

The Exercise Science Practice Model: A Framework for Integrating Critical Thinking, Reflective Practice, and Professional Reasoning in Exercise Science Education

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Abstract

The Exercise Science Practice Model (ESPM) is a foundational framework that unifies professional education, reasoning, and practice within the field of Exercise Science. Unlike allied health disciplines such as physical therapy, occupational therapy, and athletic training, Exercise Science has lacked an established practice model to guide curriculum design, professional identity, and accreditation. The ESPM bridges this gap by integrating the biopsychosocial model with critical thinking and clinical reasoning frameworks, emphasizing reflective, ethical, and evidence-based decision-making. Grounded in constructivist and transformative learning theories, the model promotes active, student-centered learning through case studies, simulations, and reflective exercises that cultivate higher-order cognitive skills.

The ESPM is organized into six interrelated domains — Psychosocial, Assessment, Diagnosis, Prognosis, Intervention, and Outcome — that together provide a structured, cyclical approach to client management. Each domain incorporates both technical competencies and reflective reasoning, aligning with standards established by the American College of Sports Medicine (2020) and the National Strength and Conditioning Association (2025). Implementation within a regional University curriculum demonstrated enhanced student engagement, improved integrative reasoning, and strengthened professional identity. Preliminary outcomes suggest that ESPM fosters critical inquiry, ethical awareness, and interprofessional collaboration, aligning with current educational reforms in health sciences.

Ultimately, the ESPM advances Exercise Science education by providing a replicable, evidence-informed framework that promotes curricular coherence, professional legitimacy, and the cultivation of reflective, competent practitioners prepared for the evolving demands of preventive health and performance science.

Keywords: exercise science, curriculum, critical thinking, clinical reasoning, practice model

1. Introduction

Over the last two decades, several healthcare education programs have adopted practice models — an organizing framework that explains professional values, processes, decision-making, and professional identity (Moseley et al., 2021). Examples of such adoption include the Doctor of Physical Therapy profession, which utilizes the Physical Therapy Patient/Client Management Model (APTA, 2023). The Doctor of Pharmacy programs have adopted the Iowa New Practice Model, the Occupational Therapy programs have integrated the Evidence-Based Practice Model, and the Athletic Training programs have implemented the Athletic Training Disability Model (Andreski et al., 2018; Tomlin & Borgetto, 2011; Snyder et al., 2008). Practice models translate abstract professional principles into educational, clinical, and research behaviors, guiding curriculum design, defining scope, and signaling validity to stakeholders.

In contrast, the field of Exercise Science has yet to adopt a unified or widely accepted practice model. This absence has created variability in curricular design, pedagogical focus, and professional preparation across programs. As Exercise Science continues to expand—driven by increasing public demand for health, performance, and preventive care—the lack of a guiding framework has become increasingly problematic. The adoption of initiatives such as the HL7 Physical Activity Implementation Guide highlights the need for consistency, yet the discipline remains fragmented in its educational and professional approaches (Saripalle, 2017).

Without a shared model, Exercise Science programs risk divergent educational outcomes, inconsistent professional expectations, and limited recognition within the broader allied health landscape. A representative practice model would help standardize core competencies, align academic outcomes with professional certifications, and enhance both curricular coherence and public recognition. The growing demand for Exercise Science professionals underscores the urgency for such a framework. The number of academic degrees and post-professional certificates in Exercise Science and related fields has continued to increase over the past decade (Nuzzo, 2020). Concurrently, the US Bureau of Labor Statistics projects about 10% job growth in Exercise-related fields through 2032 (Pojednic et al., 2024). Employers now typically require a bachelor's degree and post-professional certification from the American College of Sports Medicine (ACSM) and/or the National Strength and Conditioning Association (NSCA). Accreditation of degree programs has emerged as a mechanism to ensure consistency, quality, and clarity of professional identity (Eaton, 2015).

Despite this evolution, many existing educational frameworks focus primarily on technical knowledge —such as biomechanics, physiology, and rehabilitation —without explicitly integrating higher-order cognitive and ethical competencies. Post-professional certifications, such as ACSM's Certified Exercise Physiologist, emphasize assessment, prescription, and behavior change but lack explicit attention to reasoning, reflective judgment, and integrative decision-making (ACSM, 2021; Gordon, 2021). In practice, however, Exercise Science professionals frequently encounter complex client scenarios that demand not only technical expertise but also adaptive reasoning and critical reflection.

There has been a growing consensus that critical thinking (CT) and clinical reasoning (CR) must be scaffolded, explicitly taught, and assessed within healthcare professions (Araújo et al., 2024; Berg et al., 2023; Chacon & Janssen, 2021; Kahlke & Eva, 2018). Over the years, several scholars of CT offered their own definitions of the construct (Dewey, 1933; Glaser, 1941; Paul & Elder, 2006; Scriven & Paul, 1987; Sternberg & Halpern, 2020). Although the wording differs, in theory, all definitions describe CT as akin to the three highest levels of Bloom's taxonomy of the cognitive domain — analysis, synthesis, and evaluation — complex intellectual abilities that represent higher levels of cognition (Bloom, 1956). Facione and Facione (2008) described CT as “the process of purposeful, self-regulatory judgment. This process gives reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria”. In summary, CT and CR are interrelated concepts that serve as the philosophical underpinnings of healthcare curricula and model programs.

