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INFLUENCE OF CLASSROOM & CLINICAL LEARNING ENVIRONMENTS ON THE MASTER ADAPTIVE LEARNER CHARACTERISTICS IN PHYSICAL THERAPY STUDENTS

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INFLUENCE OF CLASSROOM & CLINICAL LEARNING ENVIRONMENTS ON THE MASTER ADAPTIVE LEARNER CHARACTERISTICS IN PHYSICAL THERAPY STUDENTS

A DISSERTATION APPROVED FOR THE

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

BY THE COMMITTEE CONSISTING OF

Dr. Maeghan Hennessey, Chair

Dr. Benjamin Heddy

Dr. Amy Bradshaw

Dr. Doo Hun Lim

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"If I have seen further, it is by standing on the shoulders of giants." – Sir Isaac Newton

Abstract

Recent healthcare literature has called for physical therapy (PT) education to more intentionally cultivate Master Adaptive Learners (MAL), experts in ill-structured problem-solving, who demonstrate curiosity, growth mindset, resilience, and motivation. Developing these characteristics requires deliberate design of learning environments, yet little is known about how PT students experience the differing historical curricular ideologies embedded within classroom and clinical settings, how they navigate transitions between these environments, or how these experiences shape their MAL development.

This mixed-methods study explored how PT students at one university perceived the influence of classroom and clinical learning environments, and the transitions between them, on their MAL characteristics. Qualitative data were collected through longitudinal focus group interviews conducted as students moved from the classroom to clinical education and back again. Supplementary data used for triangulation included longitudinal measures of students' MAL characteristics, focus group interviews with academic faculty and clinical instructors, and observations of students' MAL-related behaviors in the clinical environment.

Results revealed distinct motivational orientations shaped by context. The classroom environment was marked by external demands, performance pressures, and a high-stakes mindset, contributing to heightened extrinsic motivation and burnout. In contrast, the clinical environment fostered intrinsic motivation, persistence, and a growth mindset through personal responsibility for patient care and meaningful relationships with patients and instructors. Transitions between these environments posed challenges but also demonstrated students' adaptability as their motivational orientations shifted.

These results highlight the contextual nature of motivational characteristics and suggest that relatedness may be essential for fostering engagement in independent learning and ill-structured problem-solving. Future research should further examine how environmental transitions influence PT students' motivation to support the development of pragmatic instructional approaches that maximize MAL characteristics.

Chapter 1: Introduction

Physical Therapy (PT) is a dynamic healthcare profession consisting of individuals who are trained to use their expertise in restoring, maintaining, and optimizing movement to help others improve their overall health and participation in the meaningful activities of life and society (American Physical Therapy Association [APTA], 2023b). To accomplish this, physical therapists (PTs) typically serve a unique role on a team of healthcare professionals that is centered around a client and their personal goals related to health, movement, and physical activity. PTs, along with other members of the healthcare team, must consider the state of the biological systems that contribute to movement and function in each individual client as well as the unique circumstances created by each individual client's psychological perspective and social environment (APTA, 2023b). Furthermore, PTs use evidence-informed practice by integrating the most contemporary scientific evidence within their area of expertise with their own personal experiences and those factors related to the individual client (APTA, 2023b).

Therefore, PT is a profession that is continuously influenced by the rapidly and constantly changing context and practice of healthcare and society. Increased life expectancies in society and shortages of healthcare workers, such as PTs, have led to more complex and costly healthcare systems and increased demands on the healthcare workforce (Frenk et al., 2010). Simultaneously, rapidly evolving technology, the rapid development of new and changing scientific evidence, and new infectious, environmental, and behavioral risks are influencing health and healthcare delivery thus requiring PTs to continually expand upon the knowledge obtained through their prior educational experiences (Frenk et al., 2010). Gaps and inequities in health and healthcare delivery are also being recognized and are demanding that PTs consider the impact of social determinants of health and the need for larger reforms in social systems to

appropriately address health-related issues (Frenk et al., 2010). All of this has combined to create a need for PTs and other healthcare workers to have a blend of technical competence, service orientation, ethical commitment, and social accountability to perform effectively and efficiently in the healthcare environment (Frenk et al., 2010).

Although PT education has long focused on the practical application of knowledge and the performance of psychomotor skills related to PT examinations and interventions, this rapidly changing societal and healthcare environment has created a shift in the landscape and a critical need for PT educators to not only train students for the direct application of skills but also develop skills that will allow them to be successful in facing the unknown problems and environments they will face in their future careers. These increasing demands within PT education have presented the unique and ongoing challenge of creating learning environments that enhance and optimize these skills within PT students.

MAL Framework as a Solution to Demands of Healthcare Environment

To meet this demand, some authors have called for PT education to focus on developing students who are Master Adaptive Learners (MALs) (Hagan & Tovin, 2025; Jensen, 2022; Nordstrom et al., 2022). The Master Adaptive Learner (MAL) framework, first developed by Cutrer and colleagues (2017), theorizes that the best healthcare workers in today's healthcare environment will have skills that allow them to be an expert in both routine situations as well as situations that require novel or unique solutions. Smith and Ragan (2005) define an expert as "someone who can apply knowledge to solve problems in a particular field of endeavor" (p. 218). Although in healthcare fields this is known as clinical reasoning, learning theory describes the skill as problem-solving. Problem-solving is a specialized skill within a domain where an individual uses previously learned principles (if-then relational rules), procedures (step-by-step

know-how), declarative knowledge (recall & understanding of facts), and cognitive strategies (mental processes) in a unique way to address an unanswered question or troubling situation (Gagne et al., 2005; Ormrod, 2020; Smith & Ragan, 2005). It involves the cognitive formulation of a desired solution or goal state, the given or current state, and the operations or intermediate states that lead from the given state to the goal state (Ormrod, 2020; Smith & Ragan, 2005). For PTs, this means developing interventions that help a client move from their current state of movement and health toward a desired goal state of movement and health. The skills associated with this problem-solving within PT students and practitioners will thus exist on a spectrum of novice to expert, and the MAL framework focuses on moving individuals higher on this spectrum toward the end of expertise.

Within the MAL framework, Cutrer et al. (2017) describes two types of clinical reasoning expertise: routine and adaptive. Routine clinical reasoning expertise involves the use of skills and knowledge that have been mastered over time utilizing repetition and feedback to produce highly efficient and accurate solutions to familiar problems (Branzetti et al., 2024; Cutrer et al., 2017, 2018; Edje & Price, 2021). This type of reasoning requires a low cognitive load and effort and is most achievable when operating in familiar structured environments with familiar problems and solutions (Branzetti et al., 2024; Pusic et al., 2020). When viewed from the perspective of learning theory, this routine expertise aligns with well-defined, algorithmic problem-solving. Well-defined problem-solving is the type of problem-solving where goal states and/or given states are clear and unambiguous whereas algorithmic problem-solving is the type of problem-solving that applies a procedural cognitive strategy that has been previously developed (Ormrod, 2020; Smith & Ragan, 2005). When combined, these types of problem-solving efficiently lead to clear, best-answer solutions. In the context of PT, this type of expertise would involve

developing interventional plans of care based on straight-forward and routine patient presentations that align with current clinical practice guidelines.

In contrast, adaptive expertise involves innovative clinical reasoning and the ability to learn and/or innovate novel solutions when: (1) faced with a new and/or unique challenge or (2) one recognizes that the routine approach is not working optimally (Branzetti et al., 2024; Cutrer et al., 2017, 2018; Edje & Price, 2021). This type of reasoning requires increased effort, utilizes a higher cognitive load, and is less efficient, but produces novel solutions that can improve healthcare practice and outcomes (Branzetti et al., 2024; Cutrer et al., 2017). When viewed from the perspective of learning theory, it aligns with ill-structured and heuristic problem-solving. These types of problem-solving involve unclear or ambiguous goal states and/or given states and a lack of previously established step-by-step cognitive strategies to help determine a solution (Ormrod, 2020; Smith & Ragan, 2005). Also, there may be multiple different solutions to this type of problem-solving that vary in their degree of acceptability based on the individual's ability to provide rationale (Ormrod, 2020; Smith & Ragan, 2005). In addition to ambiguity in goal states, given states, and/or existing cognitive strategies, adaptive clinical reasoning or ill-structured, heuristic problem-solving may include missing base information such as the principles, procedures, and/or declarative knowledge required to solve the problem. Therefore, the individual may be required to fill a knowledge gap by engaging in self-directed learning (SDL). SDL is the process in which an individual takes their own initiative to determine what needs and goals they have related to learning, identifies appropriate resources that can be used to learn, develops their own learning strategies, and evaluates their own learning (Knowles, 1975).

Although the MAL framework includes both routine and adaptive clinical reasoning expertise as its desired outcome, Cutrer et al. (2020) ascertain that traditional methods in

healthcare education have been sufficient to develop the skills associated with routine clinical reasoning expertise, but that adaptive clinical reasoning expertise should take the forefront in today's healthcare environment. Developing expertise in adaptive clinical reasoning may require new educational practices to be achieved. Therefore, the largest part of the MAL framework focuses on the skills required to develop expertise in adaptive clinical reasoning.

Developing Expertise in Problem-Solving

As previously mentioned, problem-solving requires domain-specific knowledge and cognitive strategies. Smith and Ragan (2005) reported that expert problem-solvers possess greater amounts of and deeper levels of domain-specific knowledge and that this knowledge is better cognitively organized, interconnected, and integrated than novice problem-solvers. Furthermore, they state that when compared to novice problem-solvers, expert problem-solvers use cognitive strategies that are guided by previously developed problem schema and intuitive pattern recognition that they transfer to the current problem. However, since adaptive clinical reasoning involves the ability to solve problems in the absence of these conditions, an individual must possess skills in SDL, metacognition, critical thinking, and self-regulation that allow them to fill these gaps and thus solve the problem at hand. Therefore, the MAL framework is largely based on the development of such skills to improve the ill-structured problem-solving abilities in students.

Experts in learning theory agree that practice is a key element in developing higher-order skills such as SDL, metacognition, critical thinking, and self-regulation (Kalyuga et al., 2010; Ormrod, 2020; Smith & Ragan, 2005). Learners must engage in the processes themselves to develop the schema and skills that will transfer to future use. However, Smith and Ragan (2005) propose that the best instructional design for skills such as problem-solving will vary based on

how well-defined the problem is. To support heuristic, ill-structured problem-solving aligned with adaptive clinical reasoning, instructional design must enable students to form deep, meaningful connections between new knowledge and prior experiences (Kalyuga et al., 2010; Ormrod, 2020). This includes a blend of expository instruction using moderately generalizable schemas with a top-down approach, learner-driven discovery activities, collaborative learning, and a culture that promotes transfer. Instruction should emphasize the provision of appropriate rationale and provide ample opportunities for productive struggle through authentic, highly variable example problems — requiring learners to not only develop solutions but also identify and structure the problem for themselves.

However, the success of such instructional strategies depends on the engagement of the learner. Learners must be willing to initiate and sustain active engagement in challenging learning activities that may stretch the limits of their self-efficacy due to the intentional lack of prerequisite knowledge and skills. Authors believe that this engagement results from a complex interaction between characteristics of the learner and the learning environment (Kalyuga et al., 2010; Friedman & Atkinson, 2020; Gruppen et al., 2020; Hiemstra & Brockett, 2012; Smith & Ragan, 2005). In the development of the MAL framework, Friedman & Atkinson (2020) proposed that there are four critical characteristics of the learner that allow them to foster, promote, and sustain their ability to engage in adaptive clinical reasoning: curiosity, growth mindset, resilience, and motivation. Furthermore, several authors have reported various aspects of the learning environment that may be beneficial to support engagement in such processes associated with the MAL framework such as ill-structured problem-solving and SDL (Gruppen et al., 2020; Hiemstra & Brockett, 2012; Kalyuga et al., 2010; Sawatsky et al., 2017). These beneficial aspects of the learning environment focus on combining system-controlled

instructional designs with learner-controlled instructional designs as well as scaffolding the level of learner control as higher-order skills develop (Kalyuga et al., 2010). Despite this research, PT education has historically built learning environments and designed instruction based on more system-controlled curricular ideologies that may conflict with the learner-centered perspectives recommended to develop expertise in adaptive clinical reasoning.

Curricular Ideologies that Influence the Development of Learning Environments

Schiro (2013) states that the history of education in the United States has largely been governed by four overarching and conflicting curricular ideologies that are based on different views related to the purpose and means of education. These four ideologies of curriculum are: scholar academic, social efficiency, learner-centered, and social reconstruction.

The scholar academic ideology is one in which curriculum is believed to serve the purpose of identifying the objective realities and methods associated with a particular discipline so that it can then be transmitted to learners (Schiro, 2013). Supporters of the ideology believe that the purpose of education is to transmit the knowledge that has accumulated within a discipline over time to learners so that they may be acculturated into good citizens (Schiro, 2013). Knowledge is seen as having value because it provides the foundation to a particular discipline and contributes to the community within that discipline (Schiro, 2013). Knowledge is viewed as information that is repeatable, impersonal, and can be transmitted to others (Schiro, 2013). The ideology holds true that all individuals are beings capable of information storage and that an individual's learning or storage of that information is influenced by how they are taught (Schiro, 2013). Teaching is seen as the task for those with a deep understanding of a discipline and who can successfully convey that understanding to others (Schiro, 2013). According to the

scholar academic ideology, learning is assessed via formal evaluation and testing that can lead to rankings and comparisons of individuals (Schiro, 2013).

Shaped by the industrial revolution, social efficiency ideology is an ideology in which curriculum is viewed as the content and methods that provide structure so that the terminal and progressive objectives targeted by society or any other particular client are achieved in the most effective and efficient manner (Schiro, 2013). Pure subscribers to this perspective view the purpose of education through a social lens where education is used to create adults who are highly skilled, functional, and contributing members of society (Schiro, 2013; Tyler, 2022). The primary benefactor of education is any client who will receive benefit from the creation of a human "product" (Schiro, 2013). This was originally envisioned to be all of society, but over time has evolved to represent any stakeholder with a vested interest in a specific final product for a particular purpose (Schiro, 2013). Under the social efficiency ideology, the most valuable knowledge is the applied knowledge of "doing" that presents itself through actionable and observable behaviors in the human product (Schiro, 2013). The development of these actionable and observable behaviors benefits the individual, the client, and society in general due to their socially beneficial nature. Social efficiency theorists believe that these behaviors are learned through active engagement in repeated representation and practice of a stimulus-response pairing with associated feedback as to the right-wrong nature of the response (Schiro, 2013). Therefore, the role of a teacher is to manage the learning environment and provide quality control by preparing a learning environment that maximizes feedback, provide guidance to learners by letting them know what they are to be learning, motivating learners to remain engaged and interested in the repetitive learning process, and by assessing the accuracy and appropriateness of the learner's response and providing feedback accordingly (Schiro, 2013). The assessment of

learning is determined by comparing the learner's response to criterion-based behavioral objectives that are created through a "scientific" process in which the end-product skills required by a client are identified and broken down into actionable pieces (Schiro, 2013; Tyler, 2022). Therefore, from this lens, the success of schools and education are judged by how effectively and efficiently they can produce a final human product that can perform the desired skills of the client (Schiro, 2013).

Learner-centered ideology is focused on the growth and development of the learner themselves (Piaget, 2008; Schiro, 2013; Vygotsky, 1962). Theorists and educators who subscribe to the learner-centered ideology believe that education is for the purpose of stimulating healthy and beneficial intellectual, social, emotional, and physical growth and development in each unique individual involved in the education process including students, teachers, and others (Schiro, 2013). Learner-centered theorists subscribe to a constructivist epistemology as they believe that knowledge is "the creative response of unique individuals to their personal interactions with their environments" (Schiro, 2013, p. 143; von Glasersfeld, 1984). Given these concepts of education and knowledge, learner-centered ideology believes that the learners themselves should be the source of content for curriculum and that curriculum should focus on helping learners learn what is most important to them (Schiro, 2013). The learner-centered perspective believes "learning takes place when people interact with the world around them and make meaning for themselves out of those interactions" (Schiro, 2013, p. 135). The culmination of these thoughts and beliefs lead the learner-centered subscriber to view the role of a teacher as being an individual who (1) observes learners to determine both their interests as well as their stage of development, (2) uses those observations to create learning contexts, environments, and experiences that stimulates the learners' growth and development, and (3) facilitates the unique

construction of meaning in each individual learner during those contexts, environments, and experiences (Dewey, 2022; Schiro, 2013). Since learner-centered theorists believe these principles, they are against traditional assessment methods designed to compare a learner's knowledge to any external standard such as examinations, grades, etc. (Schiro, 2013). Instead, they promote authentic assessment of performance during instructional activities for the sake of determining the development and growth of learners as well as uncovering their unique interests and aptitudes (Schiro, 2013). This is done largely through direct observation or portfolios that gather written reports, collections of artifacts produced by students, learning logs, diary entries, self-assessments and reflections, peer assessments, and anecdotal narratives (Schiro, 2013). Additionally, learner-centered ideology puts an emphasis on self-assessment as a means to help facilitate growth, development, and learning (Schiro, 2013).

The social reconstruction ideology proposes that curriculum should be a social, political, economic, and cultural education program with the goal of educating youth to reconstruct society into one that is superior to the existing one (Schiro, 2013). This view of curriculum naturally extends from the belief that the purpose of education is to guide the development of children in a manner that allows them to collaboratively construct a social perspective and values as well as problem-solving skills that give them the ability to discover, explore, analyze, consider solutions, and become implementers and advocates for those solutions in relation to any social problems that currently exist or could exist in the future (Schiro, 2013). The ideology believes that knowledge "embodies both truth and value" (Schiro, 2013, p. 189) and "what society and people believe to be true and valuable is more important than what might be true or valuable in any absolute sense" (Schiro, 2013, p. 190). Therefore, knowledge is considered socially constructed, culturally mediated, and historically situated; making it unique to each individual society

(Schiro, 2013). Individuals who subscribe to social reconstruction ideology view learning through a social constructivism perspective (Schiro, 2013). They believe that learning occurs both inside and outside of social institutions and involves both perception and interpretation (Schiro, 2013). Thus, learning occurs through an active process in which the learner makes sense of new experiences by accommodating and assimilating them into their existing meaning structures with consideration for their context (Schiro, 2013). Given these beliefs, social reconstruction ideology views teaching as the act of being a catalyst for these processes and a teacher as a colleague and companion for the journey (Schiro, 2013). Learning and education are therefore assessed through the lens of real-world circumstances and everyday life – they are meant to answer the question of how well the learners are taking what they have learned and are using it in their lives and communities outside of the school institution (Schiro, 2013). This is particularly true as it relates to the use of the knowledge gained by the learner to work toward disruption of existing power imbalances and structures (Freire, 2022; Giroux, 1985).

History of PT Education in the United States

The earliest precursor to modern PT education is found in Sweden and Germany in the early 1800s. Both countries began to embrace a style of education that combined cognitive learning with physical training. Schools of "gymnastics" were created, and students at the schools studied techniques surrounding massage, body manipulation, and exercise (Shaik & Shemjaz, 2014). In 1881, Harvard University created the Normal School of Physical Training and brought on Dudley Allen Sargent to lead the school which trained students in gymnastics and to teach physical education (Threlkeld & Paschal, 2007). Sargent believed that physical activity was a means to improve humanity through the maintenance of health and improvement of physical capacity. He approached physical activity and exercise through a scientific lens and

advocated for its inclusion as a serious academic discipline (Chalufour, 2021). Because of his beliefs, Sargent taught students to apply their learned techniques in massage, manipulation, exercise, and electrotherapy to those who were ill. This led to some of these students becoming known as "medical gymnasts" (Gwyer et al., 2003). These medical gymnasts became the early ancestors to the PT profession.

By the early 20th century, two major national events led to a proliferation of the PT profession and PT education: the poliomyelitis epidemic and World War I (Moffat, 2003; Shaik & Shemjaz, 2014). These events led to an increased number of individuals with disabilities who were believed to benefit from PT techniques. In 1917, the United States Government created the War Emergency Training Programs for Reconstruction Aides (Gwyer et al., 2003; Shaik & Shemjaz, 2014). These were short, intense, apprentice-style training programs that were designed to train those with backgrounds in physical education or related therapies on how to apply specific techniques to patients. The profession started its own professional organization in 1921 called the American Women's Physical Therapeutic Association and by 1927 there was a call for increased educational standards (APTA, 2023a; Gwyer et al., 2003). Although the first four-year baccalaureate program in physiotherapy was established at New York University in 1927 and accreditation standards that included a minimum 9-month curriculum for programs were established in 1928, most educational programs remained hospital-based, maintained an apprentice-style and technical approach to educational training, and focused on the application of topics such as anatomy, physiology, chemistry, and physics (APTA, 2023a; Gwyer et al., 2003).

However, in approximately 1940 as members of the profession continued to advocate for more autonomy and higher standards, PT education programs began a major shift from year-long, hospital-based apprenticeships to four-year, university-based degree programs (APTA,

2023a; Gwyer et al., 2003). This led to PTs transitioning their role in the healthcare workforce from that of a technician to a more autonomous professional practitioner (Shaik & Shemjaz, 2014). This also created a shift in educational delivery that now included didactic components that integrated liberal arts, basic sciences, and PT-specific coursework along with an additional but separate clinical training that occurred through the development of complex relationships between the academic institution and external clinical settings (Gwyer et al., 2003). This integration of PT into the academy continued as the first post-baccalaureate degree was established in 1960 and the first PhD program was established in 1973 (APTA, 2023a). In 1993, the first post-baccalaureate, professional Doctor of Physical Therapy (DPT) degree program was established and by 2016 the only accredited entry-level PT programs were at the DPT level (APTA, 2023a).

PT Education Today

Although there seems to be a recent trend of new privately owned PT educational programs, most programs continue to be associated with universities and institutions of higher learning. National accreditation through an independent organization, the Committee on Accreditation of Physical Therapy Education, oversees standards for educational programs and graduation from an accredited program is required to sit for the National Physical Therapy Examination and subsequent licensure to practice in all 50 states. Accreditation requirements include both didactic coursework in various disciplines as well as clinical apprenticeships referred to as clinical rotations. These clinical rotations are largely achieved through contractual partnerships between the university and external clinical entities where practicing PTs serve as clinical instructors. The post-baccalaureate, professional level DPT degree is the entry-level degree offered by accredited institutions with some institutions additionally offering graduate

degrees such as a Master of Science (MS) or Doctor of Philosophy (PhD). Additionally, some academic institutions and/or clinical institutions will offer post-degree residency or fellowship programs that allow PTs to further enhance their skills in specialty areas.

PT Education Through the Lens of Curriculum Theory

Like all educational programs, PT education has been strongly influenced by core theories of curriculum across its history, and the timeframes surrounding its development seem to explain its foundational structures. As discussed, the early roots of PT education were grounded in the application of knowledge to perform skills that benefited the needs within society. This significantly aligns with the social efficiency ideology of curriculum. The social efficiency ideology is grounded in the beliefs that knowledge is rooted in its ability "to do" or to produce action and that the source of knowledge is a normative objective reality developed via collective social interpretation (Schiro, 2013). It views that knowledge and truth derive power from their "ability to perpetuate society through skills provided to its members" (Schiro, 2013, p. 212). PT, as a healthcare profession, was created to use and perpetuate a particular set of skills that had benefit to society. Additionally, the focus of curriculum development via this ideology involves the creation of specific learning objectives that have been derived through a consensus of experts in the field and represent the capabilities and skills required to effectively perform the role within society (Schiro, 2013). In PT, these objectives are largely seen in the standards of knowledge and practice that have been developed by consulting experts within the field. According to social efficiency ideology, the teacher or instructor primarily serves as a manager of the instruction – directly implementing the content without deviation, creating a learning environment that is focused on meeting the objectives as efficiently as possible, and evaluating the learner's performance against the uniform standard (Schiro, 2013). This is seen within the PT profession

as tools such as the Clinical Performance Instrument (CPI) and the National Physical Therapy Examination (NPTE) have been developed to provide assessment of performance against these standards. The connection between PT education and social efficiency ideology is further evidenced in that proponents of social efficiency ideology were very active in their attempts to influence education in the United States during the 1920s when PT education was in its infancy (Schiro, 2013). This likely further solidifies social efficiency ideology as a dominant focus of curriculum development in early PT education, particularly within a clinical environment.

