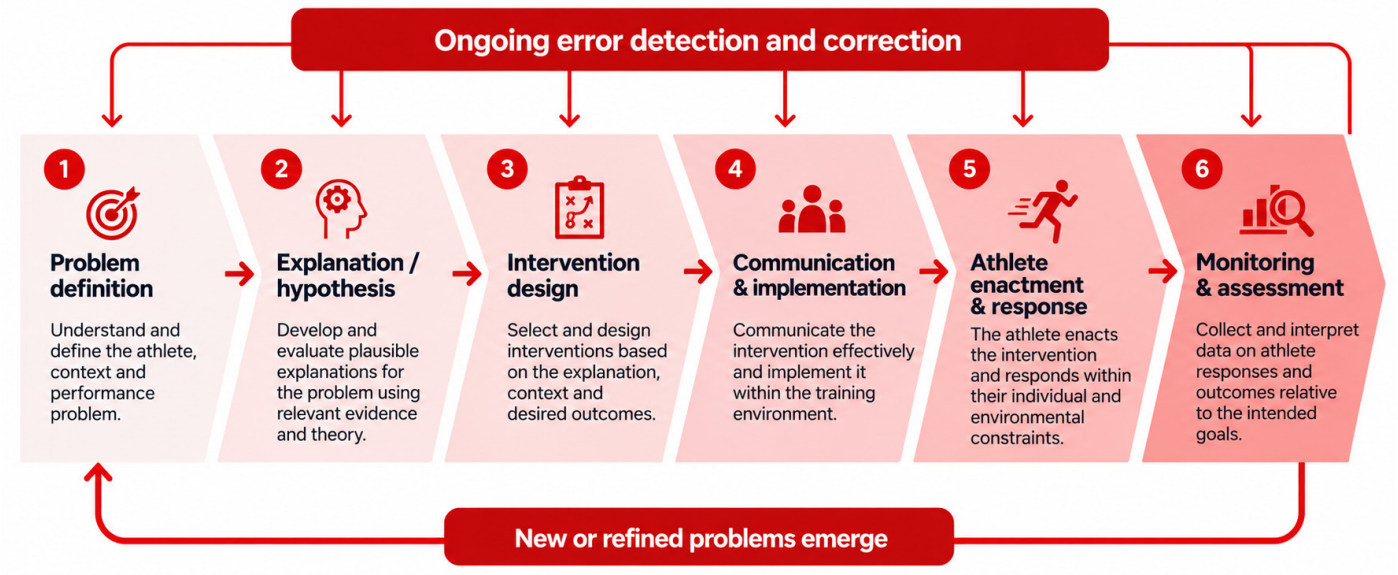


Figure 4. Error correction as a continuous process across all stages of practice.

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Protecting the means of error correction is therefore more important than protecting any individual piece of knowledge. A particular method, theory, or standard may later prove inadequate. The processes through which inadequacy can be identified and replaced are what allow practice to continue improving.

The Validity Problem: Limits of Individual Error Correction

The account above carries an assumption that must be confronted directly: that practitioners can learn reliably from their own experience. Research on intuitive expertise indicates that this occurs only under particular conditions. Genuine intuitive expertise is most likely to develop in environments with sufficiently stable relationships between observable cues and later outcomes, and where practitioners receive prompt and interpretable feedback on their judgements. Where those conditions are absent, experience may produce confidence without necessarily corresponding to competence because the environment does not reveal error clearly (Hogarth, 2001; Kahneman & Klein, 2009).

S&C practice takes place in environments that differ greatly in how reliably experience reveals error and supports learning. Technical coaching may provide rapid and observable feedback: a cue is given and subsequent movement changes, or it does not. Acute decisions within a session may also provide relatively fast feedback. In these domains, individual error correction can operate effectively, and perceptual judgement may become well calibrated.

By contrast, other important areas of S&C provide feedback that is delayed, less direct, and more difficult to interpret. Long-term athletic development and adaptation unfold over months and years, with maturation, selection, lifestyle, and concurrent training complicating attribution.