A common misnomer in Healthcare and Education is the idea that CT and CR can be taught when, in fact, these skills are learned (Chacon & Janssen, 2021; Merisier et al., 2018). Students develop critical thinking skills in learner-centered environments, where the simple delivery of facts and static information is replaced by active engagement and inquiry, thereby promoting the complex processes of inquiry, learning, and thinking (Facione, 1990). Araújo et al. (2024) demonstrated that instructional strategies, including visual representation, simulation (including interprofessional simulation), case-based discussion, and literature analysis, have shown promise in developing CT and CR skills.

In the domain of science education, García-Carmona (2025) proposed that scientific thinking (ST) and CT are mutually related intellectual processes. Scientific thinking reflects the ability to process evidence-based information. In contrast, CT is much broader, encompassing evaluative, metacognitive, and reflective domains. Both ST and CT supplement one another, as ST provides grounded methods, and CT centers around the logic of recognizing valid knowledge and using information in decision-making (García-Carmona, 2025). This perspective supports the idea that in a discipline like Exercise Science, reasoning must integrate both biomechanical logic and higher-level critique.

Despite recognition of the importance of CT, many Health Science and Exercise Science curricula rely heavily on traditional lecture, content delivery, and objective assessments, approaches that inadequately support the development of reasoning. Therefore, the inclusion of student-centered, inquiry-based pedagogies has been suggested to achieve deeper learning (Huang et al., 2025; Martin-Alguacil et al., 2024; Onuoha et al., 2024). Reflective teaching, including active learning strategies, will force students to think critically about their own learning and assumptions and to consider all factors that shape client care (Sherwood, 2024).

Within Exercise Science, such an approach supports the development of CR, ethical judgment, and interdisciplinary communication. However, despite the profession's growing scientific rigor, there is no overarching conceptual model comparable to those in other health professions, such as physical therapy, occupational therapy, and nursing (APTA, 2023; Matinho et al., 2022; Tomlin & Borgetto, 2011). This absence has implications for both professional identity and curricular coherence.

Given the needs for professional legitimation, pedagogical depth, and evolving workforce demands, this manuscript introduces the Exercise Science Practice Model (ESPM) (Figure 1).

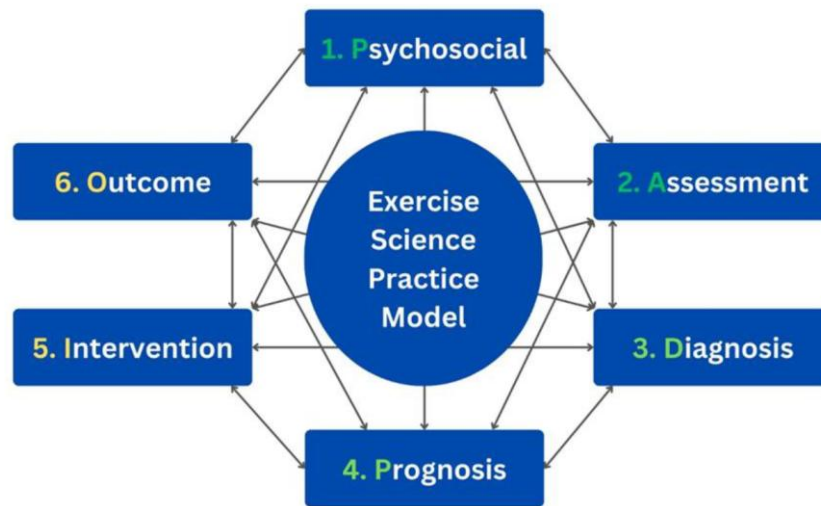


Figure 1. Exercise Science Practice Model (ESPM)

Description: The ESPM provides a structured, cyclical framework for evidence-based and client-centered practice in exercise science. It integrates six interrelated domains that guide professional reasoning and decision-making.

Dr. Mark Erickson created the ESPM as both a professional framework and educational scaffold for critical thinking. ESPM aligns with current trends in higher education, focusing on student-centered, inquiry-driven, and competency-based learning (Masava et al., 2024; Onuoha et al., 2024). The model combines the core domains of exercise science practice (such as assessment, prescription, behavior change, program design, ethics, and collaboration) with a scaffolding of critical thinking processes (analysis, evaluation, decision-making, and reflection) (Figure 2).

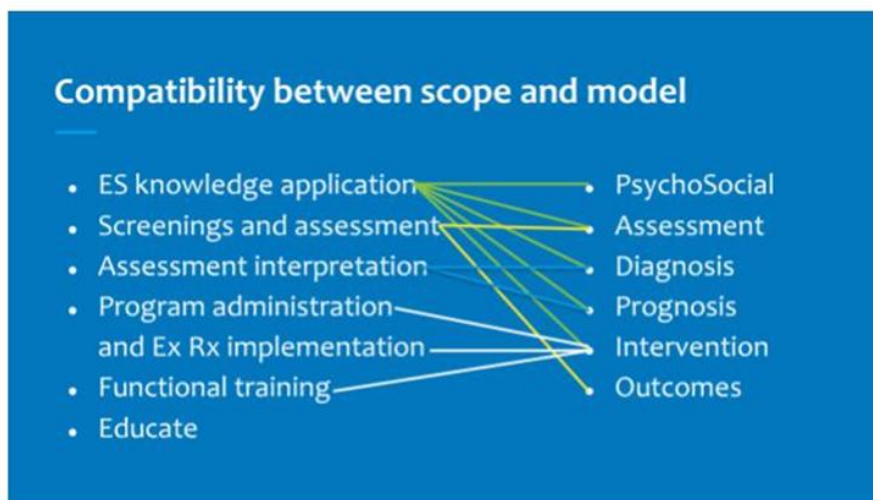


Figure 2. Compatibility between the Exercise Science profession and ESPM

Description: The interrelation between the ESPM model and the Exercise Science scope of practice is identified

Critical thinking should expand the cognitive domain; it should also include reflective and context-sensitive, encompassing analysis, evaluation, and moral reasoning (Brookfield, 2020; Facione, 2011). By offering structured reflection opportunities, students learn to justify their decisions, evaluate relevant evidence, and adapt to complex and uncertain clinical scenarios. Competency in these domains is expected by accrediting bodies such as ACSM and NSCA.