As previously mentioned and as a result of PTs seeking further recognition and autonomy within the healthcare landscape, PT education began being incorporated into institutions of higher education in the 1940s and 1950s. In addition to the fact that these universities largely grew out of a scholar academic ideology, this ideology saw an increase in its influence over education in the United States during the 1950s and 1960s as well (Schiro, 2013). Thus, it is likely that the scholar academic ideology has also played a large part in shaping PT education curriculum, especially in the classroom environment. Scholar academic ideology is grounded in the belief that knowledge is rooted in objective truths and reality and that the goal of education is to better understand this reality within a particular academic discipline (Schiro, 2013). Varied levels of expertise exist within these academic disciplines based on the amount of understanding an individual has within that discipline (Schiro, 2013). The scholar academic ideology subscribes to the belief that learning takes place when a “more educated” individual within a discipline shares the knowledge they have come to know with a “less educated” learner(s) with the intent of helping them achieve a higher level of understanding within the discipline (Schiro, 2013). Curriculum developed under a scholar academic ideology is thus completely focused on the knowledge that makes up the "essence” or the previously discovered objective truths of the

discipline (Schiro, 2013). Teachers or instructors operate as transmitters of knowledge with a focus on accurately presenting the information to the learner, ensuring uniformity aligned with the objective truths of the discipline, and evaluating how well a learner can re-present what has been transmitted to them so that they can be ranked according to their ability to advance to another level within the discipline (Schiro, 2013). PT education within universities primarily consists of faculty who are PTs with expertise in particular areas of practice that focus on conveying knowledge about that area of practice to the students. Additionally, assessment often takes the form of objective multiple-choice examinations where a single correct answer is expected. These practices align with scholar academic ideology. Finally, the relatively quick advancement of PT education into including post-baccalaureate degrees after the transition to university-based training is further evidence of the influence of the scholar academic ideology on PT education.

Purpose and Aims

The history of PT education creates a potential ideological dissonance between currently stated goals in PT education such as the development of the MAL and the historical ideologies that shaped the systems that govern PT education. This disconnect may be further extenuated by the fact that various agents control the development of learning environments and activities across both the classroom and clinical environments that PT students experience and many of these agents have backgrounds that are focused on their clinical expertise, not their expertise in education. Therefore, a potential lack of intentionality and consistency across learning environments along with a variety of philosophical underpinnings that are influencing those environments may create a hodgepodge of learning experiences. This variability within learning environments likely influences the characteristics of the learner as described in the MAL

framework that help initiate and sustain processes such as ill-structured problem-solving and SDL in either positive and/or negative ways. However, currently it is unclear what aspects of the various learning environments experienced by PT students may be contributing in positive or negative ways toward the ultimate goal of becoming a MAL.

Consequently, considering the desire to create learning environments that maximize a students' ability to become MALs and the complexity and uniqueness with which these environments currently operate, it appears that PT education programs need to more fully understand how their current unique learning environments are influencing the MAL characteristics of their learners to provide an assessment of the potential modifications that may need to be made within the environment to help maximize those MAL characteristics and thus engagement in ill-structured problem-solving and SDL. Therefore, this study intends to investigate how the learning environments associated with a professional-level PT program at a large Midwestern university are influencing the MAL characteristics of current learners within the program. To do so, investigators will seek to answer the following research questions:

1. How do current PT students in the program perceive that the didactic classroom learning environment, the clinical education learning environment, and the transition between learning environments are influencing their curiosity, motivation, resilience, and growth mindset?
2. To what extent are current PT students in the program displaying behaviors associated with the MAL during their clinical education experiences?
3. How do measures of the MAL characteristics of current PT students in the program fluctuate across the transitions between didactic classroom learning environments and clinical education learning environments?

4. How do academic faculty and clinical instructors perceive that the learning environment they oversee is influencing the MAL characteristics of current students in the PT program?
5. To what extent do the perceptions of current PT students in the program regarding the influence of the learning environments on their MAL characteristics align with quantitative measures of those characteristics and the perceptions of faculty who contribute to those learning environments?

Chapter 2: Literature Review

The context and practice of healthcare is constantly changing thus requiring healthcare practitioners to develop skills that allow them to both operate efficiently in routine tasks while also being able to learn new skills and solve novel challenges so that they may successfully treat patients and provide the best care possible (Cutrer et al., 2017). Cutrer and colleagues (2017) labeled the type of healthcare practitioner that is highly functioning in those skills and thus is capable of high performance within their environment as a Master Adaptive Learner (MAL). They have further and more specifically defined the MAL as a healthcare practitioner, "who utilizes a metacognitive approach to self-regulated learning that leads to the development and demonstration of adaptive expertise" (Cutrer et al., 2020, p. 1). Given that the MAL is viewed as the most ideal healthcare provider, Cutrer and colleagues (2017) developed a theoretical framework grounded in various other theories to help learners develop the skills of a MAL, facilitate conversations that help improve high-quality healthcare delivery, and help develop a deeper understanding of the interactions between a clinician, their skills as a learner, the clinical environment, and healthcare outcomes.

The MAL Framework: An Overview

At its core, the MAL framework focuses on clinical reasoning. Although the term is common and often implicitly understood in healthcare as the process of gathering information related to a clinical case, analyzing that information, and using it to make decisions regarding patient care, a consensus definition does not exist in the literature (Huhn et al., 2019; Moore & Fowler, 2020). Huhn and colleagues (2019) argued that a single definition of clinical reasoning was elusive due to its complex, contextual, and evolving nature and thus attempted to provide a conceptual understanding of its characteristics. The authors reported that in PT these

characteristics include the integration of cognitive, psychomotor, and affective skills; a contextual nature that involves the perspective of the therapist and the client; an adaptive, iterative, and collaborative process; and an intended outcome of appropriate client management using a biopsychosocial approach. This framing aligns with how Moore & Fowler (2020) describe the conceptualization of clinical reasoning within the MAL framework.

Within that framework, the MAL is an adaptive expert in clinical reasoning who possesses the ability to balance between routine clinical reasoning and innovative or adaptive clinical reasoning (Cutrer et al., 2017; Pusic et al., 2018, 2020). A MAL thus possesses the ability to shift their cognitive approach between the two types of reasoning based on the type of problem faced and within their level of expertise development (Branzetti et al., 2024; Cutrer et al., 2017; Pusic et al., 2018, 2020).

The MAL framework describes routine expertise as the use of skills and knowledge that have been mastered over time utilizing repetition and feedback to produce highly efficient and accurate solutions to familiar problems (Branzetti et al., 2024; Cutrer et al., 2017, 2018; Edje & Price, 2021). This type of expertise requires a low cognitive load and effort and is most achievable when operating in familiar, structured environments (Branzetti et al., 2024; Pusic et al., 2020). Innovative or adaptive clinical reasoning is the ability to learn and/or innovate novel solutions when: (1) faced with a new and/or unique challenge, or (2) one recognizes the routine approach is not working optimally (Branzetti et al., 2024; Cutrer et al., 2017, 2018; Edje & Price, 2021). This type of reasoning requires increased effort, utilizes a higher cognitive load, and is less efficient, but produces novel solutions that can improve practice (Branzetti et al., 2024; Cutrer et al., 2017).

Given this conceptualization of routine and innovative or adaptive clinical reasoning within the MAL framework, Cutrer et al. (2020) envisions the level of expertise development of the MAL through the interaction between the components of the framework which include the MAL process, the MAL environment, and the MAL characteristics. This view closely aligns with other models in the literature in other fields (e.g., counselor education) such as the Person, Process, Context (PPC) model of self-directed learning (SDL) developed by Hiemstra and Brockett (2012) where the process component reflects the skills and functions associated with the framework, the person component reflects the characteristics of the therapist, and the context component reflects the broader physical and psychosocial environment of the therapist.

The MAL Process

As previously described, the MAL framework separates the concepts of expertise in routine clinical reasoning and expertise in innovative or adaptive clinical reasoning. However, because the framework was created in response to evolving demands and changes in philosophy related to healthcare education, it primarily focuses on the processes related to expertise in adaptive clinical reasoning.

Routine clinical reasoning is developed through stages of acclimation/novice, competence, proficiency, and expertise in alignment with theories of domain-based expertise within the literature (e.g., P. A. Alexander, 2003; Dreyfus & Dreyfus, 1980; Ormrod, 2020; Pusic et al., 2020). Learners begin in the novice or acclimation stage with an introduction to concepts and rules of the domain and a fragmented understanding that must be monitored and provided feedback. Learners then progress to the competence stage where foundational knowledge and experience in the domain have progressed to the point of understanding interconnections between concepts, the development of schema and generalized principles, and the observation of

common patterns and guidelines within the domain. Learners then move to the proficiency stage where they can view the knowledge of the domain more holistically, learners can separate relevant from non-relevant information, and the learner can use prior knowledge for future recognition of similar situations and information. Finally, the learner enters the stage of expertise where they can supervise and contribute to the knowledge of others, develop intuitively appropriate and efficient actions, and develop questions that lead to new knowledge development in the domain. In the development of expertise in routine clinical reasoning within healthcare domains such as PT, this process largely involves the development of procedural knowledge where clinicians can progress toward efficiently identifying relevant information to trigger algorithmic style decisions regarding client management. Therefore, instruction to develop this type of expertise can be developed through traditional educational methods that align with curricular ideologies such as the scholar academic and social efficiency ideologies that have guided the history and development of PT education (Smith & Ragan, 2005).

Pusic and colleagues (2020) report that the MAL framework was developed to create a "different approach to learning from what has been emphasized in health professions education to date" (p. 12). This approach in which, "material to be learned is adapted to the learner" (Pusic et al., 2020, p. 12), is undergirded by a learner-centered curricular ideology and focuses on the development of expertise in adaptive clinical reasoning. The approach focuses on becoming an expert in a process that enhances an individual's skills in flexible and ill-structured problem-solving. Evidence has shown that narrow training for specific routine skills such as that which has been historically provided within PT education, is likely not sufficient to develop a learner's ability to develop flexible, ill-structured problem-solving skills (Bransford & Schwartz, 1999; Goldstone & Sakamoto, 2003; Marton, 2006). Kalyuga and colleagues (2010) have proposed that

flexible problem-solving may be best developed by providing students with domain-specific knowledge structures or cognitive strategies of medium generality and then providing, "whole-task situations organized into a simple-to-complex sequence of task classes with gradually diminishing levels of instructional support" (p. 182). The authors further propose that combining system-controlled and learner-controlled environments or varying control as learner's skills develop may provide the most ideal learning conditions to develop flexible problem-solving (Kalyuga et al., 2010).

Adaptive expertise primarily involves ill-structured problem-solving in which the learner may not already possess enough domain-specific base knowledge to develop solutions with sufficient rationale. Therefore, developers of the MAL framework used a foundation of theories in self-regulated learning and quality improvement to develop and describe a four-phased process used by a highly skilled MAL in practice (Cutrer et al., 2017, 2020). Although described as a process, these phases are not necessarily considered lockstep, but instead are iterative and dynamic with potential overlaps (Cutrer et al., 2020; Moore & Fowler, 2020; Regan et al., 2019).

The Planning Phase

The planning phase of the MAL framework is marked by several activities including identifying gaps in knowledge or skill, critically questioning observations and information from multiple perspectives, setting learning goals, prioritizing learning, and searching for and selecting resources and opportunities to learn (Cutrer et al., 2017; Moore & Fowler, 2020).

Identifying a Gap/Critical Questioning. Cutrer et al. (2017) initially described this activity as an awareness in the difference between what is and what could or should be. The authors believe that this awareness resulted from intuitive realization, deliberate questioning, intentional practice data analysis, and/or external feedback such as performance reviews (Cutrer

et al., 2017, 2018). The identification of a gap is believed to create a sense of cognitive dissonance in an individual that subsequently directs them toward seeking a resolution (Cutrer et al., 2017; Moore & Fowler, 2020).

In 2019, Regan and colleagues qualitatively investigated the characteristics of a group of medical residents identified as highly skilled MALs. They found that their activities of critical questioning and gap identification were driven by an internal sense of personal responsibility to patients instead of more externally produced feedback or assessment systems. However, these activities could be generated by either intentional or unintentional direction of the learner. Based on the analysis of their qualitative data, Regan and colleagues divided the drivers for this activity into two sub-types: performance driven and/or community driven.

Performance Driven Gap Identification. Performance driven gap identification is characterized by a self-comparison of one's performance against a particular standard and was seen most in real-time patient care (Regan et al., 2019). Performance driven gap identification was exhibited when an individual committed to a solution or action through writing, verbalizing, or doing until they encountered the "brick wall concept" (Regan et al., 2019, p. 1,254), or the point in which an individual works through decisions independently until they come to a place where they consciously realize that they do not know what to do next (Regan et al., 2019). In addition to real-time patient care, the participants in Regan and colleagues' (2019) study also identified that the review and follow-up on previous patients identified performance gaps.

Community Driven Gap Identification. In contrast to the more isolated nature of performance driven gap identification, community driven gap identification is characterized by its facilitation through interactions with other individuals residing in the learning environment

(Regan et al., 2019). The authors describe five different ways in which interactions with others led individuals to identification of a gap:

1. being asked "why" questions regarding their clinical decisions,
2. being forced to vocalize and commit to knowledge through the teaching of others,
3. being given a sense of responsibility or ownership over patient decisions,
4. intentionally seeking and inviting the feedback of trusted others, and
5. engaging in discussions of clinical experiences and knowledge with peers and others.

Setting Learning Goals. Cutrer and colleagues (2017) state that setting learning goals as a part of the MAL planning phase helps provide the learner with an explicit and intentional focus for their learning. This helps build deep and rich conceptual understanding while preventing the learner from becoming overwhelmed or distracted by extraneous content. However, other literature provides evidence that MAL goal setting may be more complex. A study by Hauer and colleagues (2018) with medical students in an academic setting found that when provided with a data-based learning dashboard, individualized coaching, and structured opportunities for reflection and goal setting, students still struggled with understanding how setting formal goals would benefit them and trended toward more performance-oriented goals than mastery goals. Additionally, medical residents identified as highly skilled MALs (Regan et al., 2019; 2022) stated that setting formal and longitudinal learning goals was influenced by their clinical learning environments. These learners embraced goal setting when it could be done a priori to a particular known and foreseen experience, but "burdensome, if not impractical, and not in alignment with their more immediate clinical needs" when gaps were unanticipated (Regan et al., 2019, p. 1,255, 2022).

Prioritization. Cutrer et al. (2017) states that the next activity in the planning phase is to prioritize the various gaps that the learner has identified and the goals they have set, a crucial skill to select and subsequently plan the learning that will occur in phase two. Cutrer et al. (2017) believe that the highly skilled MAL will prioritize based on the perceived benefit of the new knowledge compared to the perceived effort required to learn it. Moreover, the highly skilled MAL will prioritize learning when it is straightforward, easy to achieve, and in the best interests of their patients. In their study of the planning phase in medical residents, Regan and others (2019) found that highly skilled MALs were most successful when utilizing two complimentary schemas to prioritize: triage and adequacy.

Triage. Triage is considered the process by which a highly skilled MAL makes decisions regarding the importance and order of learning tasks within consideration of the time available (Regan et al., 2019). Regan and colleagues (2019) state that this activity is more individualized for skilled MALs than other activities such as gap identification which appeared to be similar across skilled MALs. The authors reported that participants in their study collectively considered the perceived importance of the content or skill, the frequency with which they perceived they would use the content or skill in the future, the convenience and/or ease with which they could address the gap, the timeframe they had available for learning, and their own personal interest to determine what, when, and how to learn. Additionally, participants reported that the triage process was distinct and different for the preparation of externally mediated goals such as high-stakes examinations when compared to gaps identified through clinical practice.

Adequacy. Adequacy is considered the process of self-identifying an endpoint for learning (Regan et al., 2019). Like triage, adequacy appears to be an individualized process even among highly skilled MALs (Regan et al., 2019). However, participants in the Regan et al.

(2019) study reported their learning endpoint typically did not represent a point of perceived competence or mastery, but rather an adequate knowledge base needed to fill the self-identified gap. Furthermore, participants reported that they would pursue deeper, richer endpoints when it was something meaningful or of interest to them compared to things such as medical care in the moment or board examinations in which they would create a learning endpoint to, "just do the bare minimum to reach that standard point" (Regan et al., 2019, p. 1,256).

Searching for Learning Resources & Opportunities. In today's environment, a copious amount of human, material, and technological resources may be available to help individuals achieve their learning goals and resolve their identified gaps. This creates a challenge and need for learners to determine which of these resources will best help them achieve their goals (Cutrer et al., 2017; Regan et al., 2019). Regan et al. (2019) reported two different processes used by medical residents highly skilled in MAL within this phase: intentional adaptation and weighted curation.

Intentional Adaptation. Intentional adaptation refers to the deliberate and opportunistic choice of learning resources and opportunities that will best address a self-identified gap (Regan et al., 2019). According to Regan and colleagues (2019), highly skilled MAL medical residents chose their resources utilizing a trial-and-error approach based on their learning stage and their physical environment. They stated their preferred resources transitioned from textbooks and broad overviews to more specific articles from literature as they transitioned from a novice learner in the academic setting to a more advanced learner in the clinical setting (Regan et al., 2019). Additionally, they selected resources based on their availability within their physical environment as well as the time available or sense of urgency related to the learning need. Thus, they used different resources at home, work, and when commuting (Regan et al., 2019). This

aligns with Cutrer et al. (2018) who stated that healthcare practitioners prefer resources that are familiar, easily accessible, clinically relevant, and time efficient.

Weighted Curation. Weighted curation refers to the iterative process of dynamically evaluating the characteristics of various resources such as their credibility, their applicability, and their ability to engage the learner to determine their potential value (Regan et al., 2019). This also includes the determination of trustworthiness and credibility of other individuals that may play a role in meeting one's learning goals (Regan et al., 2019). The value placed on various resources appears to be highly individualized, but it seems that most learners give preferential value to resources that can be educational while also meeting supplemental goals such as entertainment or building social relationships (Regan et al., 2019).

The Learning Phase

The learning phase of the MAL process involves deep and meaningful learning of the knowledge or skill itself in a manner that leads to long-term understanding and retention (Cutrer et al., 2020). Cutrer et al. (2017) describe it as, "a period of intense focus in which one wrestles with internalizing their new understandings that address their identified gap in knowledge, skill or attitude" (p. 72). To accomplish this, the highly skilled MAL chooses and utilizes effective learning strategies such as knowledge retrieval practice, spaced repetitious learning, calibration, elaboration, and concept mapping and avoids less effective learning strategies such as re-reading, highlighting/underlining, or cramming that may be characteristic of individuals lower on the MAL expertise spectrum (Cutrer et al., 2017, 2018, 2020).

The Assessing Phase

The assessing phase of the MAL framework involves the application of the new knowledge and skills generated during the learning phase to gradually build confidence and

automaticity as well as form opinions regarding their effectiveness (Cutrer et al., 2017). Therefore, this phase is focused on iterative cycles of performance and application followed by self-assessment to determine whether the new knowledge or skills should be accepted or rejected. Given that untrained and uncalibrated self-assessment is typically not accurate, Cutrer et al. (2017, 2020) suggest that the skilled MAL should and will use the process of informed self-assessment. Informed self-assessment is a form of self-assessment in which the learner calibrates and triangulates their own assessment with an external standard, externally generated data, and/or external feedback while simultaneously reflecting on the influences that their own personal biases, emotions, and experiences have on their self-assessment (Moore & Fowler, 2020; Sargeant et al., 2010; Wolff et al., 2023). Cutrer et al. (2017) also believe that for informed self-assessment to occur, the skilled MAL must have availability to trusted and credible sources of external feedback within a psychologically safe environment.

The Adjusting Phase

The adjusting phase of the MAL framework involves the determination of how and when the new knowledge and skills gained will be incorporated into one's actual clinical practice (Cutrer et al., 2017, 2020). This phase requires skills in knowledge implementation and transfer and includes decisions related to each of the following (Cutrer et al., 2017, 2018):

1. determining whether to incorporate new knowledge and skills into routine practice or maintain for novel application,
2. determining whether to incorporate the new knowledge and skills only into one's individual practice or attempt to implement on a broader system or organizational level,

3. identifying the opportunities and barriers that may exist related in incorporating the new knowledge and skills into practice and creating potential solutions to overcome those barriers, and
4. determining if and how the new knowledge and skills should be shared with others.

Self-Directed Learning (SDL) Theory

As previously discussed, the MAL framework was largely built around the four-phase process of planning, learning, assessing, and adjusting. Also, the process of the MAL framework primarily focuses on independent learning to develop a base knowledge that is usable for ill-structured problem-solving. The process as described within the MAL framework was developed and supported by literature related to self-regulated learning (SRL) as well as the plan-do-study-act process of continuous quality improvement (Cutrer et al., 2017; Moore & Fowler, 2020). Although the theories of SRL and SDL derived from two different fields (psychology and adult education respectively), the developers of the MAL framework viewed the two processes to be essentially the same process and chose SRL on which to base the MAL framework (Moore & Fowler, 2020). However, since differences exist between the SRL and SDL theoretical structures, the consideration of these differences may further enhance the MAL framework.

Malcolm Knowles (1970) was the first to popularize a theory of learning in the United States known as andragogy. At the core of this theory was the viewpoint that adults learn differently than children because as they mature and develop, the focus of learning changes from occurring within institutional settings to more “project-based” learning focused on self-actualization or achieving a desired individual or social change (Loeng, 2018, 2020). Therefore, andragogy became a theory focused specifically on adult learning and was based on six key principles (Loeng, 2018; Purwati et al., 2022):

1. adults need to know why they need to learn something;
2. over time, an individual's self-concept becomes more self-directed;
3. adults have accumulated a reservoir of previous experiences that can be used and are increasingly relied upon as a resource for learning;
4. an adult's readiness to learn becomes increasingly focused on the developmental tasks of their social roles;
5. over time the orientation of learning becomes more performance-centered than subject-centered and from postponed application to more immediate application; and
6. as a person matures, their motivation for learning becomes more internalized.

Given this perspective, Knowles (1975) postulated that adult learning primarily takes a form known as SDL in which an individual takes their own initiative to determine what needs and goals they have related to learning, identifies appropriate resources that can be used to learn, develops their own learning strategies, and evaluates their own learning. It was his belief that, in adults, this type of learning leads to higher motivation, better learning, longer retention of information, and more significant and immediate application of knowledge than other more passive methods of learning (Loeng, 2020).

As time has progressed over the last fifty years, the concepts within SDL have been further developed and models have been created to help visualize its components. Hiemstra and Brockett (2012) were instrumental in this process through the development of their Personal Responsibility Orientation (PRO) model that was subsequently updated and revised into the Person-Process-Context (PPC) model. Recently, this model has been further updated using a qualitative, grounded theory approach within a group of medical residents (Sawatsky et al.,

2017). This model, pictured in Appendix A, can be used to further describe the components associated with SDL.

Person Component of the SDL Model

The person aspect of SDL is defined as the characteristics of an individual learner themselves such as creativity, critical reflection, enthusiasm, life experiences, life satisfaction, motivation, previous education, resilience, and self-concept that may influence their engagement and performance in the SDL process (Hiemstra & Brockett, 2012). Motivation, which was previously seen only as a person-related factor, has more recently been updated to reflect its overlap with context related factors and is discussed later (Sawatsky et al., 2017). The remaining person-related factors may be further sub-divided into the following:

Knowledge Framework. Considered both a personal component of the model and the primary goal or outcome of SDL, a knowledge framework is the amount of knowledge required to understand and successfully complete a particular task, perform a particular skill, or solve a particular problem (Sawatsky et al., 2017). Therefore, there is a link between an individual's current and existing knowledge and the knowledge framework that may influence engagement and/or performance in SDL (Loeng, 2020; Sawatsky et al., 2017).

Individual Characteristics. Individual characteristics are the various aspects that are unique to an individual and influence their engagement and performance in SDL (Sawatsky et al., 2017). These characteristics may include demographic factors such as age, sex, educational level, nationality, ethnicity, and/or social class (Adenuga, 1989; Brockett, 1985; Brookfield, 2003; Hutto, 2009; Loeng, 2020; Na et al., 2018; Nasri & Mansor, 2016). Other individual characteristics may include various aspects of an individual's personality, identity, or self-concept (Bonk et al., 2015; Guglielmino, 1977; Kirwan et al., 2010; Liu & Sullivan, 2021;

Loeng, 2020; Lounsbury et al., 2009; Major et al., 2006; McCartney et al., 2016; Sawatsky et al., 2017).

Process Component of the SDL Model

The process component of SDL is defined as all the skills and abilities involved in carrying out SDL such as the facilitation of learning, learning-related skills, planning, organizing, evaluating abilities, teaching styles, and technological skills (Hiemstra & Brockett, 2012). The steps in the process originally outlined by Knowles (1975) have been refined over the years and now include the following (Sawatsky et al., 2017):

Triggers. Triggers are external events that expose an individual to a gap that they have in their current knowledge framework (Sawatsky et al., 2017). Triggers initiate the SDL process within an individual (Sawatsky et al., 2017). These triggers may include things such as performance of an activity, interaction with peers, reports from media or social media, academic or clinical teaching, mistakes made, or preparation for high-stakes examinations (Sawatsky et al., 2017).

Knowledge Gap Discovery. A trigger initiates the uncovering of a knowledge gap (Sawatsky et al., 2017). A knowledge gap represents knowledge that is not already in an individual's knowledge framework but is required to successfully complete a particular task, perform a particular skill, or solve a particular problem (Sawatsky et al., 2017). Essentially, it represents what is not already known or a capacity not fully realized.

Formulation of Learning Objectives. Once a knowledge gap has been identified, an individual will formulate learning objectives that represent the knowledge or skills needed to be obtained to fill the knowledge gap (Sawatsky et al., 2017). Additionally, this part of the process

involves the prioritization of objectives based on the perception of the level of importance the new knowledge holds for an individual's future (Sawatsky et al., 2017).