Injury-risk decisions are particularly difficult to evaluate because the absence of injury does not prove that an intervention was effective, while injuries that do occur usually have multiple causal factors. Similarly, the effects of training on competitive performance may only become apparent after considerable delay and are intertwined with tactical, technical, psychological, and contextual influences. Since the relevant counterfactual cannot be observed, many years of experience do not necessarily produce an equivalent period of learning and may instead reinforce confidently held errors.

This has important implications for how higher-level expertise should be understood. First, the sophisticated judgement described at Levels 5 to 8 should not be interpreted as a claim that individual experience alone generates reliable practitioner knowledge across every domain. Higher-level practitioners can recognise which components of practice offer valid and timely feedback. If relevant cues are unambiguous and presented rapidly, perceptual judgements may be adequate. In contrast, where feedback is delayed or complicated, decisions should be held tentatively and exposed to additional forms of scrutiny.

Furthermore, in contexts lacking inherent error correction mechanisms, implementing structured feedback protocols becomes essential. Professionals and organisations should formulate hypotheses prior to intervention, establishing explicit parameters for success and failure. Systematically documenting these outcomes prevents recall bias and enables analysis across multiple athletes, seasons, and contexts. These practices are an attempt to replace personal, subjective impressions with criticisable records and increase the possibility that error can be identified.

Progress in these areas also depends on collective and institutional forms of error correction. The principles of open science are particularly relevant here. Open reporting of methods, uncertainty, null findings, and failed interventions, together with shared case records, applied research, peer criticism, and traditions that prevent the convictions of senior practitioners from turning into unquestioned orthodoxy, are necessary components for the growth of knowledge. If a profession relies on individual intuition in environments where feedback is weak, slow, or ambiguous, false beliefs can accumulate. In contrast, a profession that develops institutional means of criticism and error correction is better placed for continual improvement.

These limitations reinforce the framework's emphasis on collective error correction. Fallibilism recognises that the same limitations that generate an error may also prevent its author from recognising it. Detecting and correcting error may therefore depend on external criticism, shared evidence, and institutional feedback. The validity problem gives this general principle a specific expression within S&C.

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IMPLICATIONS FOR THE STRENGTH AND CONDITIONING PROFESSION

The implications of this framework may be substantial across S&C and related practitioner domains. The present position statement does not attempt to define every application in detail. It identifies areas in which the descriptors provide a foundation for further work by professional organisations, educational providers, researchers, employers, and practitioners.

Institutions and Traditions of Criticism

The framework begins from the position that current knowledge is provisional and open to improvement. Practice, education, research, certification, and governance should therefore remain open to fair criticism. Criticism should not be treated as a threat to professional standards or organisational authority. It is one of the principal mechanisms through which knowledge, decisions, and standards improve (Popper, 1963/2002; Thornton, 2023).

Professional bodies, educational institutions, research groups, sporting organisations, performance departments, and teams should therefore consider how criticism can be encouraged and embedded within their normal operation. Governing and certifying bodies should be cautious about presenting particular methodologies, texts, standards, or organisational positions as final authority. Sporting organisations should likewise create conditions in which assumptions, explanations, decisions, and established practices can be questioned without criticism being interpreted as disloyalty or professional failure. Standards and shared methods remain necessary, but they should establish defensible requirements while preserving routes through which errors can be identified and alternatives proposed.

A continuing tension exists between preserving and transmitting knowledge that has proved useful and creating the new knowledge required to address emerging problems. Existing methods, explanations, and professional practices should not be rejected merely because they are established. They may embody solutions that have survived substantial criticism and practical testing. However, their previous usefulness does not establish that they will adequately address every new athlete, environment, constraint, or objective. Existing knowledge may provide a starting point, but it does not uniquely determine how a new problem should be understood or solved.

Knowledge growth therefore requires more than replication. Practitioners and institutions must be able to identify problems, conjecture possible explanations and solutions, expose them to logical and empirical criticism, test their consequences, and revise or replace them when errors are identified. This process has a Darwinian structure, where variation is generated through conjecture, alternatives are subjected to selection through criticism and testing, and progress occurs through the elimination of error. The objective is not continual novelty for its own sake, but the preservation of effective knowledge alongside the continuing capacity to improve or replace it.

These principles apply equally to the IQF. Its descriptors, definitions, and philosophical foundations are provisional. The framework must remain open to scrutiny, revision, and replacement where better explanations and more effective solutions emerge.