To further support these competencies, the ESPM integrates technology-enhanced learning environments to promote real-time reflection and data-informed feedback (Sohail et al., 2025). For example, incorporating wearable devices, cloud-based virtual-patient simulations, and the University's Health Simulation Laboratory enhances experiential learning opportunities. The simulation lab provides an authentic, controlled environment where students can apply the ESPM framework to lifelike clinical and performance scenarios. By combining real-time physiological data —such as heart rate variability, oxygen saturation, and movement metrics —with guided reflection and peer debriefing, students deepen their understanding of applied decision-making and interprofessional collaboration (Elendu et al., 2024).

From a pedagogical perspective, technological integrations align with constructivist and transformative learning theories (Elendu et al., 2024; Juvova et al., 2015; Mishra, 2023). They promote active, self-regulated learning, in which students can move beyond factual knowledge ("what to do") toward conceptual and metacognitive awareness ("why and how to think"). Moreover, embedding these technologies within reflective assignments amplifies students' understanding of their reasoning processes and further reinforces metacognitive growth.

Finally, such approaches support the ESPM's emphasis on critical pedagogy within Exercise Science education (Smith & Seal, 2021). By combining reflective reasoning with simulation-based and technology-enhanced interactivity, students are empowered not only to question established practices but also to visualize and evaluate their learning trajectories in real time. This aligns with contemporary priorities in health professions education, where empathy, social responsibility, and interprofessional collaboration are now viewed as essential components of professional competence (Chow et al., 2025).

Ultimately, this paper presents the conceptual foundations, structure, and pedagogical applications of the ESPM, articulating how this framework can enhance curricular coherence, professional reasoning, and interdisciplinary integration in Exercise Science education.

2. The ESPM

The following section introduces the ESPM in detail. Its six core categories —Psychosocial, Assessment, Diagnosis, Prognosis, Intervention, and Outcome (P/SADPIO) — adapt and extend existing clinical frameworks, particularly the Physical Therapy Patient/Client Management Model (APTA, 2023). Each of the six categories contains specific types of information generated during the client management process.

2.1 Psychosocial

The Psychosocial domain forms the foundational pillar of the ESPM, grounded in the biopsychosocial model initially proposed by Engel in 1977 and subsequently extended through contemporary interpretations that emphasize holistic, person-centered care (Adler, 2009; Bolton, 2022). Within this framework, human health and performance are understood as dynamic interactions among biological, psychological, and social systems. This is an essential domain for Exercise Science professionals seeking to bridge physiology with behavioral and contextual understanding. The psychosocial domain encourages students to engage in whole-person reasoning, integrating physiological data with the psychological readiness, emotional state, and social support structures that shape each client's response to exercise (McDevitt et al., 2024). This includes recognizing how stress, motivation, and socioeconomic context can influence both participation and outcomes. By training students to interpret fitness and health behaviors through this broader lens, the ESPM cultivates empathy, adaptability, and critical thinking, competencies increasingly demanded in both clinical and performance settings (Azizan & Fadzil, 2024; Eynon et al., 2019).

Current research highlights the importance of psychosocial factors in promoting exercise adherence, recovery, and long-term changes in health behaviors. For example, Eynon and colleagues (2019) identified self-efficacy, social identity, and perceived competence as primary psychological predictors of sustained physical activity. Similarly, Azizan and Fadzil (2024) found that social support and motivational climate significantly mediated the effects of exercise interventions on adherence rates. Embedding these findings into curricular design helps future practitioners understand how behavior-change theory and psychosocial assessment can be operationalized in client management.

To develop competence in this domain, students must be trained to identify and interpret psychosocial variables through structured assessment and reflective engagement. This can include evaluating readiness to change using validated instruments, analyzing barriers to participation, and developing individualized motivational strategies for each client. Integrating psychosocial reflection into coursework, such as through reflective journaling, case study discussions, and simulated client interactions, allows students to synthesize affective and cognitive dimensions of care, promoting self-awareness and professional growth (Richard et al., 2019).

From a pedagogical perspective, this domain aligns with reflective and transformative learning theories, which emphasize metacognitive awareness in professional education (Schnepfleitner & Ferreira, 2021). Encouraging learners

to reflect on their assumptions about health, body image, and performance critically enhances their capacity for ethical and inclusive practice. It also aligns with self-determination theory, emphasizing the roles of autonomy, competence, and relatedness in motivating both clients and students (Gagné et al., 2022). Thus, the psychosocial dimension of the ESPM encompasses not only client assessment but also the cultivation of critical empathy and the formation of professional identity within exercise science education.

Finally, the psychosocial domain supports interprofessional collaboration by helping students understand how their scope of practice intersects with that of allied health professionals, such as physical therapists, occupational therapists, and counselors. This awareness promotes appropriate referrals, shared decision-making, and collaborative care. This is consistent with contemporary healthcare education frameworks such as the Interprofessional Education Collaborative competencies (Patel et al., 2025). Through the integration of psychosocial education, the ESPM prepares exercise science graduates to deliver evidence-informed, client-centered care that reflects the complex realities of human health and behavior.