Resource Determination and Use. Once an individual self-determines their learning objectives, they select what resources they will use to help them meet those objectives (Sawatsky et al., 2017). These resources are directly influenced by the objective, and an attempt is typically made to utilize the most high-yield resources (Sawatsky et al., 2017). The individual then must use the selected resource(s) and develop learning strategies to learn what is needed to meet the pre-determined learning objective(s) (Sawatsky et al., 2017).

Knowledge Application. Knowledge application is viewed as a critical step in the SDL process and involves the immediate use of the knowledge gained via the first parts of the SDL process to complete a particular task, perform a particular skill, or solve a particular problem (Sawatsky et al., 2017). This application can then be used to solidify that new knowledge and/or evaluate the success of the SDL process (Sawatsky et al., 2017).

Evaluation of Learning. Individuals determine the level of success of the SDL process using self-reflection and external feedback based on the application of the knowledge they have added to their knowledge framework via the SDL process (Sawatsky et al., 2017). The results of this evaluation can then serve as a trigger that leads to re-entering the SDL process thus making SDL a cyclical process (Sawatsky et al., 2017).

Context Component of the SDL Model

The context component of SDL is defined as everything that encompasses the environmental and sociopolitical climate that surrounds the learner and the SDL process such as the culture, power structures, learning environment, finances, learning climate, organizational

and institutional policies, and political milieu (Hiemstra & Brockett, 2012). Sawatsky et al. (2017) further sub-divides this context component into the following:

Barriers. Barriers represent contextual items that prevent an individual from engaging in the SDL process (Sawatsky et al., 2017). These may include competing obligations, the need for personal well-being, difficulty or perceived lack of skill related to one of the components of the SDL process, and/or a sense of urgency in which the learning must take place (Liu & Sullivan, 2021; Sawatsky et al., 2017).

Perceived External Guidance. The amount of support and assistance an individual believes is available to guide them through the SDL process is known in the framework as perceived external guidance (Sawatsky et al., 2017). This may include guidance in organizing and framing the process; creating and prioritizing learning objectives; identifying, evaluating, and using resources; applying gained knowledge to a real-world situation; and/or evaluating their own learning (Sawatsky et al., 2017).

Structure and Culture of the Learning Environment. The influences of various social, institutional, and organizational components and systems that exist within the environment in which SDL may take place are also considered in the framework (Sawatsky et al., 2017). These influences may include the perceived availability of time or other resources, the influence of an individual's social circle, the amount of ownership one has over tasks and activities, and the degree of psychological safety that exists within the environment (Douglass & Morris, 2014; Liu & Sullivan, 2021; McCartney et al., 2016; Sawatsky et al., 2017; Seccombe & Stewart, 2014).

Motivation. Motivation for the SDL process spans across the person and context aspects of SDL and is viewed as the reasons that move an individual to initiate and/or sustain the SDL process (Sawatsky et al., 2017). A variety of different factors have been identified that influence

motivation for SDL including personal interest in the topic, curiosity, helping form a specific identity, perceived benefit to others, improving social-emotional connections, a fear of appearing stupid, self-preservation, previous positive or negative experiences with SDL, or doing well on high-stakes examinations (Bonk et al., 2015; Kasworm, 1983; Liu & Sullivan, 2021; McCartney et al., 2016; Sawatsky et al., 2017).

Change Over Time. The SDL framework acknowledges that changes can occur over time in the person and context aspects of the model (Sawatsky et al., 2017). Participating in the SDL process can further influence an individual's motivation & knowledge framework related to SDL itself as well as influence the efficiency and performance with which the process takes place (Sawatsky et al., 2017). Additionally, context is often dynamic thus creating a continually changing environment on the influence of SDL (Sawatsky et al., 2017).

Enhancing the MAL Process through the Incorporation of SDL Theory

According to Moore and Fowler (2020), SRL focuses more on the management of a project of learning while SDL focuses more on the learning process. As such, one of the primary differences between the two theories is that SRL describes a process of learning that can be prescribed by someone external to the learner while SDL describes a process in which the learner themselves identifies their own learning need and is the sole initiator of the process. This is an important distinction in relation to the MAL framework. An individual recognizing that they do not know something or do not possess a skill is different than them knowing what it is that they don't know or cannot do. Due to this difference, SDL contains the concept of a trigger – an event that exposes an individual to a gap in their current knowledge framework (Sawatsky et al., 2017). Therefore, a trigger is different conceptually from the gap identification that is described in the planning stages of MAL. Triggers, therefore, play an important role in the motivation to initiate a

learning process, and in typical healthcare practice must be recognized by the practitioners themselves. The need to emphasize the concept of triggers outside the planning stage of the MAL framework is further supported by an overlap in the evidence in the MAL literature with the SDL literature that shows that in healthcare providers a SDL process is initiated by similar events such as an inability to perform a particular task or answer a particular question (i.e., a "brick wall" moment); social interactions with others such as peers, supervisors, or others; and the teaching of others (Regan et al., 2019; Sawatsky et al., 2017). However, despite the benefits of adding the trigger concept to the MAL framework, it appears beneficial to retain the SRL phases as they represent overlap with the SDL process. SRL also includes the phase of adjustment where SDL does not. This phase may also be critical to incorporating new learning and developing adaptive expertise.

The MAL Environment

As previously mentioned, the context in which an individual attempts to engage in processes such as those described in the MAL framework or SDL theory is believed to heavily influence the success of such processes (Cutrer et al., 2018; Gruppen et al., 2020; Regan et al., 2022; Sawatsky et al., 2017). The MAL framework focuses on two aspects of the environment (the learning environment and coaching) that can either be facilitators or barriers to the development and application of MAL skills (Cutrer et al., 2018).

The Learning Environment

Within the MAL framework, the learning environment is described as a complex construct that refers to everything surrounding and influencing the MAL process (Gruppen et al., 2020). It is primarily psychosocial and material in nature and may involve components at various different levels of social systems including the individual, their group or team, the organization

within which they are residing, the local community, and society in general (Cutrer et al., 2018; Gruppen et al., 2020). The MAL framework utilizes a perspective of the learning environment that is further sub-divided into personal, social, organizational, and physical/virtual (Gruppen et al., 2020; Regan et al., 2022).

Personal Learning Environment. The personal learning environment represents the psychological and experiential aspects of an individual that surround and influence their MAL process (Regan et al., 2022). In addition to the four critical characteristics discussed in the MAL framework itself, Regan et al. (2022) found that highly skilled MALs had several similar personal characteristics that were a part of their personal learning environment and served to facilitate engagement and success in the MAL process. First, skilled MALs reported that personal responsibility to patients was a central focus and driving force behind engaging in the MAL process. Furthermore, they viewed learning as a necessary and continuous process that would lead to self-improvement over the course of their career and challenges in practice as opportunities for that growth to occur. Next, participants recognized that the management of their emotions played a role in the MAL process. This was either through a history of past experiences that generated negative emotions about their competence that they were seeking to avoid or through the overcoming of negative emotions such as shame or disinterest due to the gap identified. Finally, participants reported having a structured and effective approach to the MAL process that had been refined over time and through previous personal experiences.

Social Learning Environment. The social learning environment represents the interpersonal relationships of an individual such as their peers, supervisors, staff, patients, etc. that influence their engagement and success in the MAL process. Regan et al. (2022) found that highly skilled MALs leveraged their social relationships to maximize their learning in several

ways. First, being entrusted or empowered by a senior team member or supervisor to take on personal responsibility and ownership of patient care decisions helped facilitate the MAL process. Furthermore, skilled MALs have developed various trusted sources and relationships that they utilize to provide expertise, opinions, advice, and/or feedback. Additionally, skilled MALs reported participation in communities of practice where organic interactions with peers helped to further internalize their value for learning and initiated engagement in the MAL process. Finally, highly skilled MALs reported that being required to teach another facilitated their own personal learning as well.

Organizational Learning Environment. The organizational learning environment is the structure, guidance, and/or support that an organization provides (Regan et al., 2022). As previously mentioned, highly skilled MALs have reported that the learning environment is crucial to their goal-setting strategies. Goal setting seems to vary based on its relation to the classroom, a clinical environment that contains a broad scope of undifferentiated patients, or a highly specialized uniform clinical environment (Regan et al., 2022). Moreover, organizational environments that provide adequate time for reflection and learning may enhance engagement and success in the MAL process (Auerbach et al., 2020; Hauer et al., 2018; Regan et al., 2019).

Some aspects of the organizational environment have been reported to be challenges or barriers to engagement and success in the MAL process. One of these challenges is the transitions between organizational learning environments (Cutrer et al., 2018; Regan et al., 2022). Moving between environments that are different regarding their learning structure, such as the transition between classroom and clinic, may lead to increased cognitive load thus negatively influencing the MAL process (Regan et al., 2019, 2022). Furthermore, learners may experience an increased need to rely on informed self-assessment skills that were not cultivated

in a previous learning environment (Regan et al., 2019, 2022). A large organizational barrier to engagement and success in the MAL process is time (Regan et al., 2019). Learners within a clinical environment have reported a lack of available time at the moment a knowledge gap is identified which leads to superficial or non-existent learning (Regan et al., 2019). Learners thus report the need to make lists of learning needs to address in the future. However, this future learning is perceived to come at the sacrifice of personal time (Regan et al., 2019). Finally, other organizational barriers to the MAL process that are perceived to exist include an organization that rewards confidence in one's competence in the absence of actual competence and a hierarchical system that prevents a learner from being able to take ownership and personal responsibility for patients (Regan et al., 2019).

Physical/Virtual Learning Environment. The physical and/or virtual learning environment represents the actual physical space and resources to which a learner has access as well as the resources that are accessible through information technology (Regan et al., 2022). Regan et al. (2022) found that highly skilled MALs did not comment on this aspect of the learning environment as much as the personal, social, and organizational areas. However, participants did report that the use of technology to assist with organization of the MAL process helped facilitate their engagement and success in the process.

Coaching. Coaching is a special component of the social learning environment in which an individual helps facilitate the learner's ability to achieve their fullest potential across all phases of the MAL process (Cutrer et al., 2018; Deiorio & Juve, 2020). The coach may help stimulate reflection, maintain focus, provide external feedback, offer accountability, provide modeling, be a sounding board for ideas, help calibrate self-assessment, interpret practice-related data, internalize value for the MAL process, or a variety of other components of the MAL

framework (Cutrer et al., 2018; Deiorio & Juve, 2020; Hauer et al., 2018). Coaching within the MAL process appears to work best when the coach adapts to the needs of the learner, provides clear expectations, allows the learner to be vulnerable, and provides opportunities for productive failure (Auerbach et al., 2020). Coaching also appears most effective when the coach and learner have been able to establish a long-term relationship built on trust and respect that promotes an environment of psychological safety (Auerbach et al., 2020; Cutrer et al., 2018).

MAL Characteristics

Cognitive Skills

Cutrer et al. (2017) as well as Papp and Thomas (2020) believe that there are two cognitive skills that are essential for successful engagement in the MAL process: critical thinking and reflection. The authors believe that these cognitive skills are necessary for every phase of the MAL process and thus are crucial skills for an individual to possess to engage and be successful in the MAL process.

Critical Thinking. Critical thinking is defined as the ability to apply higher order cognitive skills such as conceptualizing, applying, analyzing, synthesizing, and evaluating to information that has been brought to conscious awareness through observation, experience, reflection, reasoning, or communication to deliberately guide a logical and appropriate belief or action (Cutrer et al., 2017; Papp & Thomas, 2020). This skill is content and context specific and in healthcare has taken on a variety of terms including clinical reasoning, medical decision making, clinical judgment, and clinical problem-solving (Papp & Thomas, 2020). The MAL framework is partially built on dual process theory and its explanations of the foundational cognitive processes associated with critical thinking which further highlights its overall importance to the MAL process (Papp & Thomas, 2020).

Reflection. Reflection is defined as "a metacognitive process that occurs before, during, and after situations with the purpose of developing greater understanding of both the self and the situation so that future encounters with the situation are informed from previous encounters." (Sandars, 2009, p. 685). As stated, this skill requires metacognition and can occur at any or all of the stages of an encounter with a deliberate purpose of improving oneself and their clinical practice (Sandars, 2009). Cutrer et al. (2017) states that the skill of reflection, more than any other, is what allows clinicians to maximize their learning and improve as clinicians. Papp and Thomas (2020) report that reflection relies on deliberate attention, metacognitive monitoring (the cognitive processes used when monitoring behaviors, actions, thoughts, and attitudes), and metacognitive knowledge (knowledge of what one knows or doesn't know). Therefore, the skill of reflection overlaps with both critical thinking and informed self-assessment.

Learner Characteristics

As a part of the MAL framework, Cutrer et al. (2018) describes four critical and internal characteristics of an individual that are believed to foster, promote, and sustain their ability to engage in the MAL process. These four characteristics are curiosity, motivation, growth mindset, and resilience. Although these characteristics are somewhat loosely conceptualized by Cutrer et al. (2017, 2020) within the MAL framework, they do closely align with constructs studied within various theories of psychology and motivation. Additionally, these constructs appear to be positively correlated with performance of both ill-structured problem-solving and SDL and are modifiable - being either promoted or stifled through an individual's experiences and their learning environment(s) (Friedman & Atkinson, 2020).

Curiosity. Curiosity has long been recognized as a characteristic that influences human behavior and performance in a variety of areas. However, the definition and conceptualization of

curiosity have proven elusive throughout its study and there has been a considerable amount of debate regarding a consensus of the construct. Early theorists conceptualized curiosity as a desire for new information and/or experience that drives exploratory behavior. Berlyne (1954), one of the seminal authors guiding modern theory on curiosity, provided a subdivision of curiosity. He conceptualized epistemic curiosity as a type of curiosity that is driven by "the main fruits of knowledge" and perceptual curiosity as a type of curiosity driven by "an increased perception of stimuli" (Berlyne, 1954, p. 180). Additionally, Berlyne (1966) theorized that two different types of exploratory behavior exist as well. The first, specific exploratory behavior, was viewed as exploration generated by a lack of information leading to uncertainty and conflict and thus a targeted exploration of particular sources that can supply the information that is missing. The second, diversive exploratory behavior, was viewed as exploration generated by a desire for novelty, surprisingness, complexity, change, or variety in stimuli and thus a more varied approach to stimulus seeking that can satisfy the desire.

Although these concepts initially described by Berlyne guided much of the research in the late 20th century related to curiosity, Loewenstein (1994) discussed that the innate, instinctive, and trait nature with which curiosity had been conceptualized did not account for more situational and salient characteristics displayed in information seeking. He believed that this was especially true regarding epistemic curiosity. Thus, Loewenstein (1994) interpreted curiosity as a "form of cognitively induced deprivation that arises from the perception of a gap in knowledge or understanding" (p. 75). Further adding to the discussion, the work of Reio and colleagues (2006), Renner (2006), Bugaj and colleagues (2023), and others has contributed to the emergence of the concept of social curiosity. Social curiosity is described as the desire to know more about how other people think, feel, and behave. This concept of social curiosity may be of

particular importance to fields such as PT where clinical reasoning and problem-solving involve both cognitive background knowledge and the collaborative integration of the patient's perspective (Huhn et al., 2019).

Providing further confusion to the discussion of curiosity is the educational psychology theory of interest. Interest refers to both the psychological state of being engaged with particular content as well as the predisposition to return to engagement with that content over time (Renninger, 2010). Hidi & Renninger (2006) propose that interest in particular content is developed through interactions and experiences within one's environment and developed the Four-Phase Model of Interest Development to describe this development. The model proposes two types of interest with two subcategories each which create the four phases of the model: situational (triggered and maintained) and individual (emerging and well-developed). Situational interest involves a focused attention and affective reaction in a moment by environmental stimuli and may or may not endure over time. It consists of triggered situational interest where an experience or environmental feature captures attention and creates short-term changes in affective and cognitive processing as well as maintained situational interest where those affective and cognitive processing changes are maintained through personal meaningfulness and/or involvement with the content. Individual interest involves an individual's relatively consistent predisposition to engage and reengage with a particular area of content over time. It consists of emerging individual interest where stored knowledge, value, and positive affective states from previous experiences leads to self-directed reengagement with the content when provided the autonomy to do so as well as well-developed individual interest where these stored states lead to deeper engagement and reengagement with the content such as question asking, resourcefulness and persistence when facing challenges to engagement, a sense of effortlessness, self-regulatory

behaviors, and increased ability to problem-solve within the content domain. Hidi & Renninger (2006) state that each phase may or may not be a precursor to the development of the next phase of interest.

The overlapping and similar constructs and conceptualizations of curiosity and interest have been so contentiously debated in the literature that it even warranted an entire 2019 special issue of Educational Psychology Review be dedicated to the topic (Peterson & Hidi, 2019). In the special issue, P. A. Alexander (2019) reports several areas of common ground between the constructs. First, P. A. Alexander (2019) agrees with many other authors that the terms curiosity and interest are "often ill-defined and poorly demarcated, especially within common vernacular" (p. 898). Although the terms represent complex and multifaceted constructs, curiosity and interest share certain underlying processes and components including the fact that they each have both transient (known as "state") and more stable (known as "trait") forms. They both can be manifested instinctively or intentionally and can be instigated through either internal or external processes. Both curiosity and interest appear to develop over time as a result of maturation and the experiences of an individual and the psychometrically sound measurement of each construct has largely been elusive.

Despite these similarities, several authors have attempted to provide meaningful commentary that establish distinct understanding and conceptualization between curiosity and interest (Ainley, 2019; Grossnickle, 2016; Pekrun, 2019; Shin & Kim; 2019). Pekrun (2019) proposes that state curiosity is defined by the fact that it involves an information gap, a sense of agency or control that one can eliminate that gap, and that doing so will provide intrinsic value. He further goes on to define state interest as "engagement with an activity, object, or content…because it is intrinsically valuable" (Pekrun, 2019, p. 909). Therefore, Pekrun (2019)

offers that state curiosity is a special subset of state interest where the "object" is an information gap of some kind. Additionally, although Pekrun (2019) describes trait curiosity as an individual's disposition to frequently experience curiosity across a broad range of situations and trait interest as an individual's disposition to reengage with specific activities, objects, or contents, he reports that there may be specific overlap in the concepts as both may be considered in a domain-specific way as well as in a more domain-general manner that align with certain temperament and personality characteristics.

Within the MAL framework, curiosity has been conceptualized as the desire for knowledge that leads to exploratory behavior (Friedman & Atkinson, 2020). Cutrer and colleagues (2018) state that it represents an internal desire to know and understand more and an urge to investigate and discover. Although these authors acknowledge both the state and trait forms, their description of curiosity within the framework lacks a nuanced discussion and theoretical underpinning that distinguishes between the constructs of state curiosity, trait curiosity, state interest, and trait interest. However, given the definitions proposed by Pekrun (2019) as well as the nature of the MAL process itself, state curiosity may be the most relevant construct for the MAL framework. The MAL and SDL processes begin with the recognition of an information gap (Cutrer et al, 2018; Sawatsky et al., 2017). Therefore, when faced with this recognition, state curiosity may play a critical role in the individual's sense of agency and desire to close this gap for the intrinsic value it will produce. Further discussed in the section on motivation, it is of note that particularly in settings such as PT and other healthcare professions, this intrinsic value may vary and include not only enjoyment, but also a sense that closing the gap will provide benefit to a patient. Thus, both intellectual and social state curiosity may play a large role within the MAL framework and the development of adaptive expertise. This is not to

say that trait curiosity and/or interest do not play a role in engagement in SDL or MAL processes. It is only to recognize the very intimate alignment between the constructs of state curiosity and MAL/SDL processes.

Friedman & Atkinson (2020) report that "curiosity plays a critical role in intellectual discovery, problem-solving, self-monitoring, and lifelong learning and caring" (p. 33). More specific to the practice of healthcare and PT, curiosity has been called a key to the humanistic practice of medicine and a crucial component to providing optimal patient care (Fitzgerald, 1999; Weiss, 2024). These claims seem to be supported by a variety of literature. Nanda (2012) provides several real-world examples of how curiosity can lead to advanced problem-solving and clinical reasoning in medical practice. Factors associated with both state and trait types of curiosity and/or interest have been linked to SDL as well (Bonk et al., 2015; Getz et al., 2025; Kirwan et al., 2010, 2014; Lounsbury et al., 2009; Major et al., 2006; McCartney et al., 2016; Regan et al., 2022; Sawatsky et al., 2017; Seccombe & Stewart, 2014; Sucipto et al., 2019). Furthermore, higher levels of curiosity have been associated with higher levels of problem-solving and/or component skills of problem-solving such as deeper and more organized base knowledge, critical thinking, self-regulation, and metacognition (Epstein et al., 2008; Jirout & Matthews, 2022; Karademir, 2019; Muis et al., 2015; Richards et al., 2013; von Stumm et al., 2011). Hardy and colleagues (2017) additionally found that although curiosity may be associated with problem-solving through the resolution of a perceived gap, it may not be sufficient to create more expansive and more creative problem solution options. This problem-solving skill may be more highly associated with another type of curiosity such as diversive curiosity and constructs such as creativity. Finally, although there appears to be a lack of empirical evidence to support the claims, several authors propose that higher levels of social curiosity lead to better clinical

reasoning, better patient care, and superior patient outcomes (Bugaj et al., 2023; Fitzgerald, 1999; Kasman, 2004).

In addition to its apparent connection with problem-solving and SDL, state curiosity is influenced by the learning environment, and a learning environment can lead to either increases or decreases in the characteristic (Friedman & Atkinson, 2020; Loewenstein, 1994; Pluck & Johnson, 2011; Reio & Callahan, 2004). Sternzus and colleagues (2017) reported that the trait curiosity of medical students remained relatively consistent across a 4-year medical school curriculum, but state curiosity was consistently lower than trait curiosity. Additionally, they reported that state curiosity declined from the beginning to the end of the 4-year period. Similarly, Getz et al. (2025) described a decline in intrinsic value for SDL over the course of 8 semesters among professional level PT students. These studies not only support the fact that state curiosity may fluctuate based on the learning environment, but also that current learning environments in healthcare may be contributing to a decrease in state curiosity and therefore hindering the development of adaptive expertise.

Many authors have reported aspects of learning environments that may enhance or facilitate state curiosity. First, an environment of psychological safety, one where an individual feels safe and is given opportunities to speak up, ask questions, make mistakes, and feel comfortable with uncertainty has been reported to facilitate curiosity (Auerbach et al., 2020; Friedman & Atkinson, 2020; Gruppen et al., 2020; Hauer et al., 2018; Jirout & Matthews, 2022; Kasman, 2004; Liu & Sullivan, 2021; Regan et al., 2019; Roman, 2011; Sawatsky et al., 2017; Weiss, 2024). Furthermore, environments that allow individuals to have active and direct personal involvement in a task such as patient care may also facilitate state curiosity within individuals (Dyche & Epstein, 2011; Friedman & Atkinson, 2020; Hidi & Renninger, 2006;

Kasman, 2004; Liu & Sullivan, 2021; Regan et al., 2022). Collaborative or group work on tasks may also provide for enhancement of curiosity due to its ability to provide exposure to the thoughts and opinions of others (Dyche & Epstein, 2011; Friedman & Atkinson, 2020; Regan et al., 2022; Roman, 2011). Additionally, stimuli that are surprising, novel, incongruous, demonstrate an increased intensity compared to other stimuli, or provide a connection between an individual's identity and the stimuli are likely to increase curiosity (Dyche & Epstein, 2011; Friedman & Atkinson, 2020; Hidi & Renninger, 2006). State curiosity may also be facilitated by others through question asking that triggers the awareness of a knowledge gap or direct encouragement of curiosity-related behaviors (Dyche & Epstein, 2011; Friedman & Atkinson, 2020; Pluck & Johnson, 2011; Roman, 2011; Sawatsky et al., 2017). Next, being provided with intentional opportunities for mindfulness and reflection may enhance curiosity as well (Auerbach et al., 2020; Dyche & Epstein, 2011; Hauer et al., 2018; Kasman, 2004; Regan et al., 2019; Sawatsky et al., 2017; Weiss, 2024). Finally, other additional factors that may facilitate curiosity include establishing relevancy of information or a task (Friedman & Atkinson, 2020; Hidi & Renninger, 2006; Weiss, 2024), using innovative technology (Hidi & Renninger, 2006; Roman, 2011), and/or having an available role model to observe that demonstrates curiosity within the domain (Dyche & Epstein, 2011; Gruppen et al., 2020; Kasman, 2004; Weiss, 2024).

In addition to the noted potential facilitators, authors have identified several barriers or aspects of the learning environment that may decrease curiosity. Several authors have identified a lack of time or a sense of urgency within the environment to be harmful to curiosity (Dyche & Epstein, 2011; Liu & Sullivan, 2021; Sawatsky et al., 2017). Others have reported that passive teaching and learning strategies as well as a learning culture that focuses on rote memorization or the achievement of a single "right" answer to be deleterious to curiosity (Dyche & Epstein, 2011;

Roman, 2011). Roman (2011) reported that certain aspects specific to a medical clinical learning environment such as its hierarchical nature, an expectation of full competence from the beginning of clinical training, and/or the requirements surrounding administrative tasks such as documentation may hinder curiosity.