Education

Many current educational pathways may need to be reconsidered in light of this conception of effective practice. Education, particularly at higher levels, should help practitioners develop the knowledge and tools required to form good explanations, make decisions across varied environments, implement those decisions effectively, and identify error. It should not be limited to accumulating facts or reproducing accepted methods.

At lower levels, practitioners require foundational scientific knowledge, including concepts drawn from physics, chemistry, biology, and related domains, together with an understanding of logic, reason, scepticism, empirical scrutiny, and professional responsibility. Prescriptive processes, technical models, and restrictions may be appropriate where they protect health and safety or provide necessary structure. They should be taught with their purpose, context, and limitations made clear.

Practitioners also require sufficient mathematical and statistical knowledge to analyse interventions, interpret measurements, distinguish signal from noise, and avoid unwarranted conclusions. These tools should support explanation and error correction rather than replace judgement.

Higher-level education should avoid presenting

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arbitrary exercises, programming schemes, or periodisation approaches as authoritative solutions. Students should learn to examine the problems those methods are intended to solve, the mechanisms through which they may act, the constraints on their use, and the evidence that may criticise them. Education should create conditions in which practitioners learn to reason independently while remaining accountable to evidence and professional standards.

The framework also has implications for learning that occurs through supervised practice and workplace experience. Some of the capabilities described in this position statement, including perceptual judgement, communication, implementation, adaptation in real time, and aspects of practitioner knowledge that may not yet be fully articulable, are unlikely to develop through academic instruction alone. Internships, placements, graduate assistantships, supervised practice, case-based learning, and mentorship may therefore provide important environments in which professional reasoning and judgement can be developed through observation, guided exposure, feedback, and increasing responsibility.

Experience alone, however, should not be assumed to produce expertise. As discussed above, learning from experience depends partly on whether relevant cues and outcomes provide sufficiently interpretable feedback and whether errors can be identified. Supervision and mentorship may therefore be most valuable where they make reasoning visible, expose practitioners to contrasting cases and alternative explanations, create opportunities for decisions to be criticised, and progressively increase autonomy as capability develops. The aim is to support the development of increasingly independent and criticisable judgement, rather than simply to learn and reproduce the practices of a more experienced practitioner.

The capability to develop other practitioners should also be distinguished from technical or professional expertise itself. A highly capable practitioner may not automatically possess the skills required to make their reasoning accessible, provide developmentally appropriate feedback, supervise responsibly, or create opportunities for another practitioner to exercise independent judgement. The selection, preparation, and development of those responsible for supervision and mentorship therefore represent important considerations for future work.

In practice, competence may develop unevenly across the dimensions represented in the IQF, as illustrated in Figure 5. A typical degree graduate may demonstrate capabilities consistent with IQF Level 6 in some dimensions, particularly those developed through academic study and structured scientific education, while operating closer to IQF Level 4 in dimensions that depend more heavily on applied judgement, implementation, autonomy, and experience in practice.

Conversely, an experienced practitioner may demonstrate capabilities consistent with IQF Level 6 in dimensions developed through substantial professional experience, while remaining closer to IQF Level 4 in others that have received less systematic development. These differences may reflect the particular education, experiences, responsibilities, and learning environments to which