2.2 Assessment

The Assessment domain within the ESPM highlights the centrality of systematic, evidence-informed data collection as the foundation of client-centered care. Assessment is not a passive process of measurement, but an interpretive act that requires the practitioner to integrate empirical evidence with professional judgment and the client's context (Mugerauer, 2021). Within the ESPM framework, assessment is both diagnostic and reflective, bridging quantitative evaluation and qualitative understanding of client goals, motivation, and psychosocial environment.

In educational terms, this domain develops critical thinking competencies, including analytical reasoning, pattern recognition, and contextual decision-making. By placing assessment within structured decision pathways, the ESPM aligns with constructivist learning theories, which emphasize learning through guided inquiry and reflection (Brookfield, 2020). Students are encouraged to view assessment not merely as a mechanical step but as an evolving dialogue with the client; this process will reveal both physiological and behavioral determinants of performance.

Operationally, assessment includes the systematic collection of client demographics, exercise history, and relevant medical and injury data (Wackerhage & Schoenfeld, 2021). It also involves reviewing the systems screen to detect potential contraindications and assess overall readiness for physical activity. Students are trained to evaluate physical performance using validated metrics of cardiorespiratory endurance, muscular strength and endurance, flexibility, postural control, balance, and functional mobility. The inclusion of validated functional measures, such as the Functional Movement Screen, the 6-Minute Walk Test, and the Timed Up and Go test, ensures consistent and comparable results.

Notably, the ESPM emphasizes the inseparability of psychosocial and behavioral assessment from physical evaluation (Ruissen et al., 2022). Students are introduced to instruments such as the Tampa Scale for Kinesiophobia (White et al., 2025) to assess readiness for change and barriers to adherence. Recognizing the cognitive and emotional dimensions of exercise participation allows future professionals to personalize interventions and predict adherence outcomes. Encouraging a holistic perspective that extends beyond physiological adaptation to encompass psychological well-being and life satisfaction (Eynon et al., 2019). By engaging students in this multi-layered assessment framework, the ESPM embeds habits of reflective inquiry, key to the development of clinical reasoning and professional judgment.

Within the curriculum, assessment training is scaffolded across multiple courses to progressively deepen competence. Foundational courses introduce data collection methods, measurement theory, and reliability principles, while advanced coursework emphasizes integration of how assessment data inform exercise prescription, prognosis, and client education. This structure mirrors competency-based education frameworks in allied health (Batt et al., 2020), promoting transferable reasoning skills across settings.

Finally, assessment in ESPM is positioned as an active feedback process. Students learn to reinterpret data longitudinally, monitor progress, and adjust prescriptions based on evolving client responses. This cyclical approach reinforces the iterative nature of evidence-based practice. It aligns with Kolb's experiential learning cycle, which moves from concrete experience to reflective observation, abstract conceptualization, and active experimentation (Singh & Rao, 2024).

In summary, the ESPM's Assessment domain functions as both a technical and cognitive framework: it teaches students how to measure effectively, but more importantly, how to think critically through measurement. By embedding validated assessment tools, incorporating psychosocial considerations, and facilitating reflective interpretation, this domain fosters the kind of professional reasoning that distinguishes evidence-informed exercise scientists from technicians.

2.3 Diagnosis

Within the ESPM framework, the traditional concept of diagnosis is reframed as Performance Analysis and Limitation Identification (PALI). This reconceptualization emphasizes identifying functional and performance-related limitations rather than detecting medical or pathological conditions (Martin et al., 2024). PALI involves diagnostic reasoning processes that enable practitioners to identify modifiable factors such as body composition, neuromuscular imbalances, cardiorespiratory insufficiencies, faulty movement patterns, and biomechanical inefficiencies. It also extends to functional deficits, including postural deviations, limited agility, and reduced movement speed, that negatively impact overall performance and quality of life.

Through systematic assessment and evidence-based interpretation, practitioners apply PALI to develop individualized, targeted interventions (Martin et al., 2024). For example, findings of proprioceptive deficits or postural instability may guide the prescription of corrective exercises, while reduced aerobic efficiency can inform specific conditioning strategies. This analytical process mirrors the structured reasoning frameworks found in allied health professions (Ricke et al., 2023). It reinforces the Exercise Science practitioner's capacity to bridge scientific knowledge with applied performance enhancement.

Recognizing these evaluative processes as legitimate components of Exercise Science practice helps delineate professional boundaries and strengthen the field's identity as a health-supporting discipline. By distinguishing PALI from medical diagnostic activities, the ESPM model underscores the profession's unique contribution to preventive health, movement optimization, and functional restoration across diverse populations. This approach also fosters interdisciplinary collaboration by ensuring that findings are communicated in ways that respect the scope of practice while enhancing the efficacy of exercise interventions.

The American College of Sports Medicine (ACSM, 2020) supports this perspective, advocating for Exercise Science professionals to apply evidence-based reasoning when identifying performance and fitness constraints. Embedding diagnostic reasoning, via PALI, into educational curricula ensures that students cultivate the analytical, reflective, and ethical competencies necessary for safe and effective professional practice. By redefining diagnosis as the identification of performance limitations and barriers to function, the ESPM model effectively bridges theory and practice, creating a systematic framework that parallels clinical reasoning within established health professions while remaining distinct to the Exercise Science discipline.

2.4 Prognosis

The Prognosis stage within the ESPM encapsulates the professional judgment that bridges scientific assessment with client-centered foresight. Prognostic reasoning involves estimating the likely course of outcomes based on physiological data, behavioral readiness, and contextual factors influencing performance (Ferrand et al., 2022). In Exercise Science, this predictive process is not merely technical; it represents a sophisticated cognitive integration of evidence, experience, and contextual awareness (Rosa et al., 2024).