Growth Mindset. The concept of growth mindset originated with the research of Dweck (1986). She proposed that individuals develop their own personal theories related to intelligence and that these theories orient them toward different types of goals. Dweck (1986) proposed two contrasting constructs that represent these theories: entity theory - a belief that intelligence is a fixed and static entity; and incremental theory – a belief that intelligence is malleable. Over the years, Dweck's original theory has developed, broadened, and taken on new terminology leading to the concept of incremental theory to currently be known as growth mindset (Dweck & Yeager, 2019).

Growth mindset is the belief that human capacities and qualities are not fixed but can be developed over time through personal effort, good strategies, and the support of others (Dweck, 2016; Dweck & Yeager, 2019). It is believed that this mindset then further influences the thoughts and behaviors of the individual. Mindset leads to mastery type goals (those focused on the development of competence and learning instead of those focused on proving one's ability to satisfy the judgments of others), an embracing of challenges and persistence when faced with obstacles, a view of effort being necessary for success, the use of critical feedback as an aid to improvement, and using the success of others as an inspiration instead of a competition (Dweck, 2016; Wolcott et al., 2021; Yeager & Dweck, 2012). The construct of growth mindset has grown to include domains and capacities outside of intelligence and it is now largely believed that an individual's growth mindset lies on a spectrum and may vary from one domain or context to the

next (Chan et al., 2022; Kyler & Moscicki, 2024). Wolcott and colleagues (2021) provide further evidence that even within a larger domain such as healthcare education, differences in mindset may exist for capacities within that domain such as clinical reasoning, communication, reflection, empathy, etc.

Cutrer and colleagues (2018) believe that growth mindset is one of the critical characteristics influencing engagement in problem-solving and SDL processes within the MAL framework. Within the MAL framework, growth mindset is conceptualized as the intrinsic belief that intelligence and the capacity for learning are malleable and something that can be developed through dedication and effort instead of being fixed traits (Friedman & Atkinson, 2020). Therefore, these authors specifically conceptualize growth mindset within the domains of intelligence and learning. These authors also report that growth mindset has been linked to skills and attitudes of the highly skilled MAL including the ability to embrace challenges, accept critical feedback, and invest in one's own learning. Furthermore, it is believed that a growth mindset can be promoted through targeted interventions and coaching (Cutrer et al., 2018; Friedman & Atkinson, 2020).

In fact, Dweck and Yeager (2019) have reported that a growth mindset is associated with increased challenge-seeking in learning and activities as well as persistence when facing obstacles in learning. They state that this challenge-seeking and persistence leads to deeper learning and thus a boost to the development of higher-level skills. Although not explicitly stated, these higher-order skills likely include problem-solving and SDL. Burnette and colleagues (2013) report that growth mindset had an increasing influence as the challenge of an activity increased and that growth mindset was associated with better self-regulation skills such as goal setting, goal operating, and goal monitoring during those activities. Ozer and Cankut (2025) also

reported that growth mindset was associated with improved problem-solving skills and increased confidence in problem-solving. The literature also supports an increase in persistence within problem-solving for those with a greater growth mindset, especially as it relates to problems that present a moderate level of challenge (Ackerman & Levontin, 2023; Shen et al., 2016). Finally, Royston and Reiter-Palmon (2017) reported an increase in both quality and originality of potential solutions to complex problems in those individuals who had a greater growth mindset. Therefore, it does appear that growth mindset may play an important role in engagement and success within processes such as problem-solving and SDL, especially in those that present moderate to high challenge.

In addition to its apparent link with higher-order skills, growth mindset appears to be modifiable and influenced by the learning environment. Dweck and Yeager (2019) summarized a variety of interventional studies that found that targeted interventions can increase an individual's growth mindset – particularly related to intelligence and learning. These interventions focused on providing praise for effort instead of praise for the person/intelligence, teaching about the concept of growth mindset directly, and providing appropriate responses to failure. However, they also acknowledge that aspects of the environment such as praise for effort with disregard for effectiveness, providing feedback without pathways for improvement, or providing minimal growth mindset messaging without further supportive practices may produce a "false growth mindset" that does not equate to the same behaviors that a true growth mindset does. Other authors have found that aspects of the environment such as the mindset of the instructor, school culture and leadership, and social interaction with peers will influence the mindset of an individual (Canning et al., 2019; Mesler et al., 2021; Seo et al., 2025; Zhang & He, 2024). Kroeper and colleagues (2022) provided evidence that an individual's perception of these

environmental aspects may be just as important as the realities of the environments themselves. Despite the totality of this evidence, Dweck and Yeager (2019) state that the influence of the learning environment on an individual's growth mindset is still an intriguing path of future research and hypothesize that other aspects such as the type of work/activities given by a teacher/employer, the type of feedback provided during successes and struggles, the opportunities provided to an individual for improvement, and policies related to performance evaluation may all play a role in shaping an individual's mindset.

Resilience. Resilience has been conceptualized and defined in many ways (Cassidy, 2015; Herrman et al., 2011; Sanderson & Brewer, 2017). It has been referred to as a positive adaptation or ability to maintain or regain mental health after experiencing adversity (Herrman et al., 2011) as well as the ability to bounce back from stressful and negative emotional experiences (Tugade & Fredrickson, 2004). Wood and colleagues (2024) refer to resilience as the dynamic ability to overcome stress, adversity, and challenges that threaten stability and a successful or positive adaptation to challenges and threats. Tugade and Fredrickson (2004) also discuss this adaptive quality of resilience, calling it a flexible adaptation to the changing demands of stressful experiences. Calo and colleagues (2022) define resilience as the dynamic capacity to overcome adversity, drawing on personal, social, and organizational resources to achieve personal growth and transformation. When discussed in an academic context, resilience has been considered an increased likelihood of academic success despite environmental adversities (Cassidy, 2015; Stoffel & Cain, 2018).

Despite the variations in the literature, a few authors have reported on common core concepts that exist across most definitions (Cassidy, 2015; Herrman et al., 2011; Sanderson & Brewer, 2017). Overall, resilience is considered to be an ability, capacity, or capability of an

individual (Sanderson & Brewer, 2017). However, it is also recognized that this ability, capacity, or capability is context or domain specific and may fluctuate based on not only personal and biological factors, but also environmental factors (Herrman et al., 2011). Next, resilience contains a component of flexibility and adaptability (Cassidy, 2015). The individual and environment integrate in a manner that allows the individual to be resourceful and innovative in responses to dynamic and changing demands (Cassidy, 2015). Sanderson and Brewer (2017) even described this component as a process of learning or problem-solving. Another common core concept is that these other qualities exist in relation to and in the context of an adversity, threat, trauma, or challenge (Cassidy, 2015; Sanderson & Brewer, 2017). Finally, the responses of the individual are seen as enabling and lead not only to an individual's return to a previous state, but also to a positively altered state – one where learning and growth has allowed the individual to be better equipped to handle similar experiences in the future (Cassidy, 2015; Sanderson & Brewer, 2017).

In addition to the variation in conceptualization of resilience, it is often also confused, used interchangeably, or directly connected to a similar construct known as grit. This is especially true in the health professions education literature (Calo et al., 2019; Calo et al., 2022; Calo et al., 2024; Cutrer et al., 2018; Sanderson & Brewer, 2017; Stoffel & Cain, 2018). Although related, grit has a distinct conceptualization in the literature compared to resilience. Grit is nearly uniformly described as a perseverance and passion toward long-term goals that leads to a sustained commitment toward completing a specific endeavor despite episodes of failure, setback, and/or adversity (Duckworth et al., 2007; Stoffel & Cain, 2018; Wood et al., 2024). Grit is seen as the characteristic of an individual that supports their ability to maintain both consistency of interest and perseverance of effort toward a desired goal (Duckworth &

Quinn, 2009). It therefore appears that grit is considered more explicit, focused on consistency and perseverance, and specific to a particular goal, while resilience is focused on adaptability to dynamic challenges, may or may not be related to specific goals, and grows over time (Wood et al, 2024). Stoffel and Cain (2018, p. 125) go so far as to state that resilience is an "inherent attribute" of grit in that the adaptability and flexibility of resilience allow for consistency and perseverance.

Within the MAL framework, Cutrer and colleagues (2018) conceptualize resilience as the capacity to adapt well and persist in the face of adversity, trauma, tragedy, threats, or significant sources of threat. They report that this capacity varies among individuals and is influenced by a variety of factors including genetics, development, cognition, psychosocial factors, and neurobiologics (Cutrer et al., 2018; Friedman & Atkinson, 2020). The authors state that they believe resilience plays a key role for highly skilled MALs by allowing them to persist and overcome contextual challenges that may limit their ability to learn and grow (Cutrer et al., 2018, Friedman & Atkinson, 2020). Furthermore, they believe that resilience can be enhanced in learners through interventions and coaching that force learners into a productive struggle (Cutrer et al., 2018; Friedman & Atkinson, 2020). Given this conceptualization, it appears that the MAL framework is using the term resilience to represent both resilience and grit as the authors describe both the adaptability and persistence components within the domains of problem-solving and SDL within healthcare professions.

Existing literature supports the link between both resilience and grit to constructs within the MAL process, such as problem-solving and SDL. Resilience has been shown to be correlated with SDL competency (Hwang & Kim, 2023; Khan & Bibi, 2025). Despite that connection, Calo and colleagues (2022) concluded that no correlation existed between resilience and the academic

success or clinical performance of PT students. However, they did report that grit was predictive of both academic success and clinical performance. Grit has additionally been linked to problem-solving ability both directly (Kalia et al., 2019; Kim & Jang, 2022; Ozer & Cankut, 2025) as well as through common correlates such as conscientiousness, neuroticism, and positive affect (Duckworth et al., 2007; Duckworth & Quinn, 2009; D'Zurilla et al., 2011; Hill et al., 2016; Singh & Jha, 2008). There is also evidence that the perseverance of effort component of grit may be more valuable than the consistency of interest component when predicting both academic performance (Wolters & Hussain, 2015) and problem-solving performance (Kalia et a., 2019). Furthermore, there is evidence that the link between grit and problem-solving performance may be mediated by other variables such as distress tolerance, self-directedness, self-control, or other constructs related to self-regulation (Duckworth & Gross, 2014; Kim & Jang, 2022; Ozer & Cankut, 2025; H. Wang et al., 2025).

In fact, self-regulation has been proposed as the mediator by which grit leads to both academic performance (Wolters & Hussain, 2015) and performance in ill-structured problem-solving (H. Wang et al., 2025). Duckworth and Gross (2014) proposed that grit and self-control were also linked through their relationship with goal setting and goal structure. Indeed, the perseverance of effort component of grit has been shown to be strongly associated with multiple aspects of self-regulation including regulation of value, self-efficacy, cognition, metacognition, motivation, time & study environment, and procrastination (Won et al., 2025; Wolters & Hussain, 2015). However, although higher grit has been shown to be associated with the lower adoption of performance-avoidance goals, it does not appear that the relationship between grit and self-regulation is mediated by achievement goals (Won et al., 2025) nor does it appear that

grit in and of itself is sufficient to predict self-regulation in processes such as ill-structured problem-solving (H. Wang et al., 2025).

Although grit was initially conceptualized as a trait characteristic, recent studies have shown that its measurement has demonstrated a clear domain specificity (Rost et al., 2024). This variability across domains, along with variability seen across age, culture, and educational level (Morell et al., 2021; Muenks et al., 2017), supports the fact that grit and/or its components may be amenable to influence from the learning environment. Herrman and colleagues (2011) also acknowledge that resilience is likely domain specific and is influenced by the contribution of environmental factors. The thought that resilience and grit are modifiable and are influenced by the learning environment is additionally supported by the proponents of the MAL framework as they state that they believe that resilience can be enhanced in learners through interventions and coaching that forces learners into a productive struggle (Cutrer et al., 2018; Friedman & Atkinson, 2020).

Research by F. Wang and colleagues (2025) supports this idea and the authors have proposed that environmental factors such as the use of active learning activities, the encouragement of question asking, the presentation of clear goals and standards, and access to peer support helped shape the resilience of students. In separate systematic reviews of grit and resilience in healthcare professions education, Calo and colleagues (2024) as well as Stoffel & Cain (2018) found that environmental factors and interventions led to positive changes in resilience and grit. These factors included interventions focused on providing learners with evidence and theory related to resilience and/or grit; teaching skills such as positive self-talk, mindfulness, breathing techniques, gratitude, and meditation; providing learners with time management strategies; training students in strategies for conflict management and resolution;

and sharing vicarious experiences – stories of other students overcoming adversity. According to the authors, these interventions are most effective when targeting students with low levels of resilience and grit (Calo et al., 2024). Other environmental factors, such as the transition from classroom to patient care; being provided opportunities to take personal responsibility; an environment allowing for safety in failure and the positive use of critical feedback and reflection; an environment supportive of self-care; an environment with access to mentorship; and an environment with available cultural, financial, and academic supports all positively influenced resilience and grit in students. Although more theoretical than empirical, Whitfield and Wilby (2021) also believe that environments that encourage the explicit formation of purpose and goals; provide opportunities for the development of physical endurance; encourage building of relational connections and support networks; and provide teaching of cognitive strategies such as reframing, positive self-talk, and mindfulness serve to enhance resilience and grit. However, Stoffel & Cain (2018) propose that environments and systems that encourage competitiveness, have poor organization and structure, and lack proactive preparation for known challenges may negatively influence the resilience and grit displayed by students. Such environments and interventions may be particularly important considering that approximately 13% to 25% of PT students have shown to have low levels of resilience and/or grit (Calo et al., 2019, 2022).

Despite the results of these studies and despite the near universal definition and conceptualization of grit in the literature, many authors within educational psychology have questioned the conceptualization of grit as a unique theoretical construct that provides benefit above and beyond existing and similar constructs (Crede et al., 2017; Morell et al., 2021; Muenks et al., 2017; Muenks et al., 2018; Ponnock et al., 2020; Steinmayr et al., 2018). Several authors have noted that grit, and especially its perseverance of effort component, has shown

strong association with other existing constructs of personality and motivation such as conscientiousness, expectancies for success, self-efficacy, task value, and constructs related to self-regulation. When the measurement of grit undergoes factor analysis, it does not distinguish itself as being a separate and unique construct (Crede et al., 2017; Morell et al., 2021; Muenks et al., 2017; Muenks et al., 2018; Ponnock et al., 2020; Steinmayr et al., 2018). Factor analysis of the construct of grit has also shown inconsistencies across different populations including age, culture, and educational level (Morell et al., 2021; Muenks et al., 2017). These studies show that although the perseverance of effort component of grit is strongly correlated with academic performance and achievement such as grades, other constructs such as self-efficacy, expectancies of success, task value, school engagement, personality, prior school grades, and variables related to self-regulation are superior predictors of success; the addition of grit has provided little to no increase in the explanatory power of these predictive models (Muenks et al., 2017; Muenks et al., 2018; Steinmayr et al., 2018). Morell and colleagues (2021) provide additional arguments against the unique conceptualization of grit citing: (1) a lack of clarity regarding terms such as “long term” and “passion” as well as challenges in creating measurements of such terms, (2) a lack of empirical evidence to support the fact that perseverance of effort and consistency of interest are both subconstructs of an overall grit construct, and (3) a lack of criterion validity for the consistency of interest component. Finally, other authors have raised concern that a large focus on grit may obscure or create justifications for systemic barriers and challenges faced by marginalized populations and thus allow for the continuance of harmful structural oppression within educational systems (Aliari, 2025; Liu et al., 2023).

Based on this evidence, the conceptualizations of resilience and grit as well as the role they play in being able to foster, promote, and sustain engagement in MAL processes remain

unclear. Despite this, the constructs continue to be used and studied within healthcare education (Calo et al., 2019, 2022, 2024; Cutrer et al., 2018; Sanderson & Brewer, 2017; Stoffel & Cain, 2018). Therefore, further research is needed to help determine whether these terms as conceptualized within the MAL framework should continue to be used or replaced with other constructs.

Motivation. Although debated, motivation within the context of education is often described as "the process in which goal-directed activity is instigated and sustained" (Schunk et al., 2014, p. 5). This generally aligns with the conceptualization of motivation within the MAL framework where motivation is defined as the general desire or willingness to engage in a behavior to achieve a desired goal (Friedman & Atkinson, 2020). This desire is required for learners to spend time, energy, and effort in the MAL process. It is seen as variable, context-dependent, and capable of being influenced by the learning environment (Cutrer et al., 2018; Friedman & Atkinson, 2020). Although the MAL framework lists motivation alongside the three additional characteristics of curiosity, growth mindset, and resilience, given the definition of the constructs and their conceptualization within the framework one could argue that all four of the critical MAL characteristics are really related to motivation. However, the MAL framework does not necessarily utilize an overarching theory of motivation to describe why an individual will initiate and sustain the MAL process. Koenka (2020a) proposes that five major theories of motivation have been predominant in the literature over the last 50 years. Of these, self-determination theory (SDT) and situated expectancy-value theory (SEVT) may be able to provide theoretical frameworks with which to consider motivation to engage in MAL processes such as problem-solving and SDL.

Self-Determination Theory (SDT). Although first proposed by Edward Deci and Richard Ryan (1985) as a broader theory of human development, motivation, and wellness, SDT has been recognized as a key theory of motivation within education and academics (Ryan & Deci, 2020). In fact, SDT is considered one of the five predominant theories of academic motivation that seeks to explain why students initiate and sustain various types of goal-directed academic behaviors (Koenka, 2020a).

SDT is considered a meta-theory that is based on an organismic dialectical perspective (Center for Self-Determination Theory, 2024; Ryan & Deci, 2020). An organismic perspective operates under the assumption that people are active organisms who have an inherent tendency toward psychological growth and the integration of new experiences into a coherent sense of self, thus predisposing a natural inclination and desire for learning, mastery, and connections with others (Center for Self-Determination Theory, 2024; Ryan & Deci, 2020). However, the dialectical perspective views that these inclinations and desires rely on a supportive interaction between the social context of one's experiences and the specific individual (Center for Self-Determination Theory, 2024; Ryan & Deci, 2020). In other words, an individual's environment and social context can work to either support or thwart an individual's natural motivations toward psychological growth such as learning. Finally, SDT is considered a meta-theory because it is comprised of six different mini theories (Center for Self-Determination, 2024). Each of the smaller theories provide evidential support and explanation that, "addresses one facet of motivation or personality functioning" included in the larger SDT (Center for Self-Determination, 2024).

From a broad overview, SDT attempts to distinguish between different types or orientations of motivation – specifically intrinsic motivation, extrinsic motivation, and

amotivation (Ryan & Deci, 2000). Extrinsic motivation is further divided into four sub-types: integration, identification, introjection, and external regulation (Ryan & Deci, 2000, 2020). These motivation types, which can be viewed in Appendix B, exist along a spectrum of internalization that can also be viewed as a spectrum of most thwarting to most supportive of an individual's psychological growth and wellness.

In the development of SDT, Ryan and Deci (2020) further posit three basic and fundamental psychological needs within individuals: autonomy, competence, and relatedness (Ryan & Deci, 2020). It is the ability of the social context and environment to meet these needs that will direct where an individual's motivation will lie on the spectrum of motivation types and thus provide either support or hinderance toward an individual's growth and their desire to initiate and sustain activities such as learning.

In SDT, autonomy is defined as the ability to self-determine or be the "perceived origin or source of one's own behavior" (Ryan & Deci, 2002, p. 8). Autonomy includes a sense of integrity in that an individual perceives that they are volitionally in control and can willingly act in a manner that is consistent with their own interests, values, preferences, and feelings in a self-endorsed and authentic way (Ryan & Deci, 2002, 2020; Vansteenkiste et al., 2020). This can be contrasted with a sense of pressure or conflict that may arise when one's actions, behaviors, thoughts, and/or feelings are perceived as being externally controlled through means such as rewards and/or punishments (Ryan & Deci, 2020; Vansteenkiste et al., 2020). When viewing Appendix B, autonomy thus aligns with either an internal or external perceived locus of causality in the sense that an individual may attribute their actions and motivations to either their own control or external sources (Ryan & Deci, 2000).

In SDT, competence is defined as a sense of effectiveness and mastery as it relates to one's experiences and interactions within their social environment as well as the opportunity to demonstrate and express those capacities (Ryan & Deci, 2002, 2020; Vansteenkiste et al., 2020). This, "leads people to seek challenges that are optimal for their capacities and to persistently attempt to maintain and enhance those skills and capacities through activity" (Ryan & Deci, 2002, p. 7). It is a sense of confidence in one's ability to capably, effectively, and successfully engage in a particular activity (Ryan & Deci, 2002; Vansteenkiste et al., 2020).

In SDT, relatedness is defined as a sense of belonging and connection with other individuals and within one's community (Ryan & Deci, 2002, 2020). It is the sense that one has a mutual, warm, and close emotional bond and attachment to another/others and that they reciprocate this feeling (Ryan & Deci, 2002; Vansteenkiste et al., 2020). Relatedness is not concerned with the obtainment of any particular outcome or formal relationship status but is instead focused on a "secure communion or unity" with others (Ryan & Deci, 2002, p. 7).

The term internalization is described as the active and natural process by which individuals take in a value, practice, behavior, feeling, attitude, belief, characteristic, or action from an external source such as their social group and integrate it with their own sense of self therefore adopting it as their own (American Psychological Association [APA], 2024; Ryan & Deci, 2000, 2002, 2017). The degree or extent to which this process is fully realized for any given action or behavior creates a continuum from more self-determined actions and behaviors that are independently and volitionally self-initiated to actions and behaviors that are perceived to be controlled by external sources (Ryan & Deci, 2000, 2017; Vansteenkiste et al., 2010). Thus, the term internalization is also used to describe the degree or extent to which a given action or behavior has gone through this process and where it lies on that spectrum (Ryan & Deci, 2002,

2017). In SDT, internalization is believed to be critical for successful socialization and personal wellness (Ryan & Deci, 2017; Vansteenkiste et al., 2010) and is highly dependent on an individual's perceived autonomy and relatedness within an experience (Center for Self-Determination Theory, 2024).

In SDT, motivation is seen as what moves or initiates people into action; what energizes and gives direction to their behaviors (Ryan & Deci, 2017). SDT concerns itself with not only the level or amount of motivation, but also the orientation or type of motivation (Ryan & Deci, 2000). Intrinsic motivation is one of these types and is defined as performing a behavior/action or engaging in an activity due to the inherent satisfactions of interest, enjoyment, and/or fun that come from it (APA, 2024; Ryan & Deci, 2000, 2002, 2017, 2020). Intrinsic motivation is seen as the natural and innate propensity of individuals to seek out and engage in novel activities and behaviors led by their own curiosity such as new adventures, new environments, and new perspectives as well as new challenges that are optimal for their given level of competence (Ryan & Deci, 2017; Vansteenkiste et al., 2010). Therefore, SDT views intrinsic motivation as the most ideal and desirable orientation or type of motivation and believes it to play a critical role in the growth, development, creativity, vitality, and well-being of individuals across their lifespan (Ryan & Deci, 2000, 2017).

In contrast to intrinsic motivation, extrinsic motivation within SDT is viewed as the initiation or maintenance of a behavior, action, or activity because it is important in satisfying an external consequence outside of the activity itself (APA, 2024; Ryan & Deci, 2000, 2002, 2020; Vansteenkiste et al., 2010). This external consequence can vary widely and includes things such as achieving social approval, obtaining an external reward, avoiding an external punishment, or attaining a valued outcome (Ryan & Deci, 2017). Due to the variety of external consequences as

well as different degrees of internalization, extrinsic motivation is seen as being heterogeneous based on the degree of autonomy or control perceived by an individual as it relates to the external consequences (Ryan & Deci, 2000, 2017, 2020; Vansteenkiste et al., 2010). In SDT, this leads to four subtypes of extrinsic motivation which can be visualized in Appendix B.

Integration, also known as integrated extrinsic motivation, is the first subtype of extrinsic motivation and represents an action, behavior, or activity that is initiated or maintained due to its full and complete alignment with the core values, beliefs, attitudes, and goals of an individual (Ryan & Deci, 2000, 2002, 2020). Integrated extrinsic motivation differs from intrinsic motivation in that the activity is not initiated due to the satisfaction and enjoyment in the activity itself, but in the fact that engaging in the activity or achieving the outcome of the activity will produce a consequence that the individual considers to be in full alignment with their sense of self (Ryan & Deci, 2000). Therefore, initiating or maintaining the activity is considered fully volitional and thus integrated extrinsic motivation is the most autonomous form of extrinsic motivation (Ryan & Deci, 2000, 2002, 2017, 2020). SDT views integrated extrinsic motivation to be the peak of internalization which has been achieved via self-examination, reflection, and self-awareness to fully bring a value, belief, attitude, goal, etc. into alignment with other aspects of oneself through a process of modification of the value, belief, attitude, goal, etc. or accommodation of previously existing ones (Ryan & Deci, 2000, 2002, 2017; Vansteenkiste et al., 2010). This allows for the full personal endorsement of the value, belief, attitude, goal, etc. and thus makes engaging in activities for the sake of their consequences toward that value, belief, attitude, goal, etc. to be fully authentic and volitional without any sense of conflict or pressure (Ryan & Deci, 2000, 2017; Vansteenkiste et al., 2010).