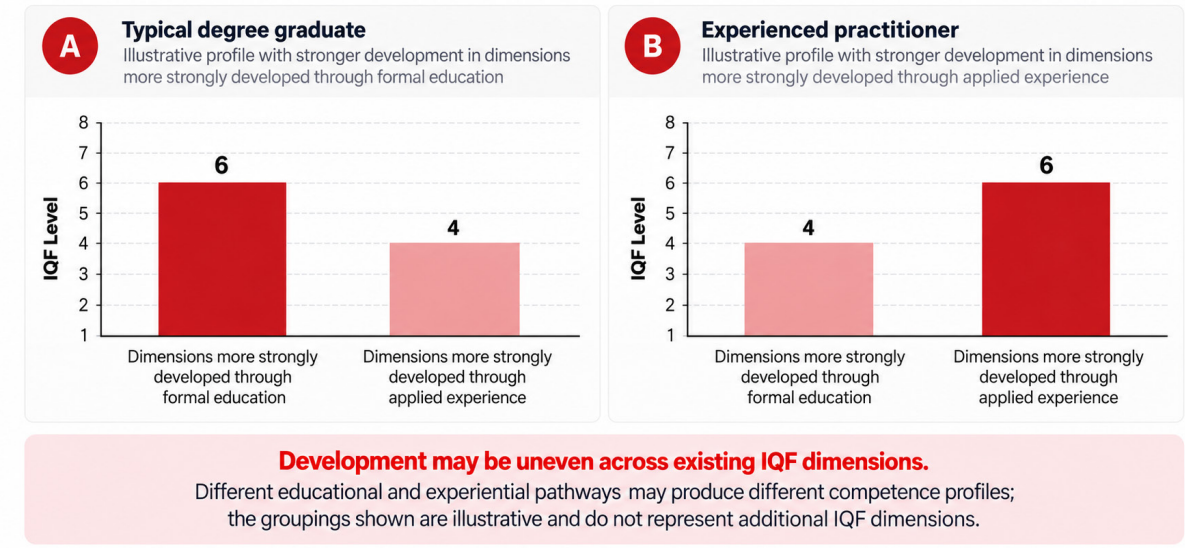


Figure 5. Illustrative examples of uneven development across International Qualification Framework (IQF) dimensions.

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the practitioner has been exposed. Education and professional development should therefore address the dimensions that require further development rather than assuming that competence progresses uniformly across the framework.

The recognition that competence may develop unevenly across dimensions does not mean that an overall IQF level represents an average of those dimensions. Where an IQF level is awarded through certification or professional recognition, the level should indicate that the practitioner has demonstrated the required standard across the dimensions relevant to that award. Higher capability in one dimension should not automatically compensate for a material deficit in another. A practitioner's more detailed competence profile may therefore provide additional information beyond the single overall level awarded.

The IQF should likewise not be interpreted as requiring sequential progression through every level or the repetition of learning and development that a practitioner can already demonstrate. Education and certification systems should be capable of recognising existing competence where appropriate while identifying the dimensions in which further development is required.

The IQF level descriptors do not prescribe which educational or developmental methods are appropriate at each stage, nor do they assume that all aspects of competence can be developed through academic instruction or workplace experience alone. Determining how formal education, supervised practice, mentorship, workplace learning, and other developmental approaches can best support the forms of knowledge and capability represented at each level remains an important area for further theoretical and empirical work.

Certification and Assessment

Certification processes should reflect the forms of competence represented at each IQF level. Factual examinations may be useful for assessing foundational academic knowledge, particularly at lower levels. They are insufficient as the primary assessment of higher-level reasoning, judgement, and decision-making.

From Levels 3 and 4 onwards, assessment should increasingly examine whether candidates can define problems, formulate defensible explanations, make context-sensitive decisions, interpret uncertainty, and expose their reasoning to criticism. This includes determining whether an existing explanation should be retained, revised, or rejected when new evidence, information, observations, or competing ideas reveal a relevant problem or error. This aligns with wider arguments for authentic assessment that reflects the complexity of professional performance rather than relying exclusively on decontextualised recall (Villarroel et al., 2018; Vlachopoulos & Makri, 2024).

Professional decision quality should also be distinguished from outcome quality. Practitioners operate under uncertainty and cannot control every variable influencing an athlete's response. A defensible decision may therefore produce an undesirable outcome, while a poorly reasoned decision may occasionally produce a favourable one. Assessment of professional competence should consequently examine the quality of the reasoning, explanations, assumptions, and information available at the time of the decision, rather than infer competence retrospectively from outcome alone. This is consistent with proposals that practitioner assessment should consider process-level indicators alongside performance outcomes (Buchheit et al., 2023).

Assessment may also examine how practitioners respond when their existing explanations are exposed to criticism. New evidence, information, observations, or competing ideas may challenge assumptions on which an explanation or decision depends. The appropriate response is not necessarily to alter the original explanation. A practitioner may reasonably retain it where the criticism does not identify a relevant error, revise it where an identifiable problem can be corrected, or reject it and conjecture a different explanation where the original account no longer withstands criticism. Higher-level assessment should therefore consider whether practitioners can identify what a criticism bears upon and revise or replace their reasoning appropriately when errors are exposed.