Drawing on the foundations of clinical reasoning theory (Yazdani & Hoseini Abardeh, 2019), prognosis in exercise science reflects the iterative process through which practitioners synthesize quantitative indicators (such as baseline fitness scores, functional movement tests, or cardiovascular capacity) with qualitative insights such as motivation, adherence potential, and psychosocial context. As in allied health professions, the ability to make accurate and ethical prognostic judgments defines professional competence and distinguishes expert from novice reasoning (Ricke et al., 2023).

In practice, prognostic reasoning requires the practitioner to determine not only what can be achieved but also how and when those outcomes can be attained (Rosa et al., 2024). For example, when developing an endurance training program, the Exercise Science professional must anticipate the trajectory of aerobic adaptation, account for recovery cycles, and balance progressive overload with injury prevention. Similarly, in rehabilitation or return-to-play contexts, prognosis involves predicting functional restoration timelines and the likelihood of recurrence based on biomechanical, behavioral, and environmental variables. Such reasoning aligns closely with the biopsychosocial model of health, emphasizing that biological progress cannot be understood in isolation from social support and psychological readiness (Bolton & Gillett, 2019).

Moreover, the ESPM's prognostic component fosters reflective practice, a hallmark of professional reasoning, by requiring students to justify their expectations through evidence-informed logic. This process parallels the concept of the reflective practitioner, where prediction and reflection operate in tandem to inform ongoing decision-making (Ziebart & MacDermid, 2019). Through guided reflection, learners critically assess whether their projected outcomes were realistic, prompting adaptive expertise and continuous improvement.

Integrating prognosis into the ESPM also serves an important educational function. It introduces students to predictive modeling as part of clinical reasoning pedagogy, encouraging them to move beyond rote program design toward strategic foresight and insight. Current research in health professions education highlights that incorporating predictive judgment exercises enhances metacognition, deep learning, and the transfer of knowledge to real-world contexts (Mukhalalati et al., 2022). Therefore, prognosis becomes a pivotal pedagogical anchor that links evidence-based practice to humanistic care, ensuring that students learn not only to measure but also to anticipate, reflect on, and revise their practice dynamically.

From a systems perspective, incorporating prognostic reasoning supports interprofessional alignment. Exercise scientists increasingly collaborate with physicians, physical therapists, and occupational therapists in clinical and community settings. A shared language of prognosis facilitates more transparent communication about progress expectations and discharge criteria, thereby enhancing continuity of care (Ricke et al., 2023; Zonneveld et al., 2018). As the field progresses toward professional accreditation, this alignment is essential for establishing legitimacy and clarity within multidisciplinary frameworks.

In summary, the Prognosis stage of the ESPM extends beyond predictive accuracy; it operationalizes the intellectual virtues of foresight, adaptability, and reflective judgment that define mature professional reasoning (Van Smeden et al., 2021). Through structured integration in both curriculum and practice, this domain prepares exercise science students to think critically, reason ethically, and act responsively within a dynamic health landscape.

2.5 Intervention

Within the ESPM, interventions are organized into three interrelated subcategories: referral, education, and exercise prescription. Each category is designed to reflect evidence-based professional practice and promote the development of interprofessional competencies. This triadic structure operationalizes how exercise science professionals make ethical judgments, engage in collaborative decision-making, and implement technical solutions within their scope of practice.

2.5.1 Referral

Referral serves as the initial decision point in the intervention phase, emphasizing professional discernment and interprofessional collaboration. When findings from the assessment process exceed the scope of Exercise Science practice—for example, when clients present with symptoms suggestive of pathology or contraindications to exercise—the practitioner must facilitate referral to an appropriate healthcare provider. This process underscores the importance of recognizing boundaries of expertise and upholding professional integrity. Interprofessional models, such as the Integrated Care Framework (Zonneveld et al., 2018), demonstrate that referral behaviors are not passive but essential components of patient-centered care, contributing to continuity and safety across the care spectrum.

2.5.2 Education

Education within the ESPM positions clients as active partners in their health journey. It begins with summarizing primary assessment findings, clarifying individualized goals, and co-creating the exercise prescription by engaging clients in a shared understanding of both the why and how of the intervention (Mönkkönen & Kekoni, 2023). Exercise Science professionals reinforce self-efficacy and adherence. These are critical determinants of long-term behavioral change. Educational interventions are informed by adult learning theory and self-determination theory, which highlight autonomy and intrinsic motivation as foundations of sustained engagement (Loeng, 2020). Thus, the educational role of the Exercise Science professional extends well beyond information transmission to empowerment and collaborative reflection.

2.5.3 Exercise Prescription

Exercise prescription represents the synthesis of clinical reasoning, evidence-based practice, and contextualized judgment. Individualized programming requires integration of psychosocial, physiological, and environmental factors, aligning with the biopsychosocial model (Bolton & Gillett, 2019). Within the ESPM, prescriptions are not static programs but dynamic processes responsive to client feedback, progress monitoring, and reassessment. The practitioner's role involves balancing safety, effectiveness, and motivation, skills central to professional competence and ethical practice.

Importantly, these three intervention components are not mutually exclusive. For instance, a client may present with mild red flags requiring medical clearance but can safely begin low-intensity supervised exercise while awaiting consultation. In this way, the practitioner both refers and trains, illustrating the flexibility and ethical responsiveness built into the ESPM. Collectively, the ESPM's intervention structure integrates technical skill, ethical discernment, and

reflective reasoning, providing the students with a holistic framework for managing complex client presentations within interprofessional contexts.