The second subtype of extrinsic motivation is identification. Identification, also known as identified extrinsic motivation, represents an action, behavior, or activity that is initiated or maintained due to the fact that engaging in the activity or achieving the outcome of the activity will produce a consequence that the individual believes to be personally important, significant, or valuable (Ryan & Deci, 2000, 2002, 2017; Vansteenkiste et al., 2010). This is a conscious and volitional personal endorsement of the action, behavior, or activity thus making it somewhat autonomous (Ryan & Deci, 2002, 2017, 2020; Vansteenkiste et al., 2010). However, identified extrinsic motivation differs from integrated extrinsic motivation in the fact that the individual has not fully engaged in a process of self-reflection to explore how the action, behavior, or activity may relate to other internalized values, beliefs, attitudes, goals, etc. (Ryan & Deci, 2017). Therefore, there can be a sense of compartmentalization in the fact that an individual may engage in a particular activity or exhibit a particular behavior/action for its alignment with one specific value, belief, attitude, goal, etc. without consideration for how it relates to other personally endorsed values, beliefs, attitudes, goals, etc. (Ryan & Deci, 2002, 2017). This creates a context of relatively high autonomy and low conflict until the individual engages in the process of integration (Ryan & Deci, 2002, 2017, 2020).

Introjection, also known as introjected extrinsic motivation, is the third subtype of extrinsic motivation. Introjection represents an action, behavior, or activity that is initiated or maintained due to its ability to enhance an individual's self-esteem or self-worth through the production of feelings such as pride or through the avoidance of negative and self-deprecating feelings such as guilt, shame, and anxiety (Ryan & Deci, 2000, 2002, 2017, 2020; Vansteenkiste et al., 2010). However, these feelings are often not solely based on just engagement in an activity, but on the outcome of the activity as well (Ryan & Deci, 2020). This creates an

internally demanding or controlling force that one “should” or “must” do something or achieve a particular result (Ryan & Deci, 2017; Vansteenkiste et al., 2010). Additionally, this internal force is often projected onto others creating a perception that others will socially accept or reject an individual based on their actions and behaviors, their engagement in a particular activity, or the outcome they achieve from a particular activity (Ryan & Deci, 2017). Therefore, introjected extrinsic motivation is considered to have a relative external perceived locus of causality (Ryan & Deci, 2000). Because of these factors, an individual who has large amounts of introjected motivation develops a sense of self that becomes continually dependent upon exhibiting certain actions/behaviors, engaging in certain activities, or achieving particular outcomes thus increasing energy demands, decreasing vitality, and decreasing overall wellness (Ryan & Deci, 2017).

The final subtype of extrinsic motivation is external regulation. External regulation, also known as externally regulated extrinsic motivation, represents an action, behavior, or activity that is initiated or maintained due to an external demand or socially constructed contingent reinforcement such as the obtainment of a potential reward or the avoidance of a punishment (Ryan & Deci, 2000, 2002, 2017, 2020; Vansteenkiste et al., 2010). This represents the least autonomous form of extrinsic motivation and is characterized by the engagement in an activity solely for the purpose of complying with the external demands (Ryan & Deci, 2002; Vansteenkiste et al., 2010). Therefore, it is considered to completely have an external perceived locus of causality (Ryan & Deci, 2000, 2002). Although externally regulated extrinsic motivation may utilize powerful contingencies, an activity will only be maintained as long as the external contingency is in place (in the absence of any internalization) (Ryan & Deci, 2017). Due to this lack of any sense of personal endorsement, Ryan and Deci (2017) state that the activity will typically be performed with the least amount of effort and least amount of attention to quality

possible while still operating within the contingency. Additionally, since there is no internalization, there is a concern that motivation will not transfer to other similar and meaningful activities (Ryan & Deci, 2017).

In addition to intrinsic and extrinsic motivation, SDT defines a third type of motivation (or lack thereof) known as amotivation. Amotivation is defined as the state of lacking any conscious or unconscious intention to engage in a particular activity (Ryan & Deci, 2000, 2002, 2017, 2020). It is this intentionality that divides amotivation from motivation, whether it be intrinsic or extrinsic (Ryan & Deci, 2017). The lack of intentionality in amotivation is thought to result from one of two sources. First, it may result from a perceived inability to attain a desirable outcome due to very low levels of competence or a perceived independence between the activity and a desired outcome (Ryan & Deci, 2000, 2002, 2017, 2020). Secondly, amotivation may result from an absence of interest or perceived value for the activity (Ryan & Deci, 2000, 2002, 2017, 2020). This absence of value or interest may result from previously existing and internalized values, beliefs, attitudes, and goals or from a lack of exposure to an activity or another like it (Ryan & Deci, 2017).

Situated Expectancy Value Theory (SEVT). In addition to the use of theoretical frameworks such as SDT to help explain motivation and the behaviors of choice, persistence, and performance that it produces (Eccles & Wigfield, 2002; Gopalan et al., 2017), SEVT may be another appropriate choice to boost the MAL framework. Eccles and Wigfield (2020) developed SEVT, to integrate various other motivational theories as well as to explain both short-term motivation and motivation that encompasses an individual's achievement-related choices over the long-term (Eccles & Wigfield, 2002, 2020). SEVT has been utilized in longitudinal studies more than other theories and has been applied successfully in the development of short-term

interventions (Anderman, 2020). It aligns with educational goals related to SDL in which we want to develop interventions related to the learning environment to enhance motivation for SDL that in turn influence the longitudinal outcomes of SDL. The primary premise of SEVT is that motivation may be predicted by a combination of an individual's expectations for success (ES) related to a given task and the relative value that the individual places on the task, also known as subjective task value (STV) (Eccles & Wigfield, 2020). These ES and STVs are developed through various social and cultural experiences of individuals and manifest in various hierarchical considerations of ESs and STVs to produce individual choice (Eccles & Wigfield, 2020).

Eccles and Wigfield (2020) define ES as an individual's beliefs about how well they will do on an upcoming task which will occur in either the immediate or long-term future (Wigfield & Eccles, 2000). Many authors have pointed out similarities and differences between the ES concept of SEVT and concepts within other theories of motivation (Anderman, 2020; Eccles & Wigfield, 2002, 2020; Hattie et al., 2020; Murphy & Alexander, 2000; Pintrich, 2000; Schunk, 2000; Schunk & DiBenedetto, 2020; Wigfield & Eccles, 2000). Pintrich (2000) notes that it is important to discuss these various concepts in the context of how they are defined, how they contribute to theoretical clarity, the level of consciousness individuals have of them to contribute to self-report, the interdependent or independent nature of the concepts, and the specificity and stability of the concepts over time and across various domains and contexts.

Eccles and Wigfield themselves propose that the most closely related construct to ES is self-efficacy (Eccles & Wigfield, 2020; Hattie et al., 2020; Wigfield & Eccles, 2000). The construct of self-efficacy was first proposed by Bandura (1977) and is defined as an individual's personal judgement of their capability to organize and execute courses of action that attain a

designated goal or type of performance (Eccles & Wigfield, 2002; Murphy & Alexander, 2000; Zimmerman, 2000). An individual's self-efficacy thus informs their efficacy expectations or their beliefs that they are capable of accomplishing a task at a particular level (Bandura, 1977; Eccles & Wigfield, 2002). Authors within the realm of self-efficacy consider it to be specific to a particular task or activity, sensitive to situational context, and focused on future potential performance capability (Anderman, 2020; Wigfield & Eccles, 2000; Zimmerman, 2000).

The development of an individual's self-efficacy and efficacy expectations likely depends on multiple factors. First, an individual's efficacy expectations have been associated with the anticipated level of difficulty or challenge presented by the designated goal or type of performance (Eccles & Wigfield, 2020; Zimmerman, 2000). Particularly as it relates to SDL, efficacy expectations may also relate to the anticipated level of support or guidance an individual will receive during the task (Sawatsky et al., 2017). More generalized constructs that may relate to the development of self-efficacy and efficacy expectations are locus of control (Rotter, 1966; Zimmerman, 2000) and mindset (Dweck, 2016).

Since self-efficacy represents a personal belief, it can be influenced by different experiences. Authors report four different types of experience that can influence or change an individual's self-efficacy and efficacy expectations (Schunk & DiBenedetto, 2020; Zimmerman, 2000). The first type is enactive or mastery experiences. These relate to the outcomes of previously lived experiences and are considered to be the most influential experiences on self-efficacy (Zimmerman, 2000). However, the relative importance of enactive or mastery experiences in shaping an individual's self-efficacy and efficacy expectations is likely largely dependent on the causal attributions that an individual has prescribed to those previous outcomes (Schunk & DiBenedetto, 2020; Weiner, 1985; Wigfield & Eccles, 2000). Due to the significant

influence that enactive or mastery experiences can have on self-efficacy and efficacy expectations, authors report that efficacy expectations will play a large role related to ES for tasks with which the individual is already familiar (Zimmerman, 2000). The second type of experience that is believed to influence self-efficacy and efficacy expectations is vicarious experiences. These experiences involve the observer's self-comparison to a model and the outcomes perceived to be achieved by that model (Zimmerman, 2000). The influences of these vicarious experiences on self-efficacy are maximized by models with which an individual believes they are most closely aligned (Zimmerman, 2000). The next category is social or verbal persuasion which involves persuasive verbal statements made by others (Schunk & DiBenedetto, 2020). The influence that social or verbal persuasion has on an individual is influenced by the individual's perception of the credibility of the person providing the persuasion (Zimmerman, 2000). Finally, physiological or emotional indices can influence self-efficacy and efficacy expectations. An individual may experience certain physiological indicators and then attribute these indicators to a particular physiologic state (e.g., fatigue) or emotion (e.g., anxiety). The interpretation of these indicators, states, or emotions as being positive or negative will then influence that individual's self-efficacy (Schunk & DiBenedetto, 2020; Zimmerman, 2000).

The construct of self-efficacy can also be understood in terms of how investigators have focused on measuring it. Self-efficacy is typically measured in a very specific manner that may include either domain (e.g., self-efficacy for mathematics) or task (e.g., self-efficacy for multiplication) (Zimmerman, 2000). However, it is believed that the ability for self-efficacy to predict choice, persistence, and performance is increased with increased specificity of measurement and thus measuring at the task level is preferred (Zimmerman, 2000). Additionally, measures of self-efficacy have focused on self-referent items in which an individual is asked to

rate their belief in relation to the perceived difficulty of the task, as opposed to a comparative manner where individuals are asked to rate how they might compare to others (Anderman, 2020; Zimmerman, 2000).

Another construct discussed in the literature to be related to the construct of ES is ability belief, also known as self-concept (Anderman, 2020; Eccles & Wigfield, 2020; Wigfield & Eccles, 2000; Zimmerman, 2000). Self-concept has been defined as both an individual's perception of their current competence at a given activity (Wigfield & Eccles, 2000) and as an individual's global perception of themselves and their self-esteem reactions to that self-perception (Zimmerman, 2000). In contrast to the very task-specific construct of self-efficacy, self-concept represents a more generalized self-evaluation of current overall ability and is more present-focused than dependent on a consideration of future performance (Wigfield & Eccles, 2000; Zimmerman, 2000). An individual's self-concept relies more heavily on their beliefs related to past experiences than self-efficacy does and researchers have found that it is not as consistently related to an individual's choice and performance when compared to self-efficacy (Zimmerman, 2000). As a result, theorists have created a hierarchical taxonomy of self-concept that moves from the more global construct of self-concept to a more specific academic self-concept and finally to very domain-specific academic self-concepts (e.g., mathematics self-concept) (Zimmerman, 2000). As such, researchers have found that domain-specific self-concepts are highly correlated with self-efficacy and efficacy expectations (Zimmerman, 2000). However, several authors support their continued separation as two distinct constructs (Eccles & Wigfield, 2020; Zimmerman, 2000). This may be especially necessary in cases where a future task is very unfamiliar to an individual thus causing them to rely more on their domain-specific self-concept compared to self-efficacy when generating their ES (Zimmerman, 2000).

In addition to self-efficacy and self-concept, several other additional constructs within the literature have connections with the ES construct of SEVT. Self-schema is a construct that is defined as personal knowledge about oneself that represents individual differences in the way one perceives and responds to events (Murphy & Alexander, 2000). This is a construct similar to self-concept in the fact that it is a more global self-belief, but is considered to be more dynamic and situational in its application than self-concept (Murphy & Alexander, 2000). In other words, it appears to be a construct that attempts to blend the concepts of self-efficacy and self-concept: a generalized belief that applies within individualized situational contexts. Self-determination theory describes three innate, essential, and universal psychological needs: competence (need for individuals to understand how to attain various external or internal outcomes and be efficacious in performing the appropriate actions to achieve those outcomes), relatedness (need to develop secure and satisfying connections with others in one's social milieu), and autonomy (need to be self-initiating and self-regulating in one's own actions) (Deci et al., 1991; Ryan & Deci, 2000). An individual will determine if a particular task will help them successfully develop and maintain these needs which then influences their ES and motivation.

Finally, in addition to efficacy expectations, Bandura (1977) describes the construct of outcome expectations. This is an individual's belief that a given action will result in a given outcome (Bandura, 1977). This belief is based on an individual's prior experiences (Schunk & DiBenedetto, 2020), but authors report that it plays a much smaller role in performance and choice than efficacy expectations do (Wigfield & Eccles, 2000; Zimmerman, 2000). Despite the apparent unequal weighting in favor of efficacy expectations, outcome expectations still likely have a role in the performance and choice of some individuals and in some contexts. For instance, Schunk and DiBenedetto (2020) state, "efficacious students may display low

motivational outcomes if they believe that they can perform well but that their efforts will not be properly recognized (e.g., due to an unresponsive environment)" (p. 4).

Although the exact interrelationships between the above constructs and ES within SEVT remains unclear, there is believed to be both some overlap and some distinct differences (Pintrich, 2000). Eccles and Wigfield have postulated that their construct of ES within SEVT is most consistent with the efficacy expectations of Bandura (1977; Eccles & Wigfield, 2002, 2020; Wigfield & Eccles, 2000). However, they state that their attempts to measure ES have often included both self-referent and comparative means of measurement and have also included measures of both domain-specific self-efficacy and domain-specific self-concept (Wigfield & Eccles, 2000). Additionally, Eccles and Wigfield (2020) state that empirically, the constructs related to efficacy, domain-specific self-concept, and task difficulty often display collinearity and thus are often reduced to only efficacy measures. In spite of this empirical phenomenon, the authors believe in the theoretical importance of distinctions between the constructs and thus recommend continued use, exploration, and development of the constructs as separate entities (Eccles & Wigfield, 2020).

In addition to ES, SEVT proposes that STV will influence an individual's choices, performance, and persistence. Eccles (2005) states that STV is the "quality of a task that contributes to the increasing or decreasing probability that an individual will select it" (p. 109). In other words, it is a characteristic of the task that represents the reason(s) an individual will engage in the activity or not. This STV is subjective because a specific task can be valued differently by different people (Eccles & Wigfield, 2020). For instance, the characteristics of a specific task may be appealing to some individuals and those same characteristics unappealing to another. In SEVT, this STV is subdivided into four different components: attainment value,

utility value, intrinsic or interest value, and cost (Eccles, 2005; Eccles & Wigfield, 2002, 2020; Wigfield & Eccles, 1992, 2000).

Attainment value is defined as the relative personal or identity-based importance of doing well on a given task (Eccles, 2005; Eccles & Wigfield, 2020; Wigfield & Eccles, 1992, 2000). In other words, it is the extent to which a task is consistent with one's own self-image and how good the fit is between the task and an individual's core self-schema or identity (Eccles, 2005; Wigfield & Eccles, 1992). Gaspard et al. (2015) subsequently proposed a further subdivision of attainment value into (1) importance of achievement and (2) personal importance. Importance of achievement represents how important it is to an individual's identity to meet a specific goal (i.e. For me, being good at math is very important) while personal importance represents the extent to which the individual ties that goal to their identity (i.e. Thinking mathematically is an important part of who I am) (Gaspard et al., 2015, 2017). However, Gaspard and colleagues (2017) state that further research is required to make sure that these subconstructs can be generalized across various age groups and academic domains outside of their initial studies. Eccles (2005) asserts that the attainment value component of STV is related to the psychological needs of autonomy, relatedness, and competence of SDT in that the importance assigned to an activity by an individual is related to the positive or negative influences it will have on these needs. Eccles (2005) also proposes two additional psychological needs that may contribute to an individual's determination of importance: (1) the need to feel that what one does matters in a fundamentally important way to one's social group and (2) the need to feel respected and valued by one's social group. In spite of these various nuances when it comes to attainment value, Eccles and Wigfield (2020) report that most measures to date have only focused on an individuals perceived personal

importance and that further measures should be developed to consider the differentiation in the importance of achievement within competing task options.

Utility value is defined as the extent to which a task fits into an individual's immediate and future plans (Eccles, 2005; Eccles & Wigfield, 2020; Wigfield & Eccles, 1992, 2000). Similar to attainment value, it is possible that utility value has further subconstructs based on the life domain in which the plan resides such as utility for daily life, utility for job, utility for school, and social utility (Gaspard et al., 2015, 2017). Because the construct of utility value in SEVT deals with both immediate and future plans, it has overlap with several other similar constructs such as extrinsic motivation and goal theory (Eccles, 2005; Eccles & Wigfield, 2002, 2020; Wigfield & Eccles, 2000). Utility value places meaning on a task based on its ability to provide a "means to an end" instead of being seen as the "end" or goal in and of itself. This is similar to the concept of extrinsic motivation as proposed by Deci and colleagues (1991) in SDT. Therefore, utility value can be seen not only as the ability of a task to contribute to major future life plans such as college major, but also as a means to achieve a more immediate reward such as praise or financial gain. Due to this apparent spectrum that exists from more immediate, temporary goals to more future-based, core goals, utility value represents a similar spectrum to that proposed in SDT of extrinsic to intrinsic motivation (Deci et al., 1991; Eccles & Wigfield, 2020). Additionally, goals that are more deeply rooted in an individual's core identity will lead to an overlap as it relates to the attainment value, utility value, and intrinsic value an individual places on a task (Eccles & Wigfield, 2020). However, it appears to be unknown as to whether this overlap has a simple additive effect when it comes to STV or if it could potentially lead to more multiplicative or exponential effects on an individual's STV determinations.

In addition to the overlap with SDT, utility value also overlaps with aspects of goal theories. The "immediate and future plans" as discussed in relation to utility value are consistent with personal goals set by individuals. These goals can be divided into two types: (1) ego or performance goals and (2) task, learning, or mastery goals (Eccles & Wigfield, 2002). Ego/Performance goals are goals that attempt to either maximize favorable evaluations of their competence by others (known as performance approach goals) or minimize negative evaluations of one's competence by others (known as performance avoidance goals) (Eccles & Wigfield, 2002). These goals are often based on comparing oneself to others and attempting to outperform others (Eccles & Wigfield, 2002). Task/Learning/Mastery goals are goals that attempt to maximize an individual's ability to perform a task and/or increase competence and are self-focused on improving oneself through individual progress (Eccles & Wigfield, 2002). It may also be of note that although goal theory focuses on specific goals set by individuals, individuals may base the type of goals they select on a more stable individual characteristic such as the fixed or growth mindset proposed by Dweck (2016). Goal-setting relates to utility value because individuals who have set performance goals may place more value on tasks in which they know they will be successful and more competent when compared to others while individuals who have set mastery goals may place more value on tasks that are challenging and will lead to greater personal growth (Eccles & Wigfield, 2002).

Another category of STV in SEVT is intrinsic or interest value. Intrinsic value is defined as the enjoyment one expects to gain from doing a task (Eccles & Wigfield, 2020; Wigfield & Eccles, 1992, 2000). This value is related to several other constructs within the motivation literature such as intrinsic motivation, interest, and flow (Eccles, 2005; Eccles & Wigfield, 2002, 2020; Wigfield & Eccles, 2000). As opposed to the more task-specific and situational intrinsic

value, intrinsic motivation is viewed as a more stable individual characteristic that focuses on ultimate explanations of behavior (Deci et al., 1991; Eccles & Wigfield, 2002). Intrinsic motivation is concerned with the origin of the task decision that lies within the individual themselves while intrinsic value focuses on the contribution that the task itself brings to the decision (Eccles & Wigfield, 2020). In spite of these differences within the constructs, theories of intrinsic motivation can help explain why some individuals have a preference for difficult or challenging tasks, strive for competence and mastery, and are driven by curiosity and interest (Eccles & Wigfield, 2002). These qualities of an intrinsically motivated individual are analogous to those discussed earlier such as growth mindset that lead individuals to develop mastery goals and value tasks that align with their internal drives.

In addition to intrinsic motivation, intrinsic value is closely related to theories of interest (Eccles, 2005; Eccles & Wigfield, 2002, 2020; Hidi & Renninger, 2006). Interest is another construct that can be further broken into two subcategories. The first is individual or personal interest. It is a relatively stable individual evaluative orientation toward certain domains that relates to an enduring predisposition to re-engage with a domain or task (Eccles, 2005; Eccles & Wigfield, 2002; Hidi & Renninger, 2006). Similar to other constructs previously mentioned such as self-concept, growth mindset, and intrinsic motivation, personal interest represents a more stable individual characteristic and therefore is not focused on the quality of a task and thus not as closely aligned with the STV construct of intrinsic value (Eccles & Wigfield, 2002, 2020). In contrast, intrinsic value is more closely aligned with the second subcategory of interest known as situational interest. Situational interest is an emotional state or feeling that is aroused in an individual by a specific feature of an activity or task (Eccles, 2005; Eccles & Wigfield, 2002). This emotional state is thought to bring about increased cognitive effort, focus, and attention

through an interaction of a stimulus and an individual (Hidi & Baird, 1986). This type of interest is more task focused and relates to qualities of a task that "trigger" this cognitive and emotional state (Eccles, 2005; Eccles & Wigfield, 2002; Hidi & Baird, 1986; Hidi & Renninger, 2006). These triggers may include personal relevance, familiarity, novelty, comprehensibility, intensity, surprising or shocking information, and social interaction (Eccles, 2005; Hidi & Baird, 1986; Hidi & Renninger, 2006). Therefore, these triggers of situational interest are closely related to the construct of intrinsic value in SEVT in the fact that they are qualities or characteristics of a task that give the task a particular level of perceived enjoyment.

Finally, intrinsic value is closely related to the concept of flow (Eccles, 2005; Eccles & Wigfield, 2002; Nakamura & Csikszentmihalyi, 2014). Flow is an immediate subjective experience related to an individual's engagement in a particular task or activity that creates a holistic feeling of immersion in the activity, a merging of action and awareness, a focus of attention on a limited stimulus field, a lack of self-consciousness, and a feeling of being in complete control of one's actions and environment (Eccles & Wigfield, 2002; Nakamura & Csikszentmihalyi, 2014). This experience is most consistently produced when high levels of ability within an individual are matched with high levels of challenge in the task or activity (Eccles & Wigfield, 2002; Nakamura & Csikszentmihalyi, 2014). The experience of flow may serve as an internalized reward for individuals that leads to reinforcement of increasing competence and thus the likelihood that a task will produce a flow experience may weigh in to an individual's intrinsic value of the task (Eccles & Wigfield, 2002).

Similar to attainment value and utility value, Eccles and Wigfield (2020) state the need to continue to explore and clarify the concept of intrinsic value. Particularly, they question how much influence that situational interest has on intrinsic value and how much of intrinsic value is

related to a perceived fit between a task and an individual. Additionally, they state that most current attempts to measure intrinsic value have focused on an individual's level and depth of engagement in an activity, how much an individual wants to do an activity, and whether an individual engages in an activity independently. These measures more closely align with intrinsic motivation and may not appropriately capture a true measure of intrinsic value.

The final component of STV is cost. Cost is defined according to three subcategories. Effort cost is defined as the amount of perceived effort it will take to accomplish a task or activity and the worth in doing so (Eccles & Wigfield, 2020; Wigfield & Eccles, 2000). Opportunity cost is the perception of how a decision to engage in one activity will limit access to do other activities of value (Eccles, 2005; Eccles & Wigfield, 2020; Wigfield & Eccles, 2000). Finally, emotional cost is defined as the perceived emotional and psychological costs of pursuing a task (Eccles & Wigfield, 2020; Wigfield & Eccles, 2000). This manifests itself as either an anticipated level of anxiety, stress, or other negative emotion perceived to be associated with the task or as the emotional or social cost of failing at the task or activity (Eccles, 2005; Eccles & Wigfield, 2020).