Assessment must also consider implementation. The capacity to explain the reasoning behind a decision is not the same as the capacity to deliver it effectively. Workplace-based, performance-based, and longitudinal approaches may be required where competence depends on coaching, communication, adaptation, and performance in context (Prakash et al., 2020; So et al., 2024).

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Practical assessments can remain overly rule-based when candidates are expected to reproduce a rigid model of predefined practice. This may be appropriate at foundational levels where safety and procedural consistency are priorities. At higher levels, assessment must allow more than one defensible solution and evaluate the quality of reasoning, implementation, monitoring, and revision. One possible approach is to use case-based or practical assessments in which additional information, observations, or competing explanations are introduced after an initial decision has been made. The purpose would not be to reward changing a decision, but to examine whether the practitioner can critically evaluate the new material, determine its relevance to the existing explanation, and explain whether their original position should be retained, revised, or rejected.

Where IQF descriptors are used to inform certification or other consequential decisions, the quality of their application also requires consideration. The theoretical status of the descriptors should be distinguished from the reliability and defensibility of decisions made when applying them. Appropriate assessor preparation, shared interpretation of criteria, moderation, review, and mechanisms for appeal may therefore be required to reduce avoidable inconsistency and support fair decision-making. These processes concern the quality assurance of assessment and certification rather than empirical validation of the descriptors themselves.

Further work is required to establish appropriate forms of evidence and assessment at each IQF level, including how reasoning, implementation, response to criticism, and error correction can be evaluated together without reducing advanced competence to the reproduction of fixed methods.

Universities

The IUSCA is a universities-led organisation, and its position on the role of universities in S&C is central rather than peripheral. S&C is fundamentally a problem-solving discipline, and progress in problem-solving depends on the growth of knowledge. Universities are especially well placed to contribute to this progress through research, education, criticism, and the development of future practitioners. Universities therefore play a vital role in the professional system described in this position statement.

This role depends on universities maintaining the characteristics described throughout the framework, particularly commitments to open science, error correction, intellectual independence, and healthy cultures of criticism. Universities do more than supply graduates to existing industry structures. They help shape the intellectual environment within which future practice, professional standards, and new knowledge develop (Langford et al., 2024; Piggott, 2015).

This has direct implications for engagement with industry. Some professional bodies offer university endorsements that impose standards derived from prevailing conceptions of practice and present them as authoritative. Universities may feel pressure to align with such systems to demonstrate employability pathways or provide routes into recognised certification (Weldon et al., 2024). Alignment with defensible professional expectations can be valuable. However, universities should be cautious about allowing external bodies to dictate curricula, assessments, or learning outcomes in ways that constrain inquiry to fixed exercises, programming structures, techniques, or preferred methods. Universities understandably seek to prepare students for employment, but they should not achieve this by adopting closed systems of knowledge. Their central responsibilities include creating and disseminating new knowledge, exposing existing claims to criticism, and enabling students to think independently. This is especially important in practitioner education, where overly closed systems may suppress the reasoning and criticism required for professional growth (Piggott, 2015).

The IUSCA recognises that it is itself an industry body. The intended distinction lies in the purpose and content of the IQF. The IUSCA does not seek to prescribe curriculum content, define one correct technique, or protect a methodological orthodoxy. Universities adopting the IQF retain autonomy over how the descriptors are translated into education and are encouraged to interrogate, criticise, and refine the framework. The purpose is to support the conditions for knowledge growth in S&C, not to constrain them.

Universities are therefore a crucial component of the wider error-correcting system. They can preserve long-term inquiry when immediate professional incentives favour conformity, aggregate evidence beyond individual practice environments, develop and criticise explanatory theories, and educate

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practitioners who can contribute to the continued improvement of the profession. Their independence and active participation are necessary to the credibility and development of the IQF.

Employment, Roles, and Professional Recognition

Employment structures and role expectations within S&C remain inconsistently defined (Langford et al., 2021). Many roles in elite and professional sport are criticised for low rates of pay relative to the competence and responsibility expected. The wider issue is a lack of clarity about what different roles require and what certifications or qualification levels are intended to represent. This problem of role definition, qualification alignment, and professional recognition was central to the original development of the IQF (Langford et al., 2024).