2.6 Outcomes

The Outcomes domain in the ESPM represents the cyclical and reflective component of professional reasoning (Gonzalez, 2021). It emphasizes continuous reassessment, data-informed decision-making, and the evaluation of both physiological and psychosocial indicators of progress. Within this model, outcomes are not static endpoints, but dynamic feedback loops that inform subsequent interventions and educational refinements. This iterative approach parallels evidence-based models in allied health and rehabilitation sciences, where reassessment is essential to sustaining long-term behavior change and client well-being.

In practice, the outcomes stage involves both quantitative and qualitative measures of client progress following the implementation of exercise prescriptions. Physiological outcomes may include metrics such as VO₂ max, muscular strength, flexibility, balance, and body composition, which provide objective evidence of fitness improvements. However, recent literature underscores the need to expand outcome evaluation to encompass psychological well-being, intrinsic motivation, and perceived quality of life, as these dimensions are critical predictors of exercise adherence and sustained health behaviors (Ricke et al., 2023).

Integrating psychosocial and behavioral outcome measures reflects the biopsychosocial foundation of the ESPM, ensuring that assessment extends beyond performance metrics. The inclusion of such measures prepares students to evaluate the whole person, aligning outcome assessment with person-centered care frameworks prevalent in healthcare education (Bolton & Gillett, 2019). The reflective function of the outcomes domain serves a pedagogical role within curriculum design. Students are encouraged to interpret outcome data critically, questioning not only what changed but why it changed. This reflection develops higher-order reasoning by integrating clinical data with contextual understanding of client goals, motivation, and barriers. Such reflective practice is consistent with Schön's theory of the reflective practitioner, wherein learning occurs through iterative cycles of action and reflection-in-action (Ziebart & MacDermid, 2019).

Embedding reflection into outcome evaluation supports the development of adaptive expertise, a key competency in modern health professions education (Malecka et al., 2022). The feedback loop inherent in the ESPM ensures that outcome assessment informs revisions to exercise prescriptions, educational materials, and programmatic strategies (Figure 3).

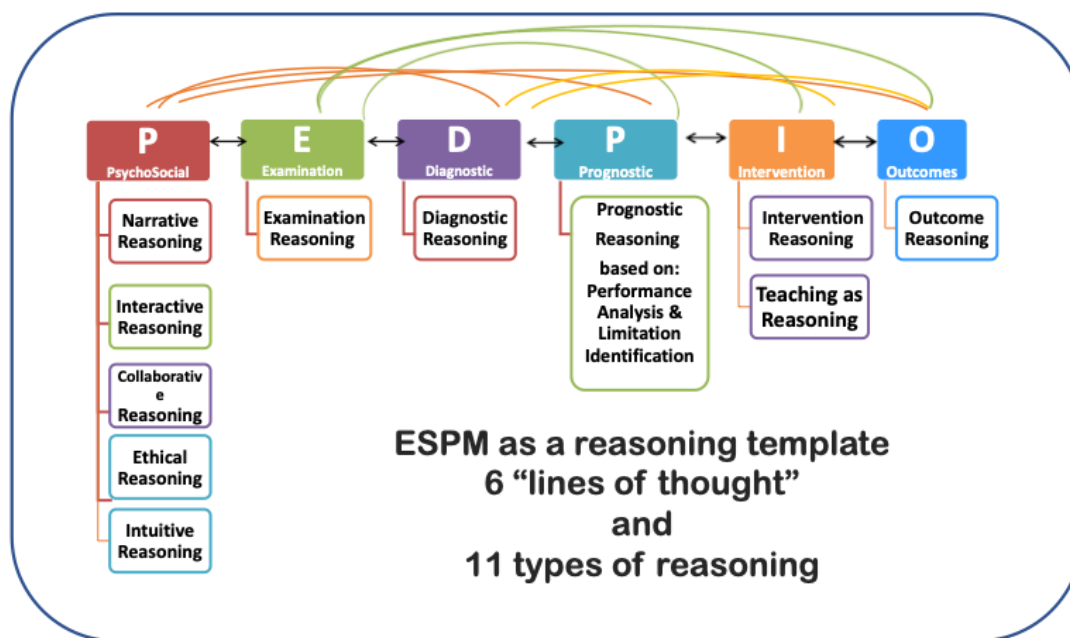


Figure 3. ESPM Reasoning Model

Description: The ESPM model is demonstrated as a reasoning template with the interaction between the six lines of thought

In educational settings, this cyclical evaluation is integrated into capstone projects and practicum experiences, where students design, implement, and reassess interventions based on real or simulated client data. This pedagogical structure fosters not only technical proficiency but also critical consciousness, the ability to analyze the ethical, cultural, and systemic dimensions that influence client outcomes.

By positioning outcomes as an evolving, evidence-informed process rather than a fixed endpoint, the ESPM reinforces the profession's commitment to continuous improvement and reflective learning. It aligns with constructivist learning theories, which emphasize knowledge construction through reflection and feedback, and with competency-based education frameworks that stress the ongoing evaluation of skills, attitudes, and values. Ultimately, the Outcomes domain operationalizes the integration of evidence-based practice, reflective reasoning, and holistic assessment, key components for advancing both educational and professional standards within Exercise Science.