Cost is included as a category within SEVT because the developers of the theory view STV as a net derived value that results from an individual's considerations of both the benefits and costs of a task or activity in comparison to that same net value of other task or activity options (Eccles & Wigfield, 2020). This has led most researchers to attempt to measure STV by considering task value in a positive sense and task cost in a negative sense to obtain this net value (Eccles & Wigfield, 2020). Therefore, most measures have used only positively oriented Likert scales of value and cost. Eccles and Wigfield (2020) calls this practice into question and states that both task value and task cost may exist along a continuum from a negative to positive

perception. Additionally, most current measures do not take into account the relative and comparative aspects of STV and only attempt to measure STV via qualities of a single task (Eccles & Wigfield, 2020). Finally, most literature to this point has viewed the four components of STV to be of equal weight to all individuals. This is unlikely and it is quite possible that the weighting of each component is different for different individuals, and this weighting may change across different contexts or situations (Eccles & Wigfield, 2020).

Enhancing the MAL Environment & Characteristics Components

In addition to the incorporation of the concept of the trigger into the MAL process component, the ways in which SDL literature has viewed the components of environment and personal characteristics may also be valuable to help expound upon the MAL framework. Although the MAL framework includes components such as individual characteristics, the learning environment, and coaching, the conceptual model presented as the MAL framework appears to oversimplify the complex nature and interactions of these influences and potentially provides for exclusion of meaningful concepts. Combining the components of the MAL framework with Sawatsky and colleagues' (2017) model of SDL may provide an improved view from which to understand the influences and relationships of the learner and the context on the learning process (Appendix C). For example, the MAL framework discusses key cognitive skills such as critical thinking and reflection. This contrasts with the broader knowledge network described by Sawatsky and colleagues (2017) which not only includes cognitive skills, but other existing schemas such as those related to content knowledge. Furthermore, the individual characteristics included in the MAL framework appear to entirely revolve around aspects of motivation. However, SDL literature describes other individual characteristics such as age, sex, race, ethnicity, educational level, personality, genetics, etc. that may influence SDL and MAL

processes. These additional aspects of the knowledge network and individual characteristics should not be excluded from a framework such as the MAL as there is evidence that supports their potential influence on the SDL process (Brockett, 1985; Hutto, 2009; Kirwan et al., 2010; Kirwan et al., 2014; Lounsbury et al., 2009; Major et al., 2006).

Viewing the MAL framework through the lens of SDT, a learner will be most likely to engage in and sustain the learning process when they have either intrinsic motivation or integrated extrinsic motivation. An individual develops this type of motivation through the process of internalization based on their past experiences. The MAL framework presents a unique perspective when discussed in terms of SDT as the individual may have an intrinsic or integrated motivation for the activity of learning itself or it may be related to the specific context or situation a potential learner encounters. This is supported by evidence that suggests that individuals highly-skilled in MAL/SDL are primarily motivated by an enjoyment of learning itself, the need to affirm their own self-concept or beliefs, interest in a specific topic, to develop a specific professional identity, and as a sense of responsibility to their patients (Hagan & Tovin, 2025; Loeng, 2020; McCartney et al., 2016; Regan et al., 2019, 2022). Additionally, viewing the MAL framework in this manner emphasizes the role that an individual's past experiences and their learning environment may play in either enhancing or diminishing motivation for future SDL.

Other evidence ties the motivation to engage in the MAL process to an individual's sense of autonomy, competence, and relatedness. It appears that an individual's sense of competence related to both the content topic as well as the skills and process of SDL will influence an individual's motivation. This is supported by evidence that reports prior knowledge of a topic, confidence in SDL abilities, and previous successes or failures with SDL experiences all relate to

an individual's likelihood of engaging in the SDL process (Kasworm, 1983; Regan et al., 2019). Factors that align with an autonomy-supportive environment have also been linked to MAL including the ability to take on personal ownership of patient care decisions, perceived psychological safety, and the lack of barriers such as time constraints or competing obligations (Cutrer et al., 2018; Regan et al., 2019; Sawatsky et al., 2017). Finally, the SDT concept of relatedness can explain motivational factors related to MAL such as the creation and utilization of learning communities of practice, emotional connections to patients, positive guidance and coaching, as well as the teaching of others (Cutrer et al., 2018; Regan et al., 2019, 2022; Sawatsky et al., 2017). The sense of autonomy, competence, and relatedness may vary between different types of learning environments and content topics, thus creating a more dynamic and situated perspective of motivation than described in the original MAL framework.

Summary

As seen in the previous review and underscored in the SDT and SEVT theories, a preponderance of evidence supports a complex interaction between the person, the process, and the context as proposed in both the MAL framework and SDL theory. For example, H. Wang and colleagues (2025) found that no single condition could predict high or low SRL within the context of an ill-structured problem-solving activity. However, several different combinations of variables such as gender, task value, creativity, goal setting, grit, and self-efficacy were able to explain high levels of SRL while a different combination of factors predicted low levels of SRL. Although it is clear from the literature that the influence of the environments and characteristics of the learner are domain-specific, it becomes less clear as to the domain of interest (SDL, flexible problem-solving, PT content, etc.) when using the lens of the MAL framework. To add additional complexity, the influence of the learning environment on the characteristics of learners

may depend as much on the individual perceptions of the environment as determined by each learner as it does on any overarching reality of the environment (Kroeper et al., 2022). Therefore, this study looked to determine how PT students who experienced different learning environments (classroom and clinical) perceived that those environments influenced characteristics and factors related to the MAL framework and how those perceptions related to other variables such as the measurement of those characteristics and the perceptions of others within those learning environments (academic faculty and clinical instructors). Thus, the study was guided by the following five research questions:

1. How do current PT students in the program perceive that the didactic classroom learning environment, the clinical education learning environment, and the transition between learning environments are influencing their curiosity, motivation, resilience, and growth mindset?
2. To what extent are current PT students in the program displaying behaviors associated with the MAL during their clinical education experiences?
3. How do measures of the MAL characteristics of current PT students in the program fluctuate across the transitions between didactic classroom learning environments and clinical education learning environments?
4. How do academic faculty and clinical instructors perceive that the learning environment they oversee is influencing the MAL characteristics of current students in the PT program?
5. To what extent do the perceptions of current PT students in the program regarding the influence of the learning environments on their MAL characteristics align with

quantitative measures of those characteristics and the perceptions of faculty who contribute to those learning environments?

Chapter 3: Methodology

Overview

Dawadi and colleagues (2021) report that a mixed-methods design should be considered when studying a complex phenomenon. They state that using a mixed-method design helps to expand a study by allowing for increases in both dept and breadth of information. Additionally, they report that a mixed-methods approach can provide a more holistic and complete picture of a phenomenon by capturing complimentary and divergent views. Finally, a mixed-method design may be used to provide triangulation of data and thus increase the validity of study results (Dawadi et al., 2021).

This study sought to explore the influence of different learning environments on various motivational characteristics in PT students. As stated in Chapter 2, this interaction is complex and is dependent upon individualized perspectives. The study also sought to explore this influence not only within a single context but across two different contexts and the transitions between them. Therefore, it was desirable to consider what complimentary and divergent views may exist between the various stakeholders as well as to triangulate those perspectives with more direct measures of the students' characteristics.

To provide this holistic view of a complex interaction between two different learning environments and individual characteristics of students, this study utilized a pragmatic approach through a convergent parallel mixed methods design (Dawadi et al., 2021; Fetters et al., 2013; Sharma et al., 2023). Both qualitative and quantitative data were collected to help answer the research questions and collectively create a deeper understanding of how the learning environments associated with the PT program were influencing the MAL characteristics of current learners within the program. Investigators collected qualitative and quantitative data

simultaneously from May 2025 through September 2025 and all data analyses occurred following completion of data collection.

Setting and Participants

Investigators recruited students, academic faculty, and clinical instructors associated with the PT program. This specific PT program selects students from an applicant pool of individuals who have obtained a previous undergraduate or graduate degree. Selected students begin the program in June of the year they are admitted and matriculate through the program as a cohort. Each cohort contains approximately 70 to 80 students. The program uses distance education technology to conduct a single program across two campuses with approximately 60% of the students attending one campus and 40% attending the other. The educational program involves a curriculum that extends across three continuous years, and students advance in a lockstep fashion. Students attend didactic classroom courses from June of their admitted year through June of the following year. Following this time, students complete a clinical education experience, which is a real-world, hands-on apprenticeship, for 6 weeks from June through July. Students return to didactic classroom courses from August of their second year through June of the following year. Again, at that time, students progress through an 8-week clinical education experience. Finally, students return to didactic classroom work for a 6-week period beginning in August and ending in October prior to progressing to two back-to-back 10-week clinical education experiences that occur from October until April of their graduation year.

Instruction within this curriculum is primarily provided by two different types of faculty. Didactic classroom courses are conducted by academic faculty. These faculty are direct employees of the university and have assigned full time equivalents (FTE) within the areas of teaching, research, and service. The program involved with this study currently employees 11

academic faculty (including the investigator) with 7 residing on one campus and 4 on the other. This group of faculty has the responsibility of curricular development and assessment and thus plays a large role in the creation of learning environments at the classroom and programmatic levels.

Clinical education experiences are provided by clinical instructors. These instructors are practicing PT providers who volunteer with the program to provide non-paid mentorship and real-world patient care opportunities for students during their clinical experiences. Students are typically assigned to a clinical instructor in a one-to-one fashion. Clinical instructors have a large role in shaping the clinical learning environment by overseeing the patient care experiences of the student and providing the student with feedback and by providing the academic faculty with assessments of the student's progress toward meeting standards of the profession. Academic faculty maintain the responsibility of ensuring the quality of these clinical education experiences and their ability to align with the program curriculum and goals.

Recruitment and Enrollment

This study recruited three groups of human subjects: students, academic faculty, and clinical instructors. As such, investigators applied for and received Institutional Review Board approval prior to beginning any study recruitment, enrollment, or data collection procedures.

Students

Investigators recruited students at in-person clinical orientation meetings to participate in two different components of data collection: quantitative self-report surveys of MAL characteristics and a series of focus group interviews led by a faculty member not directly associated with the physical therapy program who had experience with facilitating focus groups and conducting qualitative research. Due to the desire for the study to provide specific program

information and to ensure data was collected from students experiencing different learning environments, investigators used purposeful sampling of students. Investigators recruited from a pool of all PT students within the Class of 2026 and Class of 2027 cohorts during the summer 2025 and early fall 2025 semesters. This pool represented all PT students in the program who were completing either their first or second year of didactic classroom time and were involved with clinical education experiences during the months of June through August 2025.

Prior to attending their clinical education experiences and as a part of routine program practices, academic faculty lead a group meeting for each student cohort to discuss expectations and assessment of their clinical education experiences. Investigators presented the study and recruited students during these scheduled clinical education meetings which occurred in early June 2025. Additionally, investigators sent e-mails to the entire pool of possible student participants to recruit any students who wished to participate but were unable to attend the clinical education meeting. At the time of recruitment, investigators provided students with information about the study, answered questions regarding the study, and provided the students with a digital link to the initial data collection survey. Students agreeing to volunteer for the study were then able to click on the digital link to provide signed informed consent and begin the first quantitative survey if desired. Within the informed consent form attached to the survey, student participants were able to indicate whether or not they wished to be considered for focus group interviews (n=23; 2026 Cohort: n=14; 2027 Cohort n=9) as well as whether or not they would agree to allow the research team to access selected educational records (n=66; 2026 Cohort: n=40; 2027 Cohort n=26). Per IRB requirements, student participants who reported that they were willing to allow investigators access to their educational records (n=66) received a separate consent document granting them the ability to designate which selected educational

records investigators were allowed to access. After data collection finished, a program staff member gave access to educational records for the participants had given this additional consent (n=18 gave consent). Educational records were deidentified and included in the quantitative spreadsheet.

To link student qualitative and quantitative data through the process of connecting and to assist with integration of the different data types, students were selected and contacted to participate in focus group interviews via e-mail from among those students who had completed the initial quantitative survey and had agreed to participate in focus group interviews via the initial informed consent (Fetters et al., 2013). The faculty member facilitating focus groups attempted to create a focus group of five to seven participants for each student cohort. For timepoint #1, those agreeing were given a list of available times from the facilitator, who then chose to schedule the focus groups at a time when the most participants could attend. Subsequent focus groups were scheduled collaboratively with those who participated in the first focus group.

Academic Faculty

Investigators recruited academic faculty to participate in a single focus group interview. Due to the small number of total academic faculty and the desire to seek multiple perspectives, all 10 of the academic faculty within the PT program outside the principle investigator were recruited to participate in a single focus group via e-mail. The e-mail contained a digital link to provide signed informed consent and to collect demographic information. This demographic information included their number of years teaching, number of years at the university, and number of courses taught to the Class of 2026 and Class of 2027 cohorts. Given that one of the investigators of the study was academic faculty, they were excluded from study participation.

Clinical Instructors

Investigators recruited clinical instructors to participate in a single focus group interview led by one of the investigators. To link data, investigators recruited from a pool of PTs serving as clinical instructors for students in the Class of 2026 or Class of 2027 cohort during their June-August 2025 clinical education experiences. Investigators sent e-mails to the entire pool of possible participants in September 2025 to present the study and recruit clinical instructors to participate in a focus group interview. At the time of recruitment, investigators provided clinical instructors with information about the study, answered questions regarding the study, and provided the clinical instructors with a digital link. Clinical instructors agreeing to volunteer for the study were then able to click on the digital link to provide informed consent.

Data Collection Procedures

Students

Surveys. Following recruitment and enrollment, investigators provided student participants with a digital link to complete the initial quantitative survey via Qualtrics. This initial survey included demographic questions that include age, sex, race, ethnicity, previous education, cohort, and personality profile. Following the demographic questions (Appendix D), the survey included questions from existing measurement tools of MAL characteristics such as curiosity, motivation, resilience, grit, and mindset via Likert-style questions (Appendix E).

Investigators included the following existing tools and sub-scales in this survey: a modified version of the Social and Intellectual sub-scales of the Medical Curiosity Scale (Bugaj et al., 2023), the 3-item Implicit Theories of Intelligence Scale (Rammstedt et al., 2024), the Brief Resilience Scale (Smith et al., 2008), the Consistency of Interest and Perseverance of Effort sub-scales of the Short Grit (Grit-S) scale (Duckworth & Quinn, 2009), and modified versions of the Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Control of Learning

Beliefs, and Self-Efficacy for Learning and Performance sub-scales from the Motivated Strategies for Learning Questionnaire (MSLQ) (Morais et al., 2025). Investigators chose these questions to capture all information related to the MAL characteristics as they are conceptually described within the MAL framework (Friedman & Atkinson, 2020).

The Social (SMC) & Intellectual (IMC) subscales of the Medical Curiosity Scale were developed by Bugaj et al. (2023). A study using a sample of 305 medical students demonstrated good internal consistency of the scales with Cronbach's alpha equal to 0.866 for the SMC and 0.796 for the IMC. Additionally, factor loadings for each item ranged between 0.68 and 0.78 for the SMC and 0.66 and 0.79 for the IMC. The scales also showed high convergent and discriminant validity when correlations with other scales were considered. The sample of medical school students in the study demonstrated a mean score of 5.34 for the IMC and 5.54 for the SMC.

Rammstedt et al. (2024) developed the 3-item Implicit Theories of Intelligence scale. The authors tested the scale in a samples of both 365 adults as well as 362 adolescents. The scale showed good reliability with Cronbach's alpha equal to 0.83 in the adolescent sample and 0.91 in the adult sample. Test-retest reliability was 0.67 in adolescents and 0.45 in adults. However, the authors note that this is a conservative measure of test-retest given that it included the possibility of actual change within the characteristic. Factor loadings for each item ranged from 0.75 to 0.81 in the adolescent sample and 0.83 to 0.92 in the adult sample. The scale also showed high convergent validity when compared with other measures.

Smith et al. (2008) developed the Brief Resilience Scale and tested it in two different samples of undergraduate students. One with a sample size of 128 and another with a sample size of 64. Cronbach's alpha for the scale was 0.84 and 0.87 within the two samples and test-retest

reliability at one month showed an interclass correlation coefficient of 0.69. The authors also reported good convergent and discriminant predictive validity.

Duckworth & Quinn (2009) developed the 8-item Short Grit (Grit-S) scale. The authors tested the scale on a sample of 1554 adults. They reported factor loadings from 0.61 to 0.74 for the Consistency of Interest (CI) subscale and 0.37 to 0.80 for the Perseverance of Effort (PE) subscale. Additionally, the scale showed good reliability with a Cronbach's alpha of 0.70 for the PE subscale and 0.77 for the CI subscale. The authors also reported high convergent validity with other measures and high predictive validity of both grade point average, military retention, and spelling bee performance. The shortened scale had a correlation coefficient of 0.96 when compared to its previously validated and longer counterpart. The authors reported adequate test-retest reliability with $r = 0.68$. Finally, the authors reported mean scores in the sample of adults to be 2.9 for the CI subscale and 3.7 for the PE subscale.

Morais et al. (2025) developed a shortened version of the previously validated Motivated Strategies for Learning Questionnaire and tested it among 429 adolescents in Portugal. The authors reported adequate internal consistency with Cronbach's alpha ranging from 0.69 to 0.88 and McDonald's omega ranging from 0.70 to 0.90 across each of the subscales used in this study. Furthermore, each subscale demonstrated good correlation with its longer and previously validated counterpart with correlation coefficients ranging from 0.67 to 0.91 across the subscales included in the study.

In addition to the initial completion of the survey at Timepoint #1, student participants were e-mailed a link to complete the same survey at three additional timepoints (with the exception of demographic information):

- Timepoint #2: 1-2 weeks following the beginning of their summer clinical education experiences
- Timepoint #3: during the last week of their clinical education experiences
- Timepoint #4: approximately 2-4 weeks after beginning fall coursework.

A summary of data collection timepoints is listed in Table 1. All questions remained the same for each survey except for the MSLQ questions which were modified to match the context (courses versus clinic) at the timepoint of data collection. Survey questions can be seen in Appendix E.

Table 1

Timeline of Data Collection

Dates	Matriculation Milestone	Data Collected
June 16th – 29th		Student MAL Characteristic Survey Timepoint #1
June 20th	Summer Didactic Courses Ended (Class of 2026)	
June 22nd		Class of 2026 Focus Group Timepoint #1
June 23rd	Clinical Education Began (Class of 2026)	
June 26th		Class of 2027 Focus Group Timepoint #1
June 27th	Summer Didactic Courses Ended (Class of 2027)	
June 29th – July 10th		Student MAL Characteristic Survey Timepoint #2
June 30th	Clinical Education Began (Class of 2027)	
August 7th		Class of 2027 Focus Group Timepoint #2
August 11th		Class of 2026 Focus Group Timepoint #2
August 11th – 24th		Student MAL Characteristic Survey Timepoint #3
August 8th	Clinical Education Ended (Class of 2027)	
August 15th	Clinical Education Ended (Class of 2026)	
August 24th	Fall Didactic Courses Began	
September 23rd		Clinical Instructor Focus Group
September 26th		Academic Faculty Focus Group
September 23rd – 30th		Student MAL Characteristic Survey Timepoint #4
September 25th		Class of 2027 Focus Group Timepoint #3
September 26th		Class of 2026 Focus Group Timepoint #3

Focus Groups. To minimize social-desirability bias and perceptions of persuasion, the student focus groups were led by a faculty member not directly associated with the PT program. This individual was a colleague of the investigator who worked within a different program at the university and who volunteered to assist the investigator with the study by performing the student focus group interviews. The individual reported having previous experience with facilitating focus groups and conducting qualitative research. Additionally, the investigator provided training to the individual including discussion of the study's purpose and aims, questions to be asked and their alignment with those aims, and direction on conduct and recording of the interviews. This faculty member from the outside program coordinated a convenient date and time within a selected date range to complete semi-structured interviews with students volunteering to participate in focus groups. Focus group interviews occurred at three different timepoints:

- prior to the beginning of summer clinical rotations
- the last 1-2 weeks of summer clinical rotations
- approximately 6 weeks after the beginning of fall coursework.

The faculty member conducted the focus group interviews using a semi-structured interview guide that was modified for each focus group timepoint (Appendix F). Focus group interviews occurred over the Zoom meeting platform to allow for the most convenient location for each participant. The focus group facilitator recorded both audio and video of the recordings. Following the interviews, the meeting audio was transcribed by the focus group facilitator using tools within Microsoft Word 365. The facilitator then reviewed the transcripts by comparing them with meeting audio and video to ensure accuracy and completeness as well as to assign and

use participant pseudonyms on the transcripts. Upon completion, the facilitator emailed the completed transcripts to the investigators for further data analysis.

Educational Data Release. Investigators contacted all students who had previously indicated consent to access educational records on their initial survey to sign the second IRB required release to allow investigators to access program records related to the clinical instructor's assessment of students' MAL behaviors in the first week and final week of their clinical education experience as well as their current and undergraduate cumulative grade point averages. The MAL behavior assessments asked clinical instructors to identify the frequency with which they have observed a list of observable MAL behaviors in the student for whom they are supervising in the clinical education experience. The list of observable MAL behaviors was created from and aligns with those identified by Hopson et al. (2024) and includes questions like, "The student initiates, guides, and engages in the reflective process by seeking out feedback on performance," and "The student engages in critical examination of recent cases to identify their own personal learning and performance gaps. This information is often shared with a trusted source for further feedback and advice" (see Appendix G for all items). The program asks clinical instructors to complete this assessment within the first and final weeks of the student's clinical education experience.

Academic Faculty

Survey. Investigators e-mailed participating academic faculty a Qualtrics survey link. This survey included demographic questions that include age, sex, race, ethnicity, previous education and certifications, number of years as academic faculty, and number of years as academic faculty at the current university.

Focus Group. The investigator coordinated a convenient date and time within a selected date range to complete a single semi-structured interview with academic faculty volunteering to participate in the focus group. To allow for questions focused on the students' transition from the clinical learning environment back to the didactic classroom environment, the focus group interview occurred approximately 6 weeks after the beginning of fall coursework. The investigator created and used a semi-structured interview guide to lead the discussion (Appendix H). The focus group interview occurred over the Zoom meeting platform to allow for the most convenient location for each participant. The investigator leading the focus group recorded both audio and video of the meeting. Following the interview, the meeting audio was transcribed by the investigator using tools within Microsoft Word 365. The investigator then reviewed the transcript by comparing them with meeting audio and video to ensure accuracy and completeness as well as to assign and use participant pseudonyms on the transcripts. Upon completion, the transcript was available to the investigators for further data analysis.

Clinical Instructors

Survey. Investigators e-mailed participating clinical instructors a Qualtrics survey link during the first 1-2 weeks of a student's clinical education experience. This survey included demographic questions that include age, sex, race, ethnicity, previous education and certifications, number of years in clinical practice, and number of years as a clinical instructor.

Focus Groups. The investigator coordinated a convenient date and time within a selected date range to complete a single semi-structured interview with clinical instructors volunteering to participate in the focus group. To allow for clinical instructors to retrospectively respond to questions regarding the students' MAL characteristics across the entire clinical education experience, the clinical instructor focus group interviews occurred approximately 1-2 weeks after

the end of the students' clinical education experiences. The investigator used a semi-structured interview guide to guide the discussion (Appendix I). The focus group interview occurred over the Zoom meeting platform to allow for the most convenient location for each participant. The investigator leading the focus group recorded both audio and video of the meeting. Following the interview, the meeting audio was transcribed by the investigator using tools within Microsoft Word 365. The investigator then reviewed the transcript by comparing them with meeting audio and video to ensure accuracy and completeness as well as to assign and use participant pseudonyms on the transcripts. Upon completion, the transcript was available to the investigators for further data analysis.

Data and Safety Monitoring Plan

All qualitative and quantitative data files were stored and maintained on a secure university server and only accessed via university approved, encrypted, and password protected computers. Data was only accessible to the principal investigator and coinvestigators. All data analyses and discussion of the study between investigators took place via conversations in private offices or via encrypted and secured e-mail communication or video conferencing. A specific data monitoring plan was not necessary due to a lack of intervention, minimal immediate or on-going risks to participants, and the lack of need for on-going data analysis to meet the study's aims. Therefore, privacy and confidentiality measures were able to fulfill the data and safety monitoring plan requirement.

Data files were and will be stored and maintained on a secure university server or archived to an external data storage device and maintained behind two locked locations for up to seven years following completion of the study. Any future studies that desire to make use of the

data will undergo institutional review board consideration, and further informed consent from participants will be obtained as required.

Privacy and Confidentiality

Given that the study involved an investigator, students, and faculty from a single educational program, the potential for actual and/or perceived power differences and conflicts was possible. Therefore, several strategies for the protection of privacy and confidentiality of information were used. First, all data were stored and maintained via the previously mentioned data storage plan. No faculty, clinical instructors, or students had access to the data and study information. Faculty, clinical instructors, and students were not made aware of the results and will not be until non-identifiable aggregate data is reported via final publication or presentation. Participants and associated investigators were not provided with any information regarding the make-up of each focus group, nor which students, clinical instructors, and faculty were selected for the focus groups.