A single certification may currently be requested for roles that differ substantially in responsibility, complexity, autonomy, and risk. This makes it difficult for employers to determine the level of practitioner required and weakens the signalling value of the credential itself.

S&C also differs from professions in which one minimum standard is required for all independent practice. The fitness sector predates the modern S&C profession and includes entry-level roles in comparatively structured or lower-risk contexts, including fitness instruction, group exercise, and personal training. S&C practitioners may appropriately work within these settings, but the absence of coherent lower-level S&C pathways has sometimes resulted in higher-level certifications being used as entry requirements for lower-level roles. This diminishes clarity across the professional pathway.

The IQF provides a structure through which roles can be considered at an appropriate level of reasoning, judgement, autonomy, and responsibility across professional sport, schools, universities, community settings, tactical environments, and healthcare-related contexts in which S&C practice is relevant. It is not confined to one sector or level of sporting performance.

The level of a role should therefore be determined by the actual demands placed on the practitioner rather than by job title, organisational status, or the profile of the sport or setting. Relevant considerations include the complexity of the problems being addressed, the degree of autonomy and responsibility required, the consequences of error, the number and interaction of relevant variables, and the quality and timescale of feedback available to identify whether decisions were effective. Roles in apparently less prominent settings may therefore require substantial professional expertise where practitioners face complex problems, delayed or ambiguous feedback, or significant responsibility for long-term outcomes.

At higher levels, professional practice may also involve responsibilities that extend beyond direct programme design and coaching. Practitioners may be required to coordinate systems of practice, work across professional disciplines, communicate and defend decisions to coaches or organisational leaders, develop other practitioners, and create environments in which reasoning and error correction can occur effectively. These responsibilities are relevant to the autonomy, complexity, and system-level judgement represented within the IQF. However, organisational seniority or formal management responsibility should not itself be treated as evidence of a higher IQF level.

Professional expertise, technical leadership, people management, and organisational authority may overlap, but they should not be assumed to be equivalent. At the advanced IQF levels, broader responsibility, system-level influence, and the consequences of professional decisions nevertheless form part of the competence being described. These capabilities may be demonstrated through formal leadership positions or through other forms of professional responsibility and influence.

Further development may allow competence requirements to be communicated more clearly, aligned with appropriate education and certification, linked more fairly to remuneration and role expectations, and incorporated into job descriptions and hiring processes. Employers should also consider how selection methods can assess competence at the level required rather than relying only on credentials or years of experience.

Interdisciplinary Practice and Scope

S&C practitioners frequently work within systems that involve technical coaches, medical and rehabilitation professionals, sport scientists, nutritionists, psychologists, and other specialists. Many practical problems therefore extend across disciplinary boundaries. Training decisions may

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interact with injury management, competition demands, technical preparation, nutrition, psychological state, and wider organisational constraints. Effective practice requires practitioners to understand these interactions sufficiently to reason about the athlete or system as a whole while recognising the limits of their own expertise and responsibility.

As practitioners progress through the IQF, interdisciplinary competence should increasingly involve the ability to identify where different explanations, objectives, and professional responsibilities interact; communicate the reasoning behind decisions; recognise relevant expertise held by others; and integrate appropriate contributions without abandoning independent professional judgement. At higher levels, this may extend to coordinating decisions across disciplines, identifying conflicts or unintended consequences within the wider system, and creating conditions in which assumptions and decisions can be criticised across professional boundaries.

Some of the capabilities represented at the higher IQF levels may also have relevance beyond the practitioner's immediate technical domain. The ability to reason effectively about complex systems, identify and criticise assumptions, recognise interactions and unintended consequences, and establish environments in which decisions can be scrutinised and errors corrected may be transferable across multidisciplinary performance settings. Practitioners operating at IQF Level 8 may therefore be particularly well placed for roles such as performance director or other system-level leadership positions, where a principal responsibility is to coordinate expertise, improve decision-making, and create effective error-correcting systems across disciplines rather than to possess specialist expertise in every domain.