3. Implementation of the Exercise Science Practice Model

At a regional University in Southwest Florida, the implementation of the ESPM represents a structured, multi-semester pedagogical strategy that integrates professional reasoning, evidence-based decision-making, and client-centered care into the undergraduate curriculum. The Exercise Science program operates using a cohort model spanning the upper level of the Bachelor of Science degree, allowing for developmental scaffolding of knowledge and competencies across courses. The ESPM is introduced early in the curriculum and intentionally revisited, expanded, and operationalized as students progress through increasingly advanced coursework.

3.1 Foundational Integration

In the first semester, the ESPM is presented conceptually, with emphasis on the profession's identity, ethical foundations, and societal role. This aligns with the professional formation phase described by Sarraf-Yazdi et al. (2021), where learners begin to internalize professional values and frameworks. Students engage with discussions and case-based reflections that position exercise science not just as an applied discipline but as a professional practice grounded in biopsychosocial reasoning. Through this lens, the ESPM provides a structure for understanding how client management decisions are made, emphasizing critical thinking, ethical judgment, and reflective reasoning.

By embedding the ESPM in introductory coursework such as Anatomy and Biomechanics I and Introduction to Evidence-Based Practice, students learn to contextualize scientific knowledge within client-centered frameworks. This foundation is reinforced through low-stakes reflective writing and visual concept mapping, encouraging metacognitive awareness of how assessment, diagnosis, and intervention relate to one another (Brookfield, 2020).

3.2 Progressive Application and Scaffolding

As students advance into courses such as Anatomy and Biomechanics II, Resistance Training, and Exercise Physiology, the ESPM becomes a practical tool for structured reasoning and applied skill development. Each of the six ESPM domains — Psychosocial, Assessment, Diagnosis, Prognosis, Intervention, and Outcome — is mapped to course learning outcomes, assignments, and laboratory activities.

Examples include:

- (1) In Resistance Training and Program Design, students apply the intervention and outcome categories through simulated client cases, integrating physical assessment data with performance goals.
- (2) In Anatomy and Biomechanics II, students explore diagnosis and prognosis, learning to identify faulty movement patterns and predict their implications for performance or injury prevention.
- (3) Evidence-Based Practice courses explicitly emphasize critical appraisal and reflective reasoning, aligning with the ESPM's function as a cognitive framework for professional judgment.

This spiral curriculum design allows for revisiting core ideas at increasing levels of complexity, promoting deeper learning. By encountering ESPM repeatedly across contexts, students build schema and pattern recognition, the key attributes of clinical and professional reasoning (Mugerauer, 2021).

3.3 Collaborative Curriculum Infrastructure

Successful implementation of ESPM relies on collaborative coordination among program faculty and administrative leadership. Regular meetings are held to ensure consistency in pedagogical philosophy, alignment of learning outcomes, and continuity of assessment practices. Figure 4 illustrates this vertical and horizontal curriculum integration.

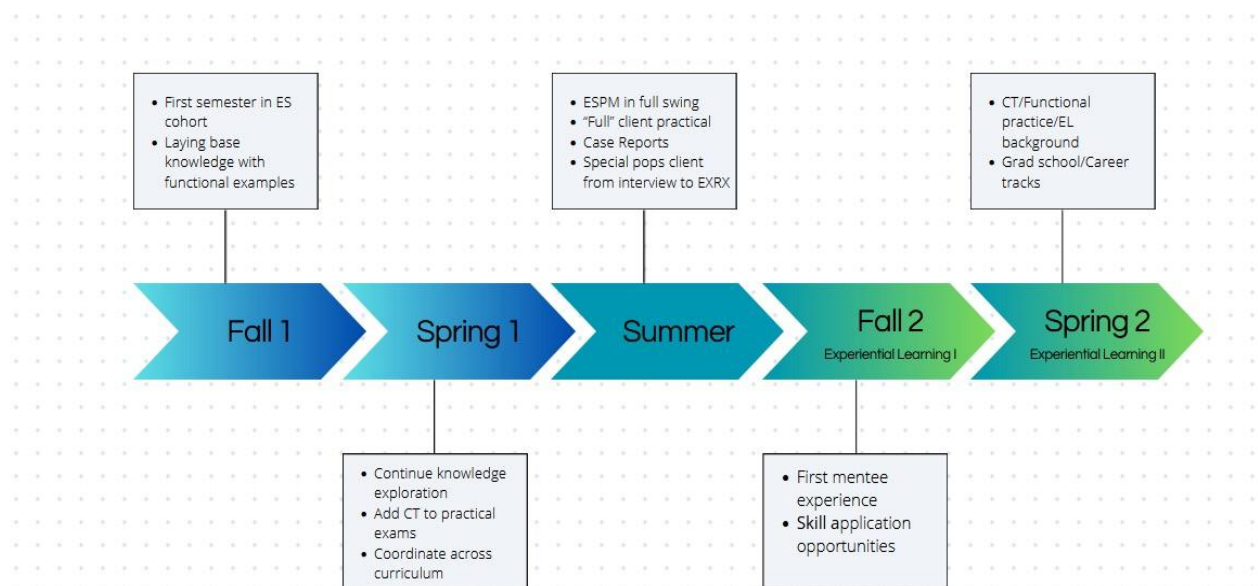


Figure 4. Curricular Timeline

Description: Implementation of the ESPM in the Exercise Science curriculum

Faculty development sessions were instrumental in promoting shared understanding of ESPM principles and in harmonizing assessment rubrics. This collaborative culture aligns with the literature on curricular coherence, which emphasizes cross-course communication, faculty alignment, and a shared vision as prerequisites for meaningful program reform (Gouédard et al., 2020).