To maintain privacy and confidentiality from the investigator who resides within the PT program, a co-investigator from outside the program, de-identified the survey datasets of identifiable student information by creating unique participant coding prior to uploading to a shared file folder. This investigator maintained the file that contained identifiable student information separately on a secured, encrypted, and password protected university computer to which the investigator associated with the program did not have access. This same investigator sent study materials to participants for Timepoints 2-4, interfaced with university staff members to collect educational records necessary for the study (i.e., student behavior observation checklists and GPA), and gave names of student participants agreeing to participate in focus groups to the student group facilitator. The student focus group facilitator served as the primary

contact for each member of the student focus groups, and this facilitator conducted all student focus groups. This facilitator also transcribed all student focus groups to ensure anonymity of participants and maintained all identifiable data files separately on a secure, encrypted, and password protected university computer to which the investigator associated with the program did not have access.

Methods of Data Analysis and Representation

Prior to data analysis focused on answering the specific research questions, investigators calculated and reported descriptive statistics for demographic data collected via surveys collected from students, academic faculty, and clinical instructors. Additionally, when possible, demographic data was calculated separately for student participants who completed surveys across all four timepoints. Program staff also provided student demographic data for the entire PT program. This information helped to describe the samples from which the data was collected as well as provide comparisons for the sake of making determinations regarding any sampling bias.

Research Question #1: How do current PT students in the program perceive that the didactic classroom learning environment, the clinical education learning environment, and the transition between learning environments are influencing their curiosity, motivation, resilience, and growth mindset?

To determine student perceptions of the two learning environments and the transition between them, investigators used the process of thematic analysis as described by Ezzy (2002). Two different investigators reviewed and independently performed open, line-by-line coding of the Class of 2026 student timepoint #1 focus group that occurred prior to beginning their clinical rotation. Following independent coding, the investigators met to assess similarities and

differences in codes used and agreed upon a common set of codes. Investigators then used these codes to create a shared codebook. Subsequently, the two investigators used the shared codebook and newly created codes needed to independently perform open, line-by-line coding of the Class of 2027 student timepoint #1 focus groups that occurred prior to beginning their clinical rotation. The investigators then met and assessed similarities and differences in coding, agreed upon coding used for the transcript, and updated the shared codebook. This process continued until all transcripts for both cohorts across all timepoints had been coded. Following the initial process of open coding, the investigators met, discussed, and selected categories and themes via the inductive processes of axial and selective coding for each timepoint. Investigators reported overall themes and categories for each timepoint and utilized direct quotes from transcripts to provide context and calibration for each theme.

Research Question #2: To what extent are current PT students in the program displaying behaviors associated with the MAL during their clinical education experiences?

To determine the extent to which PT students display MAL behaviors during clinical experiences, investigators calculated and reported group means and standard deviations for each cohort at each timepoint and for each behavior measured on the survey of observable MAL behaviors collected from program data. Additionally, investigators used paired t-tests to determine if any differences between group means for each behavior at the two timepoints were statistically significant. Finally, investigators calculated effect sizes to report the magnitude of differences between the two timepoints.

Research Question #3: How do measures of the MAL characteristics of current PT students in the program fluctuate across the transitions between didactic classroom learning environments and clinical education learning environments?

Investigators scored each sub-scale of the survey completed by students according to the appropriate methods outlined in the literature to create total sub-scale scores for each student. Investigators calculated and reported group means and standard deviations for each sub-scale at each timepoint based on the number of participants completing the survey at that timepoint. Additionally, investigators calculated and reported group means and standard deviations for the students who completed surveys across all four timepoints. Investigators then used paired t-tests to determine if any significant differences existed in the subscale scores at one timepoint compared to the next subsequent timepoint for those students. Next, investigators calculated effect sizes for each sub-scale to report the magnitude of differences between timepoints. Finally, investigators calculated the group means and standard deviations separately for the students who had completed a survey at a particular timepoint but did not complete surveys at all four timepoints. At each timepoint, investigators compared the group means of those who had completed all four surveys to those who had completed it at that particular timepoint using independent t-tests to determine if any differences existed between students who had completed the survey at all four timepoints and those who did not.

Research Question #4: How do academic faculty and clinical instructors perceive that the learning environment they oversee is influencing the MAL characteristics of current students in the PT program?

To investigate academic and clinical instructors' perceptions of the influence of their particular learning environment on students' MAL characteristics, investigators used the process of thematic analysis as described by Ezzy (2002). Two different investigators reviewed and independently performed open, line-by-line coding of the transcript of the academic faculty and clinical instructor focus groups. Following independent coding, the investigators met to assess

similarities and differences in codes used and to agree upon a common set of codes. Investigators used these codes to discuss and select categories and themes via the inductive processes of axial and selective coding. Investigators reported overall themes and categories and utilized direct quotes from transcripts to provide context and calibration for each theme.

Research Question #5: To what extent do the perceptions of current PT students in the program regarding the influence of the learning environments on their MAL characteristics align with quantitative measures of those characteristics and the perceptions of faculty who contribute to those learning environments?

To answer this question, investigators merged data through a process of weaving as described by Fetters et al. (2013). Investigators used themes and categories resulting from the analysis of research question #1 that related to student perceptions of the influence of the learning environment on their MAL characteristics as the primary data source. Investigators met to compare other data and data analysis from the study to the themes developed in research question #1 and to assess for confirmation, expansion, and/or discordance of those themes. Data used for these comparisons included the following:

- Themes for research question #1 at timepoint #1 which related to student perceptions of the influence of the classroom learning environment on their MAL characteristics were compared to the quantitative measures of those characteristics that occurred prior to the beginning of their clinical rotations as well as the qualitative themes developed via analysis of the academic faculty focus group.
- Themes for research question #1 at timepoint #2 which related to student perceptions of the influence of the clinical education learning environment on their MAL characteristics were compared to the quantitative measures of those characteristics that occurred at the

end of their clinical rotations, the qualitative themes developed via analysis of the clinical instructor focus group, and the quantitative measures of the observed MAL behaviors of the students.

- Themes for research question #1 at timepoint #3 which related to student perceptions of the influence of the transitions between learning environments on their MAL characteristics was compared to the fluctuations that occurred in the quantitative measures of MAL characteristics over the four timepoints measured, the quantitative measures of observable MAL characteristics at both timepoints measured, themes developed from analysis of clinical instructor focus group, and themes developed from the academic faculty focus group.

Investigators discussed these comparisons using an inductive approach to explore confirmations, expansions, and/or discordance that the secondary data may provide to deepen the understanding of the primary data. Investigators arrived at consensus and reported their findings related to alignment in each of the areas. Finally, investigators compared the findings to existing literature to explain any discordant findings or enhance previous knowledge.

Chapter 4: Analysis and Results

Participants

Surveys

Ninety-one students out of approximately 143 students in the combined Class of 2026 and Class of 2027 cohorts began filling out the initial survey, representing a 63.6% response rate. However, 6 students only completed the consent and demographic portions of the initial survey. Therefore, 85 students began filling out survey questions related to their MAL characteristics. Further attrition was noted with only 72 students completing all portions of the initial survey. This trend continued with only 40 students completing the survey at timepoint #2, 22 students completing at timepoint #3, and 14 students completing at timepoint #4. Altogether, only 11 total students completed surveys across all timepoints. Demographics of those responding to the initial survey are presented in Table 2 below. When possible sample data were compared to larger data pools to check for potential sampling bias.

Table 2

Summary of Student Demographics

Variable	Category/Statistic	Values for All Participants	Values for Full Survey Participants	Known Values for Entire Program
Age (n=90)	Mean (sd)	24.59 (2.23)	23.27 (0.91)	24.81 (2.45)
	Range	21 - 35	21 - 24	22 - 43
Cohort (n=91)	Class of 2026	61 (67%)	5 (45.5%)	71 (50.4%)
	Class of 2027	30 (33%)	6 (54.5%)	70 (49.6%)
Sex (n=91)	Female	60 (66%)	9 (81.8%)	94 (66.7%)
	Male	30 (33%)	1 (9.1%)	47 (33.3%)
	Prefer Not to Say	1 (1%)	1 (9.1%)	0 (0%)
Grade Point Average (PT program) (n=17)	Mean (sd)	3.68 (0.32)	3.83 (0.19)	3.60
	Range	2.81 – 4.00	3.38 – 4.00	
Grade Point Average (Undergraduate) (n=17)	Mean (sd)	3.78 (0.17)	3.87 (0.14)	3.78
	Range	3.40 – 4.00	3.57 – 4.00	

Table 2 (continued)

Variable	Category/Statistic	Values for All Participants	Values for Full Survey Participants	Known Values for Entire Program
Race (n=91)	White	70 (77%)		
	Two or More Races	10 (11%)		
	Native American or Alaskan Native	8 (9%)		
	Asian	2 (2%)		
	Black or African American	1 (1%)		
	Prefer Not to Say	0 (0%)		
Ethnicity (n=90)	Hispanic or Latino	10 (11%)		
	Not Hispanic or Latino	77 (86%)		
	Prefer Not to Say	3 (3%)		
Previous Education (n=35)	Bachelor's Degree	32 (91%)		
	Master's Degree	1 (3%)		
	Doctorate	2 (6%)		
5-Voices Personality Profile Primary Voice (n=88)	Guardian	16 (18%)		
	Connector	16 (18%)		
	Pioneer	4 (5%)		
	Creative	6 (7%)		
	Nurturer	20 (23%)		
	Do Not Know	26 (30%)		

Six of the ten full-time academic faculty within the physical therapy program completed the survey collecting demographic data. These demographics are summarized in Table 3 below.

Table 3

Summary of Academic Faculty Demographics

Variable	Category/Statistic	Value
Age (n=6)	Mean (sd)	46.67 (8.33)
	Range	40 - 60
Sex (n=6)	Female	5 (83.3%)
	Male	1 (16.7%)
Race (n=6)	White	5 (83.3%)
	Asian	1 (16.7%)
Ethnicity (n=6)	Hispanic or Latino	0 (0%)
	Not Hispanic or Latino	6 (100%)

Table 3 (continued)

Variable	Category/Statistic	Value
Previous Education (n=6)	Bachelor's Degree	6 (100%)
	Master's Degree	1 (16.7%)
	Professional Degree	6 (100%)
	Doctorate	4 (66.7%)
Additional Certifications (n=6)	Board Certified Specialist	4 (66.7%)
	Certified Wound Specialist	1 (16.7%)
	Certified Edema Specialist	1 (16.7%)
	Fellowship in Manual Therapy	1 (16.7%)
	Dry Needling	1 (16.7%)
	Vestibular Specialist	1 (16.7%)
Number of Years as Academic Faculty (n=6)	Mean (sd)	9.83 (10.6)
	Range	3 - 31
Number of Years as Academic Faculty at Current Institution (n=6)	Mean (sd)	9.08 (10.8)
	Range	3 – 31

Fifteen clinical instructors completed the survey collecting demographic information. These demographics are summarized in Table 4 below.

Table 4

Summary of Clinical Instructor Demographics

Variable	Category/Statistic	Value
Age (n=15)	Mean (sd)	36.9 (12.6)
	Range	24 - 67
Sex (n=15)	Female	9 (60%)
	Male	6 (40%)
Race (n=15)	White	10 (66.7%)
	Two or More Races	3 (20%)
	Native American or Alaskan Native	2 (13.3%)
Ethnicity (n=15)	Hispanic or Latino	1 (6.7%)
	Not Hispanic or Latino	14 (93.3%)
Previous Education (n=15)	Bachelor's Degree	5 (33.3%)
	Master's Degree	1 (6.7%)
	Professional Degree	9 (60%)
	Doctorate	7 (46.7%)

Table 4 (continued)

Variable	Category/Statistic	Value
Additional Certifications (n=15)	Board Certified Specialist	2 (13.3%)
	Pelvic Floor Specialist	1 (6.7%)
	Certified Clinical Instructor	1 (6.7%)
	Manual Therapy Certification	2 (13.3%)
	Dry Needling	6 (40%)
Number of Years in Clinical Practice (n=14)	Mean (sd)	12.1 (12.8)
	Range	1 - 42
Number of Years as Clinical Instructor (n=13)	Mean (sd)	6.6 (8.0)
	Range	1 – 30
Cohort of Student Supervising in Summer 2025 (n=15)	Class of 2026	3 (20%)
	Class of 2027	12 (80%)

Focus Groups

Five total students participated in the student planned focus group interviews. One focus group interview consisted of a single student from the Class of 2026 cohort while the other consisted of four students from the Class of 2027 cohort. The same students participated in focus groups at each of the three timepoints. However, only two of the four students participated in the Class of 2027 cohort focus group at timepoint #2 and three at timepoint #3. Each focus group lasted between 12 minutes and 32 minutes.

Eight of the ten full-time academic faculty members in the physical therapy program participated in the single focus group interview. The focus group interview took place on September 26th following the time when students had returned to the classroom environment after the summer clinical experiences. The interview lasted approximately two hours.

Three clinical instructors participated in the single clinical instructor focus group. This focus group interview occurred on September 23rd which again was following the students'

completion of their summer clinical experiences and return to the classroom. The interview lasted approximately one hour.

Research Questions

Research Question #1: How do current PT students in the program perceive that the didactic classroom learning environment, the clinical education learning environment, and the transition between learning environments are influencing their curiosity, motivation, resilience, and growth mindset?

Classroom Environment. Within the classroom environment, student perceptions spanned across four major themes: External Demands, Content, Social Interactions, & Personal Environment. These themes along with their sub-categories and the codes that went into developing them are presented in Appendix J.

External Demands. Students commented on an array of external demands created by the classroom learning environment. The sentiment surrounding these external demands was largely negative and appeared to be associated with a mindset of survival.

First, students commented on various time and workload pressures imposed by the classroom environments. These pressures were seen as being placed upon them, but necessary to manage - "…we're so busy and we have so much to deal with that you just kind of have to ride it out and work towards it step by step. Otherwise, you'll fall behind. So you're just kind of forced to keep up." Furthermore, these workloads and time demands were seen to create cyclical and nearly continual stress and pressure throughout their entire time within the classroom environment. One student summarized it in this way, "Yeah, I feel like every week, there's always like one test or one assignment where I'm like, okay, just push through these next three days, get it over with, it'll be done, and then I'll relax. And then I make it through, and then two

days later I'm back in the same rotation of there's a new test and I'm just trying to get through that one, and then I think it's going to be calm. And just repeating that cycle for the past year." Students viewed these demands as something on top of challenges they were facing in their personal lives. They reported feeling burnt out, but feeling like they had to continue pushing forward anyway. They perceived that this created a mode of survival and required them "to figure out how to connect to that part of yourself."

Students seemed to perceive that the time and workload pressures were being created by external goals that were being imposed upon them. The students perceived that these external goals took the form of examinations and assignments for their various classes. One student stated, "I think grad school kind of in and of itself is just one big challenge. I mean, I don't, there's always something that's you're either working towards or you're trying to get better at…" However, despite this apparent agreement on the imposed nature of external goals, the motivations toward these goals seemed to be different for each student. One student was focused on meeting the goals for the sake of their grade which they tied to their identity - "I feel like just the nature of grad school…you're naturally a pretty hard worker and you have to care about your grades to some extent. And so being in grad school, I feel like a lot of the time where our self-worth is tied up in our grades." Still another, linked the motivation to meet the imposed external goals to appearing competent to others stating, "You're going to have to go out into the field and be competent. So just trying to, kind of the main goal, just being feeling confident in your abilities."

This combination of pressures linked to imposed goals seemed to create a high-stakes mindset and fear of failure among the students. Students communicated that this came with negative emotional responses, making statements such as, "Like every test or every checkout,

I'm like, wow, this is the end of the world. And then we get through it and then you just kind of move on to the next thing," and "…just to know that you've, feel like you knew the material and then you get something wrong, it just kind of, or at least for me, it goes all over me." It appeared that they perceived the classroom environment came with a heavy weight or pressure that would lead to a sense of finality if externally imposed goals were not accomplished. This is evidenced by comments such as, "…when we don't get a certain grade that we think we deserve or that we are capable of getting, that can be pretty challenging and make you feel like you failed...," and "…you're either going to accomplish this or you're done...."

Content. Students perceived that the content and topics included within the classroom environment influenced them in many ways. This appeared to include influences on various aspects of their motivation, the nature of learning, and their evolving professional identities. Interestingly enough, it appeared that the influence that the content had on these factors could either be positive or negative and this seemed to be largely individualized based on the perceptions and attributions made by each student.

The content and topics, particularly when new or unfamiliar to the students, seemed to generate interest and a desire to learn and explore further. When asked about how the classroom environment has influenced their desire to explore physical therapy topics on their own, one student commented, "I would say it's definitely increased. The more things we learn about, the more in-depth I want to learn about it." Several students mentioned having a specific area of interest within physical therapy that was either strengthened or changed by the content they had been presented in class. The new information came with a desire to explore different topics within the profession in further breadth or depth. Students made comments such as, "I had a certain specialty in mind that I wanted to go into and I still want to do that, but I think I was a

little bit naïve. And we learned a little bit about it and I was like, ‘Wow! That's a lot more complicated than I thought.’ But if anything, it just made me more interested because I'm like, ‘Wow! There's so much more that we can learn.’” However, other students noted that receiving new information changed or altered their interests - “I always kind of thought maybe sports would be something that I'd be interested in. And now I don't dislike it, but I just, I've kind of learned the sacrifices you have to make to go down that path. And I'm maybe not as interested as I was.” In addition to its influence on their interests with physical therapy, students also reported that being presented with new and unfamiliar content increased their excitement to be entering the profession of physical therapy and opened their eyes to professional identities that they previously did not know existed. One student summarized it this way, “To me too, there's a little bit of that, like, you don't know what you don't know until you're exposed to it. And so there's still things daily that we're being taught and material that's being put in front of us in school that's, like, I didn't even really know that was a part of physical therapy or that it existed. And that's pretty interesting to know that that's out there and I can, that's pretty motivating to be like, there's, it's kind of a never ending pool of knowledge...”

In addition to the content and topics creating new possibilities to explore, students commented on the influence that their perceptions of the relevance and applicability of the content and topics had on their motivation to learn. Students made comments that they sometimes generated personal connections between the content and topics they were covering in class and past patients or family members with particular conditions that may benefit from physical therapy. The students reported that this led to an increased perceived value of that content. This perceived value was often related to the utility that the content may have for future patients. One student commented, “But I think kind of like having that personal connection with

it made us sink in of like, what we're doing right now is important and it matters for our future patients." Students demonstrated this connection to future patient care and increased value in their comments and linked them to an increased desire to learn content in more depth. They made statements such as, "I think that being in grad school, it makes what you're learning really, real because this is it and this is what the information that you get in the classroom and in clinical is the information that you're bringing to your patients. And so I think, we can briefly touch on things in class, but there's so much material to cover that we're not going to get in depth in every topic. And so I think, it's encouraged me to just, like, if there is something that either I'm interested in or not understanding to do extra work to really grasp it. Because again, it's the realization of, oh, what I learn here is what I'm taking to my patients."

However, not all students appear to view this relevance of content in the same manner, nor are they similarly motivated by it. One student reflected that they knew content would be relevant in the clinic, but that they were motivated from a more mastery-avoidant perspective in the sense that they did not want to appear incompetent. This student said, "I mean, I don't want to be in a position where I don't know something like in the clinic. So that's a motivation. Like, I mean, I know there'll eventually be something I don't know, but I would like to, you know, not be in front of my CI [clinical instructor] and not know something that is basic or that I am expected to know."

Over and above its influence on factors such as motivation and curiosity, students reported that being presented with certain content helped improve their self-efficacy and ability to perform independent learning. This included content related to information searches and the critical evaluation and prioritization of information which not only provided students with the tools and resources to engage in independent learning but also helped inform them about their

most ideal learning strategies. A student from the Class of 2026 summarized this way, “It's increased my confidence because I've been given like resources so I know how to kind of learn stuff on my own, if you will. Like I'm not just blindly going to Google or something, you know, I have, I have kind of tools to learn and I've kind of learned myself some more along the way so I know how I best retain knowledge.”

Finally, students reported that the content and topics that they were experiencing in the classroom environment were changing some of the ways in which they viewed learning. They reported that covering certain topics related to physical therapy patient care led to an increased desire to integrate that information into their own lives. For example, one student said, “Yeah, I agree. I think just talking about goal setting a lot throughout our coursework and talking about asking our patients to set goals, it's kind of like, I'm like, oh, I should probably be doing that too.” Therefore, it appeared that at least some students were compelled to use content from the classroom designed to influence physical therapy practice and integrate into their own behaviors so that they maintained integrity in their future patient interactions. Furthermore, students reported that they were beginning to view learning and intelligence from a new perspective based on the content they were covering in the classroom environment. As they began to view knowledge outside of just the test-focused perspective of formalized schooling and more from a standpoint of real-world applicability, they began to view intelligence in a more multi-faceted way. One student put it this way, “I would say it's kind of like changed the way that I think I look at intelligence specifically because you can see people who, like you can do really well on the exam, but it doesn't necessarily translate to labs or to working with actual patients. And so I think it just kind of changed my perspective on what it looks like to be intelligent and what it looks

like to truly grasp the material to where you can apply it to the clinic and to actual patients versus just book knowledge and answering the questions on a test."

Social Interactions. Besides content and external demands, students perceived that the social interactions that they have within the classroom environment also influence their characteristics. These social interactions include the feedback they receive, conversations that they have with professors, peers, and others, as well as the observations they make of others who are simultaneously experiencing the classroom environment.

Students discussed that the feedback they receive in the classroom environment, primarily via grades, helps them reflect, self-evaluate, and determine ways to improve. A Class of 2027 student stated it in this manner, "Yeah, I think both when you expect to do well and then you don't or you walk out of a test or a checkout and you think you did really well, then you get your grade back and you didn't, definitely have to step back and reevaluate…Definitely a lot of, like, not having an ego about I'm right about this, the way I'm studying is the best way for me, like having to constantly adapt to what's going to be best for how you learn." Furthermore, students reported that feedback that they interpreted as meaning they were being successful in the classroom environment created positive emotions: "But I think just since being in the classroom and having success in the classroom, it's gotten me excited about joining the profession."

Some students also reported that conversations with physical therapy professionals to whom they have now been exposed as a part of the classroom environment has led to increased curiosity and a desire to explore professional options. A Class of 2026 student stated, "Having experiences to talk with other professionals at different events and the path they took makes me want to kind of look more into that and explore options myself." However, these conversations

are not necessarily always viewed as positive as they can create angst among students when they use them as a means of comparison. Another student described it as this, “I think I know everything, like just can't wait to get started. And then I'll talk to somebody who's been doing it for many years and I realize how little I know and that's a little scary.”

As for comparisons, it appeared that students use their own observations of others within the environment to make comparisons about themselves even though they feel like it may not be the best thing to do. Students made comments such as, “But I think it's can be really easy to compare like, oh, wow, this person's studying this much or this person did this good on this test. But just realizing that we all have our own strengths and success in our own ways has been helpful,” as well as comments like, “But I think for me, it's really easy for me to look around and just compare myself to the way that other people are doing. And like, I have siblings and parents that have all gone to grad school and med school. And so I think it's easy for me to look at them too.”

Personal Environment. Although much of the discussion from students about the classroom learning environment and their characteristics of curiosity, mindset, resilience, and motivation revolved around social and organizational components, students did discuss how they themselves interacted with that environment as individuals. First, several students included the use of self-talk and personal mindset reminders as strategies to manage aspects of the classroom environment such as stress, failure, and reframing the tendency to make comparisons. Students recognized that some of their own personal qualities such as short attention spans and a tendency toward the emotion of anxiety influenced how they individually interacted with the classroom environment. Finally, students also discussed how their self-efficacy was shaped by perceiving a

positive outcome in response to the challenges of the classroom environment and that this self-efficacy likely contributed to their interests and desire to learn about certain topics in more depth.

Clinical Learning Environment. Within the clinical environment, student perceptions spanned across three major themes: Personal Responsibility for Patients, External Demands, and Social Interactions. These themes along with their sub-categories and the codes that went into developing them are presented in Appendix K.

Personal Responsibility for Patients. Students found the ability to accept personal responsibility for patients to be extremely meaningful and to serve as a strong environmental influencer of their curiosity, mindset, resilience, and motivation. Students described an emotional and ethical responsibility over a patient's clinical care which heightened their motivation and sense of purpose. This sense of ownership over the decisions that influenced a patient's care and progress seemed to develop a sense of commitment to those decisions that provided them with opportunities to take ownership over both their successes and mistakes. One student commented, "Yeah, I think beforehand you're kind of like scared to make mistakes and you're kind of guarding yourself up against, you know, like in your head, you're thinking, oh, I'm not, I'm not going to do this or I'm not going to do that. And, you know, like in reality, it's pretty inevitable that some of those things are going to slip in and some things happen and you just have to be able to kind of forgive yourself, kind of be communicative, like communicate with the patient, be open and then, address it and fix it."