Higher IQF level should not, however, be interpreted as conferring unrestricted scope of practice. Advanced expertise in S&C does not make a practitioner interchangeable with a clinician, nutrition professional, psychologist, technical coach, or other specialist. Professional scope remains dependent on the practitioner's relevant knowledge, competence, qualifications, responsibilities, and the regulatory or organisational context in which they work. Recognising when a problem exceeds one's own competence, and when another form of expertise is required, is itself an important component of professional judgement. Further work should consider how interdisciplinary reasoning, communication, referral, shared decision-making, and management of professional boundaries develop across IQF levels and how these capabilities can be represented and assessed without collapsing distinct professional disciplines into a single model of expertise.

Research and Evidence-Based Practice

Scientific progress in applied disciplines is often incremental. Individual studies add pieces of information, and meta-analyses estimate average effects across studies. This has clear value for mapping broad patterns and reducing noise. However, it can also encourage methodological conservatism when prevailing explanatory assumptions remain implicit and therefore unchallenged. Where research primarily accumulates correlations without clearly stated causal mechanisms, statistical regularities may be mistaken for explanatory conclusions (Hernán & Robins, 2020; Kalkhoven, 2024).

The IQF emphasises that evidence is interpreted through explanatory models, whether these are explicit or implicit. Research should therefore move beyond asking only what tends to correlate with improvement and also ask which causal mechanisms could plausibly produce improvement in the relevant context, what observations should follow if those mechanisms are operating, and what findings would count against the explanation. This is consistent with causal-inference approaches that distinguish association from explanation and intervention (Hernán & Robins, 2020; Pearl, 2010).

At higher levels of practice and scholarship, practitioners and researchers should articulate mechanism-based hypotheses, derive context-sensitive predictions, and subject them to systematic error correction. This can support research questions that discriminate between competing mechanisms, study designs that improve causal inference, and translation to practice that is tied to explanatory structure rather than average effects alone.

Evidence-based practice is sometimes represented as a hierarchy in which published research determines what works and practitioners apply the result. This framing is limited in S&C because practice is dominated by non-identical cases: athletes, teams, constraints, and environments differ. Research findings cannot independently

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determine what is appropriate for a particular person or system at a particular time. The original formulation of evidence-based medicine and more recent accounts in S&C instead emphasise integration of research evidence with practitioner expertise, athlete needs, values, preferences, and contextual constraints (Sackett et al., 1996; English et al., 2012; Turner, 2024).

The expertise component of these formulations is often left underdefined or described as the "art of coaching". The IQF reframes high-level practice as explanatory problem-solving and scientific judgement. In this view, it is explanatory knowledge that bridges the gap between research and practice. Research constrains explanations, practice tests predictions, and feedback informs revision. This does not require every practitioner to articulate every component of effective judgement immediately. However, it does require the profession to treat that judgement as real, investigable, criticisable, and potentially developable rather than as a permanently unexplained residual.

Open Science

The principles and values of science extend beyond hypothesis generation and testing. They require conditions through which claims can be scrutinised, criticised, and corrected by others. Open Science is therefore a practical extension of science itself. If knowledge claims are to remain open to improvement, the reasoning, methods, data, analyses, and interpretive assumptions behind them should be made as transparent and accessible as possible. UNESCO's Recommendation on Open Science frames this around shared values and actions intended to make scientific knowledge more accessible, transparent, and equitable (UNESCO, 2021).

This is particularly important in applied disciplines. Findings may be translated into practice despite being context-dependent, methodologically limited, or only partially explanatory. Greater openness allows practitioners and researchers to inspect how conclusions were reached, identify hidden assumptions, assess the strength of the logic, and judge the extent to which findings may transfer beyond the original setting. Transparency supports reproducibility and better professional judgement (Munafò et al., 2017; Nosek et al., 2015).

Open reporting of methods, uncertainty, failed interventions, null findings, and contextual constraints also strengthens the culture of the profession. It reduces dependence on selective success stories and creates a shared basis for criticism and cumulative learning. A field becomes more scientific when it rewards transparency and error correction rather than certainty and status.

Open inquiry may also widen participation. Where ideas are judged through the quality of their explanations and their openness to criticism, professional standing and institutional status should not determine who may contribute meaningfully. This shifts attention from who is speaking towards the content and criticisability of what is being proposed (Piggott, 2015; UNESCO, 2021).