3.4 Student-Centered Learning and Feedback

Student feedback has been essential to refining ESPM's curricular integration. Surveys and reflective feedback indicate that students value the model's systematic nature and its relevance to real-world practice. Representative comments include:

- (1) "I enjoyed learning about and implementing a systemic process to identify the root of dysfunction by first identifying the dysfunction in a whole-body movement assessment, then narrowing down the hypotheses by performing specific tests."
- (2) "Even though I am going into Physician Assistant, I will be able to apply this way of thinking with my future patients, and this is exciting."
- (3) "There are so many possibilities for both subjective and objective assessments—it leaves much room for practitioner creativity. These skills are going to help us greatly in our future careers because we will be working with people."

Such testimonials illustrate the model's value not only for acquiring technical skills but also for developing reflective, adaptive practitioners—an outcome consistent with the literature on reflective and experiential pedagogies (Alam, 2022). Students report increased confidence in critical reasoning, interdisciplinary collaboration, and professional communication—essential competencies identified by accrediting bodies such as ACSM and NSCA.

3.5 Assessment of Implementation Effectiveness

Program evaluation integrates multiple measures, including direct assessment of ESPM-based assignments, reflective journals, and exit surveys, to provide a comprehensive understanding of student learning outcomes. These outcomes are benchmarked against professional competencies outlined by the ACSM (2020) and the National Strength and Conditioning Association (2025). Faculty analyses indicate that students exposed to ESPM demonstrate stronger integrative reasoning skills and greater proficiency in articulating client management decisions.

Preliminary qualitative findings from capstone reflections further suggest that the ESPM supports professional identity formation by helping students define their scope of practice while recognizing opportunities for interprofessional collaboration. This aligns with the Interprofessional Education Collaborative's recommendations (Gautama et al.,

2025), which emphasize the value of structured reasoning frameworks in promoting shared understanding and teamwork among allied health professionals.

The ESPM's focus CT and CR closely align with the principles of Problem-Based Learning (PBL), a globally recognized, student-centered approach in healthcare education that encourages learner autonomy (Al-Najar et al., 2019; Barrows & Tamblyn, 1980; Sharma et al., 2023). Both ESPM and PBL emphasize higher-order cognitive processes that require learners to analyze, evaluate, and apply knowledge to authentic, real-world scenarios. While educators play a key role in cultivating students' CT abilities, Sternberg and Halpern (2020) emphasize the importance of transferring these skills across domains. Contemporary healthcare practice models, such as the Physical Therapy Patient/Client Management Model (APTA, 2023), the Iowa New Practice Model, the Evidence-Based Practice Model, and the Athletic Training Disability Model (Andreski et al., 2018; Tomlin & Borgetto, 2011; Snyder et al., 2008), all center on improving patient care delivery and outcomes. Integrating case studies and simulation-based learning, both hallmark PBL strategies, can enhance critical thinking and clinical reasoning while refining decision-making and judgment (Saleem & Khan, 2024; Sportsman, 2023).

Ultimately, grounding the ESPM in established practice models and incorporating student-centered, problem-based learning activities provides a strong framework for fostering the development of critical and clinical reasoning across health science education.

4. Conclusion

The Exercise Science Practice Model represents an innovative advancement in exercise science education by providing a unified framework that integrates the biopsychosocial model, clinical reasoning theory, and evidence-based practice. Serving simultaneously as a pedagogical scaffold and a professional framework, the ESPM fosters the development of reflective, ethical, and competent practitioners. Its integration into the FGCU Exercise Science curriculum demonstrates its capacity to enhance curricular coherence, promote faculty collaboration, and strengthen students' critical thinking and professional reasoning skills.

Through its six interrelated domains —Psychosocial, Assessment, Prognosis (Performance Analysis and Limitation Identification), Prognosis, Intervention, and Outcome —the ESPM translates theoretical principles into structured, actionable processes that guide client-centered decision-making. This systematic approach bridges the gap between conceptual understanding and applied competence, aligning educational practice with standards set by accrediting bodies such as the American College of Sports Medicine and the National Strength and Conditioning Association. Moreover, the model's incorporation of diverse reasoning paradigms, including narrative, diagnostic, ethical, and prognostic reasoning, aligns it with the broader literature on interdisciplinary clinical reasoning within the health sciences.

Institutionally, the implementation of the ESPM has contributed to curricular alignment, faculty engagement, and student integration of knowledge across courses. Its framework supports accreditation-readiness by ensuring that program outcomes align with national competencies while advancing scholarly discourse on the professionalization of Exercise Science. More broadly, the ESPM provides both a theoretical foundation and a practical framework for the evolution of Exercise Science as a recognized allied health discipline grounded in evidence-based reasoning, psychosocial understanding, and reflective practice.

This work represents the initial phase of ESPM implementation within a single institutional context and is therefore limited by its qualitative scope and preliminary evaluation data. Future research should examine the model's scalability across diverse academic environments and longitudinally assess outcomes such as professional reasoning competency, student self-efficacy, and graduate performance in applied settings. Comparative studies contrasting ESPM-based curricula with traditional, content-driven programs would further validate its educational impact. Additionally, exploring faculty development strategies and interprofessional applications of the ESPM could enhance its integration across health and human performance disciplines.

As Exercise Science continues to evolve amid growing professionalization and interprofessional collaboration, the ESPM offers a forward-looking, evidence-informed framework for unifying education, research, and practice. Its adoption has the potential to standardize professional competencies, strengthen reflective learning, and elevate the discipline's contribution to preventive health, human performance, and the broader allied health landscape.

5. Competing Interests/Conflict of Interests

The author(s) declare that they have no competing interests.

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