Relationship to Established Educational Frameworks

The IQF is designed to align broadly with established qualification frameworks such as the Frameworks for Higher Education Qualifications (FHEQ), the Regulated Qualifications Framework (RQF), and the European Qualifications Framework (EQF) in terms of the general stage of intellectual and professional demand represented at each level (European Commission, 2018; Quality Assurance Agency for Higher Education, 2024; UK Government, n.d.).

This alignment does not imply identical descriptors or automatic equivalence between qualifications. Established frameworks provide widely recognised structures of increasing knowledge, complexity, autonomy, and responsibility. The IQF applies an additional profession-specific lens concerned with reasoning, judgement, implementation, and error correction in S&C practice.

The IQF is also designed to operate across national boundaries and support greater portability of education and certification. It provides a professional structure through which qualifications, certifications, and standards may be interpreted more coherently across international contexts while remaining compatible with relevant national and regional frameworks.

Application to Other Sport and Exercise Science Disciplines

The IQF and its descriptors were developed specifically for S&C, but many of the underlying problems are present across other sport and exercise science disciplines. Questions of professional identity, clarity of standards, alignment between education and practice, and the definition

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of higher-level competence are not unique to S&C. Recent international work on sport science professional standards also reflects a wider movement towards more coherent education, training, and collaboration across professional domains (CASES, 2026).

Most applied sport and exercise science professions share a broad task: generating and applying domain-specific knowledge to bring about desired changes in the physical world. An orientation towards explanatory problem-solving, empirical evidence, open science, and error correction may therefore support professional development across those disciplines.

The wider logic of the IQF concerns progression in reasoning quality, judgement, autonomy, responsibility, and the capacity to act effectively under uncertainty. Other disciplines need not adopt identical descriptors; however, they may benefit from a similar architecture through which education, certification, employment, and professional progression can be aligned with internationally recognisable levels of demand. Comparable levels across disciplines would indicate broadly comparable levels of professional demand and capability within these dimensions, rather than equivalence of domain-specific knowledge, qualifications, or scope of practice.

We therefore encourage consideration of the IQF, or an IQF-informed approach, across related sport and exercise science domains. Its broader value may lie in helping these professions develop clearer and more coherent structures while preserving the specialist knowledge and responsibilities of each field.

CONCLUSION

This position statement provides a clearer definition of the eight levels of the IQF and advances a conception of effective S&C practice grounded in explanatory reasoning, judgement, implementation, and the continual correction of error. Professional progression is represented as increasing capacity to identify meaningful problems, construct and criticise explanations, make context-sensitive decisions, act effectively under uncertainty, and create conditions through which practice can continue improving.

The implications extend across education, certification, assessment, employment, research, evidence-based practice, open science, governance, and professional culture. Universities occupy a central place within this system because they create and criticise knowledge, educate future practitioners, and help preserve the intellectual independence required for long-term progress.

S&C will never possess exhaustive knowledge of every athlete, performance context, training process, competition environment, and lifestyle constraint relevant to practice. There can be no final authoritative resource containing everything that needs to be known. New problems, constraints, and errors will continue to emerge.

While this may superficially appear a pessimistic outlook, this is ultimately an optimistic conception of the profession. Problems are inevitable because knowledge will always remain incomplete, but this does not make progress finite. Some problems are hard, but it is a mistake to confuse hard problems with problems that are unlikely to be solved. The position adopted here is that problems are solvable, given the right knowledge (Deutsch, 2011). This makes traditions of criticism and the capacity to identify and eliminate error indispensable.

Progress should therefore not be defined as increasing conformity to prevailing methods or accepted doctrine. It should be understood as movement towards better explanations, better judgement, more effective implementation, and better solutions. This requires institutions and cultures that value criticism, transparency, open science, and continual error correction.

The IQF is offered as a framework for supporting that development. Its credibility will depend on the same conditions it asks of the profession: openness to criticism, willingness to expose error, and readiness to revise or replace current explanations when better ones emerge.

CONFLICTS OF INTEREST

Several authors hold leadership, governance, editorial, advisory, or other professional roles within the International Universities Strength and Conditioning Association (IUSCA). The IUSCA develops and administers the IQF and its associated education, accreditation, assessment, and certification activities, with independent oversight through the IQF-IRC. These organisational

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and professional interests are therefore disclosed as relevant to the interpretation of this position statement. The authors retain responsibility for the arguments and conclusions presented in the position statement.

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