Subsequently, that commitment appeared to contribute to not only a changed perspective regarding their mistakes over the course of their clinical experience, but also an increase in persistence, the use of patient care as a means of self-evaluation, and an increased value for the immediate application of new knowledge. This aspect of direct and immediate application was

noted when one student said, “I think it's kind of made me want to seek out information or different type of information, types of information from reputable sources and evidence-based practice, but not just reading about it, but also finding aspects of that information that you can then implement in the patient care, like techniques and ways to manage a patient differently than just the basics, essentially.”

In addition to ownership over clinical decisions, the personal responsibility of patient care seemed to help reveal gaps in students’ knowledge, as one student noted, “There's things that I feel good about and there's things that I know I need to work on more. And time in the clinic has exposed a little bit of that....” Students reported the identification of these gaps was revealed when being to exposed to unfamiliar, uncommon, or complex aspects of a patient’s care. This gap identification seemed to create curiosity and interest from students as well as a desire to perform independent learning and exploration to fill the gaps. When referring to filling gaps, they cited, “...anything that I've seen in the clinic that's less common, I've kind of been intrigued by and wanted to. I've caught myself being more interested in it,” as well as “I think an eye-opening part of it too is that, we're just not, you're not ever seeing patients in a bottle. And so there's a lot of complexity that even just at the top, surface level patients who might seem not very complex, it kind of gets deeper. So there's more to learn for sure.” Although this desire appeared to be occasionally driven by personal interest, it seemed that the desire to help the patient with whom they were interacting was the primary driving force. They reinforced this with comments such as, “It's not just like a case report. There's a real person with real issues. And you might see a way that how you taking a deeper dive into that topic, you might be able to have a real positive effect on them,” and “...there's real people there that, when you help someone out, it

feels better. And then when they're not seeing progress, it makes you want to, push yourself a little more, try to figure out what you can do."

External Demands. Students reported facing structural and logistical challenges and pressures associated with the clinical environment. These included aspects such as time and scheduling pressures as well as institutional systems and expectations. Some students found the pace of the clinical environment to be busy, intense, and heavily influenced by patient scheduling practices. They describe this as leading to a requirement to be continually focused and working toward immediate patient care goals, stating, "It moves faster, so you need to be more on the ball with your goals, otherwise they'll get away from you pretty fast…in clinic, it just moves really fast, there's patients coming, you know, every 30 minutes, every hour, and it's every day of the week. So, you have to be on the ball with your goals and just really give that extra effort to stay locked in." Furthermore, students reported that the pace led not only to increases in stress but also to more reactive versus proactive coping strategies when faced with stress and other negative emotions. One student commented, "...it moves fast, so you don't really have a choice other than to figure out how to get through it and move on…you don't really have a choice other than to get through it. So, it's kind of throwing you into the fire and you got to just learn from it."

In addition to scheduling, students described a realization of the larger systems associated with the clinical environment and patient care such as insurance, documentation, and institutional policies accompanied their time in the clinical environment. These realizations appeared to influence the students' value-cost perceptions and led to frustration and other negative emotions. One student reported, "...seeing the insurance part of it has definitely been hard and seeing how that affects patients' care and delaying it and not getting approved more visits. So that aspect has definitely been hard, but still definitely wanting to do this career." Another student put it this

way: “Yeah, I think it's kind of from the start of the clinical to now, I didn't realize quite how adaptable. I mean, I knew, you know, being a PTA previously, you have to be adaptable and there's a lot more to patient care than just seeing a patient, you know, insurance and scheduling and communication. But I think implementing that from a PT perspective, like from the evaluation examination, I didn't quite realize beforehand how complex that could get. And so towards the end of the clinical, I'm learning, seeing how much more you have to kind of manage at one time.”

Despite the negative sentiment surrounding some of the institutional factors and demands of the clinical environment, students described an overall decrease in their cognitive load over the course of their clinical experiences due to increased familiarity with those demands, thus leading to an increased ability to seek information to support patient care. A Class of 2027 student said, “I'd say I had interest then and now, but it definitely has grown as I've gotten used to like the clinic experience that I have more, I guess, like room in my brain to think about those things and to seek that information out.”

Social Interactions. Students describe social interactions in the clinic that influence their various characteristics. In particular, students describe relationships with both their clinical instructors and their patients as being the primary social interactions that drive this influence. Students described their clinical instructors as providing a source of accountability, encouragement, and guidance. Clinical instructors were expressed as being a source of questions that reveal knowledge gaps with one student commenting, “...there was times where maybe my CI [clinical instructor] was like, if you haven't, if you don't know what I'm talking about right now, go look it up. So definitely having that push from my CI [clinical instructor]....” Clinical instructors were also seen as a point of accountability and encouragement toward goals: “I think

it's definitely helped getting to, you know, apply the goals that we set for clinical, you know, in real time and having the clinical instructor there to keep you on track with that, push you forward." Also, at least one student reported their clinical instructor as a guide to help them learn how to respond to mistakes, "My CI [clinical instructor] has been cool about like just talking me through it, you know, like verbalize how I'm going to make sure it doesn't happen again. Just set out, kind of reflect on what I did wrong, how I'm going to make sure it doesn't happen again, what the importance of that was, stuff like that." Students perceived that their ability to manage stress improved when clinical instructors could provide a delicate balance between leading them into challenge while simultaneously providing encouragement and support. One student described, "My clinic has definitely helped me and they're always very supportive and wanted to give me the time I need to do things, but at the same time pushing me to be efficient with my time."

In addition to their clinical instructors, students pointed to their relationships with their patients as influencing their personal characteristics. Patients provided opportunities to practice humility and professional communication in response to mistakes. One student recalled an instance in clinic, "...I kind of felt like, I didn't do what I needed to do in that moment, but just, apologizing, being professional and being efficient with your time helped with that." Students seemed to describe their relationships with patients as strong emotional connections which seemed to increase the value of the care the student was providing. One student fondly stated, "The most significant [aspect of the clinical environment] for me personally has just been the amount of time I've had with patients." Another student put it this way, "the relationship that I have…with the patients, I'm really sad to leave. Just having grown, you know, really close relationships and getting to know these people in their lives has been probably the most

important part for me [of the clinic environment]. And I'm excited to have that in the future where you can continue to build those relationships because it is hard to just put yourself into something for six weeks and then just leave." However, students also reported that interacting with some patients created challenges and thus opportunities to learn how to overcome those relational challenges. One student reported, "whether that's a patient with a bad attitude or a patient that's just a handful, anything like that, you don't really have a choice other than to get through it."

Transition Between Clinical & Classroom Learning Environments. Within the transition between clinical and classroom environments, student perceptions spanned across four major themes: Shifting Motivation, Changes in Learning Strategies, New Perspectives on Peer Influence, and Shifting Stressors. These themes along with their sub-categories and the codes that went into developing them are presented in Appendix L.

Shifting Motivation. Students described how their motivation changed and evolved across the transition period from the clinic back to the classroom. This shift was primarily viewed as due to changes in context, relevance, and autonomy. Some students reported that a loss of real patient centered context for learning when transitioning back to classroom learning decreased their motivation to seek out information independently. They attributed this to less observable and immediate clinical application and a decrease in cues of unfamiliar information and situations. One student summarized it this way, "[Motivation for independent learning] may be diminished a tad. Just because you're not exposed to as many things that you're not as familiar with. And there's not an element of having a real person attached to something that you, to any gaps in knowledge that you see."

Others reported an increased motivation in the classroom upon returning from the clinic due to gaining a greater value for the content they were learning and newly found clarification of their professional goals and interests. A class of 2027 student commented, “I feel like going to clinic like really allowed me to be more confident in like why I want to do this and it gives me motivation to be able to study for another year.”

Regardless of their increase or decrease in motivation, students recognized a return back to the external and formalized goals presented by the classroom environment, even stating that they had to create their own motivation to work towards classroom required goals - “...it's [the classroom environment] more standardized, like, you have due dates to hit and deadlines and test dates. You have to, kind of, address any gaps in knowledge by those deadlines or you're going to fall behind. It's less self-driven, I guess, in a way, just because you're, I mean, you still have to motivate yourself to hit those deadlines, but it's kind of, I guess, external deadlines in a way.” Another student said it this way, “And just trying to kind of shift my mindset back to learning things that I need to learn, hitting all the objectives. Like the deadlines. And the deadlines and whatnot are set and you have to meet those, but in a way you have to be more self-motivated to do what you need to do each day. Just because there's obviously not, you know, study deadlines for each single day. You, kind of, have to set those upon yourself. So in a way you have to be self-motivated when you're back in the classroom.”

Changes in Learning Strategies. Students discussed the transition back to the classroom from the clinic as involving changes in their learning strategies. Students reported that they approached content and topics in the classroom with a new focus on the clinical relevance of the information instead of just test-focused memorization. Once student commented, “…like during our exams, we kind of have to focus on, okay, what's gonna like, what's the right answer, what's the wrong answer? But having been in clinic, I can kind of look at the classes and be like, okay, this is

the kind of information that I need to keep handy to further utilize in the clinic in the future. Not that everything in the class isn't important but just knowing the certain areas that I want to focus on for my personal use...” Similarly, students discussed shifting the depth of their learning from a broad approach to one that was more targeted and clinically driven. One of the students described it in this manner, “I'd say for me, it's I'm more specific in the knowledge I seek out as where before it was, try and learn everything that I think will be on the upcoming test to do well academically. As we're now in class, I'm kind of trying to figure out what would apply to clinic that I saw and now I think it [information seeking] goes up.” However, although students reported that the transition didn’t necessarily change their view of their own intelligence and learning ability, they returned to self-evaluation strategies consistent with the classroom environment such as grades. Comments such as, “I mean, I make good grades. I feel like I do well in the classroom, so, you get you get more immediate, more objective feedback, like a grade. So that can kind of increase your confidence. Being that you were able to study something and learn it and take a test over it and score well, that can increase your confidence. Whereas in the clinic you might have more self-doubt creeping in because there's just less objective measures,” provide evidence for that transition.

New Perspectives on Peer Influence. Students reported that the transition back to the classroom brought with it a renewed sense of social belonging. They viewed their clinical experiences as a new shared experience - “I really enjoyed getting to talk to my classmates about where they went for clinic and what kind of patients they got to see and what kind of things they came up with. And I think that's been probably the best part [of returning to the classroom] for me.” Variability in the new knowledge and experiences created through being in different clinical environments led to both excitement and collaboration as well as a new level of comparison from which to make self-judgments. As one student stated, “…we all had different clinical experiences, like seeing, different people got stronger in different areas. So it is very hard not to compare. But

yeah, like we'll all, get to the places that we need to be, but it's hard when we're all at different places, depending on what kind of clinical we went to."

Shifting Stressors. Finally, students discussed a shift in both the source of stress as well as their perceived level of control and coping that accompanied the transition back to the classroom. Challenges and stressors shifted from those created by pace, schedule, and the responsibility of patient care in the clinic to increased academic depth and challenge and the pressures of meeting externally required goals in the classroom. One student reported, "It's just different types of stress going from the clinic to the classroom. So when you're in the classroom, it might be more related to grades or tests or reaching certain deadlines, whereas in the clinic it's if you feel like you're not giving proper treatment to a patient or you might have, you don't feel as confident in the treatment you're giving, that can kind of create stress too." Some students reported a positivity surrounding this shift stating that classroom stress was more controllable with increased effort - "As far as managing it, I mean, you almost have more control over it in the classroom. I can manage my stress with work ethic or studying harder, whereas in the clinic, you don't really know what you're going to face each day." However, others reported less stress in the clinical environment due to a perceived increase in flexibility and autonomy surrounding patient care. As one student put it, "I maybe felt more comfortable in the clinical setting talking to patients and just having more of a conversation and being able to apply the knowledge that we've learned in different ways versus I need to know these very specific things for this test. And just the test in general is kind of anxiety inducing, I guess, to me, because it's kind of a there is, it's, this is wrong and it's wrong for this reason versus, well, you could justify it various different ways in a clinical setting with your treatment or what you intended or didn't to do with a patient."

Research Question #2: To what extent are current PT students in the program displaying behaviors associated with the MAL during their clinical education experiences?

To answer this research question, investigators calculated means and standard deviations for each MAL behavior at each timepoint using data from the seven students who provided us access to their educational records and also had surveys completed for both timepoints #1 (beginning of clinical) and #2 (end of clinical) by their clinical instructors. Differences in the means along with their 95% confidence intervals were calculated and paired t-tests were performed to determine if there was any significant difference in the means between the two timepoints for each behavior. Hedges'g, a correction to account for small sample size bias, was used to determine the effect sizes for the differences between means. Results are presented in Table 5.

In general, students displayed a high frequency of observable MAL behaviors in the clinic with all nine of the behaviors averaging between sometimes and always. However, all behaviors remained consistent from the beginning to the end of the clinical experience. No significant differences were found between the two timepoints for any of the MAL behaviors. Additionally, all confidence intervals for differences between the means and effect sizes for the above mentioned behaviors all crossed zero indicating that we cannot be certain that any actual differences observed were not attributable to chance. The largest increase for any behavior of the course of the clinical experience was for, "The student expresses their synthesis of information through independent decision-making and creation of a concrete clinical plan even when they may have some degree of uncertainty about their conclusions" which increased by 0.71 with a confidence interval of 1.74 – -0.32. Data observation revealed that "The student identifies the limits of diagnostic and treatment algorithms/guidelines and decides when and how to move outside of an established pattern to provide optimal patient care" appeared to be the lowest rated MAL behavior.

Table 5

MAL Behaviors Observed by Clinical Instructors at Beginning & Ending of Clinical Experience

Variable (n=7)	Timepoint	Mean (sd)	Difference in Mean from Previous Timepoint (95% CI)	t-statistic	p-value (two-sided)	Hedges' g (95% CI)
The student initiates, guides, and engages in the reflective process by seeking out feedback on performance.	T1	4.43 (0.54)	0.14 (-0.50 – 0.78)	0.548	0.60	0.18 (-0.48 – 0.82)
	T2	4.29 (0.49)				
The student integrates data from multiple sources to create a mental framework for diagnosis, therapeutic, or instructional purposes and this is often shared with others.	T1	3.71 (0.49)	-0.43 (-0.92 – 0.07)	-2.121	0.08	-0.70 (-1.43 – 0.07)
	T2	4.14 (0.69)				
The student identifies the limits of diagnostic and treatment algorithms/guidelines and decides when and how to move outside of an established pattern to provide optimal patient care.	T1	3.86 (0.38)	0.00 (-1.07 – 1.07)	0.000	1.00	0.00 (-0.64 – 0.64)
	T2	3.86 (0.90)				
The student verbally explores, often with clinical instructor or other therapists, the ways in which contrived variations in presenting characteristics, available resources, etc. would affect clinical decision-making to broaden their understanding.	T1	4.57 (0.54)	0.14 (-0.50 – 0.78)	0.548	0.60	0.18 (-0.48 – 0.82)
	T2	4.43 (0.54)				
The student engages in critical examination of recent cases to identify their own personal learning and performance gaps. This information is often shared with a trusted source for further feedback and advice.	T1	4.00 (0.82)	-0.29 (-1.32 – 0.74)	-0.679	0.52	-0.22 (-0.87 – 0.44)
	T2	4.29 (0.76)				

* no differences were significant at the $\alpha = .05$ level.

Table 5 (continued)

Variable (n=7)	Timepoint	Mean (sd)	Difference in Mean from Previous Timepoint (95% CI)	t-statistic	p-value (two-sided)	Hedges' g (95% CI)
The student expresses their synthesis of information through independent decision-making and creation of a concrete clinical plan even when they may have some degree of uncertainty about their conclusions.	T1	3.71 (0.76)	-0.71 (-1.74 – 0.32)	-1.698	0.14	-0.56 (-1.25 – 0.17)
	T2	4.43 (0.54)				
The student proactively discusses, explores, and/or seeks out clinical exposure to perceived areas of deficit to build skills and fill knowledge/performance gaps.	T1	4.29 (0.49)	0.00 (-0.76 – 0.76)	0.000	1.00	0.00 (-0.64 – 0.64)
	T2	4.29 (0.49)				
The student critically compares their own knowledge and performance to external standards.	T1	4.00 (0.58)	-0.43 (-1.33 – 0.47)	-1.162	0.29	-0.38 (-1.05 – 0.31)
	T2	4.43 (0.79)				
The student cultivates a network of mentors to help guide their learning and fill their personal needs.	T1	3.57 (0.54)	-0.43 (-1.48 – 0.62)	-1.000	0.36	-0.33 (0.99 – 0.35)
	T2	4.00 (1.00)				

* no differences were significant at the $\alpha = .05$ level.

Research Question #3: How do measures of the MAL characteristics of current PT students in the program fluctuate across the transitions between didactic classroom learning environments and clinical education learning environments?

To answer this research question, investigators created variables representing composite scores for each of the MAL characteristic scales included in the survey for each of the four timepoints by summing scores across all items measuring each characteristic. Means and standard deviations were calculated for each scale and each timepoint using data from all

individuals responding to the items at each timepoint (see Table 6). Then, differences in the means and standard deviations for the 11 individuals responding across all four timepoints, along with their 95% confidence intervals, were calculated and paired t-tests were performed to determine significant difference in the means between any two consecutive timepoints for any of the scales. Additionally, Hedges' g was used to determine effect sizes for the differences between means because it corrects for small sample size bias. Results of the statistical tests are presented in Table 7.

Table 6

Student MAL Characteristics Across Four Timepoints Spanning Classroom & Clinical Learning Environments

Variable	Timepoint	N	Mean (sd)
Social Medical Curiosity	T1	85	6.16 (0.63)
	T2	40	6.10 (0.65)
	T3	22	6.19 (0.65)
	T4	14	6.11 (0.51)
Intellectual Medical Curiosity	T1	85	6.00 (0.67)
	T2	40	6.07 (0.57)
	T3	22	6.18 (0.69)
	T4	14	6.17 (0.59)
Growth Mindset	T1	81	2.44 (1.00)
	T2	40	2.44 (1.05)
	T3	22	2.47 (0.92)
	T4	14	2.21 (0.99)
Resilience	T1	81	3.48 (0.58)
	T2	40	3.58 (0.54)
	T3	22	3.48 (0.63)
	T4	14	3.55 (0.41)
Grit – Consistency of Interest	T1	79	3.28 (0.66)
	T2	40	3.50 (0.64)
	T3	22	3.48 (0.73)
	T4	14	3.52 (0.75)

Table 6 (continued)

Variable	Timepoint	N	Mean (sd)
Grit – Perseverance of Effort	T1	79	3.97 (0.42)
	T2	40	4.05 (0.41)
	T3	22	4.02 (0.36)
	T4	14	4.07 (0.42)
Intrinsic Goal Orientation	T1	72	5.32 (0.88)
	T2	40	5.58 (0.67)
	T3	22	5.82 (0.75)
	T4	14	5.41 (0.76)
Extrinsic Goal Orientation	T1	72	4.85 (1.26)
	T2	40	4.13 (1.07)
	T3	22	4.11 (1.50)
	T4	14	4.91 (1.39)
Task Value	T1	72	6.13 (0.88)
	T2	40	6.56 (0.57)
	T3	22	6.59 (0.53)
	T4	14	6.54 (0.49)
Control of Learning	T1	72	5.56 (0.97)
	T2	40	5.63 (0.74)
	T3	22	5.70 (0.80)
	T4	14	5.88 (0.64)
Self-Efficacy of Learning	T1	72	5.85 (0.89)
	T2	40	5.93 (0.73)
	T3	22	6.14 (0.73)
	T4	14	6.23 (0.74)

As can be seen in Table 6, students scored relatively high and comparably in all MAL characteristics measured across all four timepoints. When conducting paired-samples t-tests across the 11 participants responding at each timepoint, no significant differences were found between any two consecutive timepoint for measures of social medical curiosity, intellectual medical curiosity, growth mindset, resilience, consistency of interest, perseverance of effort, intrinsic goal orientation, or task value. This result was additionally evidenced in confidence intervals for differences between the means and effect sizes, which all crossed zero for the above

mentioned characteristics indicating that we cannot be certain that any actual differences observed were attributable to chance.

Table 7

Changes in Student MAL Characteristics Across Four Timepoints Spanning Classroom & Clinical Learning Environments

Variable (n=11)	Timepoint	Mean (sd)	Difference in Mean from Previous Timepoint (95% CI)	t-statistic	p-value (two-sided)	Hedge's g (95% CI)
Social Medical Curiosity	T1	6.15 (0.49)	-			-
	T2	6.02 (0.52)	0.13 (-0.08 – 0.34)	1.347	0.21	0.38 (-0.20 – 0.94)
	T3	6.22 (0.51)	-0.20 (-0.57 – 0.17)	-1.203	0.26	-0.34 (-0.89 – 0.24)
	T4	6.09 (0.48)	0.13 (-0.17 – 0.42)	0.958	0.36	0.27 (-0.30 – 0.82)
Intellectual Medical Curiosity	T1	6.11 (0.66)	-			-
	T2	6.00 (0.69)	0.11 (-0.18 – 0.40)	0.837	0.42	0.23 (-0.33 – 0.78)
	T3	6.18 (0.67)	-0.18 (-0.53 – 0.17)	-1.166	0.27	-0.32 (-0.88 – 0.25)
	T4	6.16 (0.62)	0.02 (-0.21 – 0.25)	0.177	0.86	0.05 (-0.50 – 0.59)
Growth Mindset	T1	2.09 (0.54)	-			-
	T2	2.21 (0.56)	-0.12 (-0.53 – 0.28)	-0.669	0.52	-0.19 (-0.73 – 0.37)
	T3	2.27 (0.71)	-0.06 (-0.45 – 0.32)	-0.350	0.73	-0.10 (-0.64 – 0.45)
	T4	2.33 (1.09)	-0.06 (-0.54 – 0.42)	-0.282	0.78	-0.08 (-0.62 – 0.47)
Resilience	T1	3.60 (0.52)	-			-
	T2	3.76 (0.35)	-0.17 (-0.47 – 0.13)	-1.236	0.25	-0.34 (-0.90 – 0.23)
	T3	3.71 (0.27)	0.05 (-0.20 – 0.29)	0.421	0.68	0.12 (-0.43 – 0.66)
	T4	3.64 (0.41)	0.08 (-0.15 – 0.30)	0.747	0.47	0.21 (-0.35 – 0.76)

* $p < 0.05$, two-tailed

Table 7 (continued)

Variable (n=11)	Timepoint	Mean (sd)	Difference in Mean from Previous Timepoint (95% CI)	t-statistic	p-value (two-sided)	Hedge's g (95% CI)
Grit – Consistency of Interest	T1	3.36 (0.47)	-			-
	T2	3.57 (0.59)	-0.20 (-0.59 – 0.18)	-1.194	0.26	-0.33 (-0.89 – 0.24)
	T3	3.66 (0.50)	-0.09 (-0.36 – 0.18)	-0.740	0.48	-0.21 (-0.75 – 0.35)
	T4	3.55 (0.80)	0.11 (-0.15 – 0.38)	0.959	0.36	0.27 (-0.30 – 0.82)
Grit – Perseverance of Effort	T1	4.05 (0.31)	-			-
	T2	4.07 (0.37)	-0.02 (-0.32 – 0.27)	-0.171	0.87	-0.05 (-0.59 – 0.50)
	T3	4.00 (0.34)	0.07 (-0.84 – 0.22)	1.000	0.35	0.28 (-0.29 – 0.83)
	T4	4.16 (0.39)	-0.16 (-0.45 – 0.13)	-1.208	0.26	-0.34 (-0.89 – 0.24)
Intrinsic Goal Orientation	T1	5.25 (0.78)	-			-
	T2	5.57 (0.53)	-0.32 (-0.71 – 0.07)	-1.813	0.10	-0.51 (-1.08 – 0.09)
	T3	5.70 (0.63)	-0.14 (-0.48 – 0.21)	-0.875	0.40	-0.24 (-0.79 – 0.32)
	T4	5.45 (0.84)	0.25 (-0.18 – 0.68)	1.291	0.23	0.36 (-0.22 – 0.92)
Extrinsic Goal Orientation	T1	5.23 (1.00)	-			-
	T2	**3.61 (1.10)**	**1.61 (0.90 – 2.32)**	**5.092**	**<0.001***	**1.42 (0.58 – 2.22)**
	T3	3.98 (1.33)	-0.36 (-1.01 – 0.28)	-1.259	0.24	-0.35 (-0.91 – 0.22)
	T4	**4.82 (1.56)**	**-0.84 (-1.48 - -0.20)**	**-2.934**	**0.02***	**-0.82 (-1.45 - -0.15)**
Task Value	T1	6.45 (0.50)	-	-	-	-
	T2	6.50 (0.49)	-0.05 (-0.41 – 0.32)	-0.276	0.79	-0.08 (-0.62 – 0.47)
	T3	6.62 (0.48)	-0.11 (-0.44 – 0.21)	-0.787	0.45	-0.22 (-0.77 – 0.34)
	T4	6.52 (0.51)	0.09 (-0.31 – 0.49)	0.507	0.62	0.14 (-0.41 – 0.69)

* $p < 0.05$, two-tailed

Table 7 (continued)

Variable (n=11)	Timepoint	Mean (sd)	Difference in Mean from Previous Timepoint (95% CI)	t-statistic	p-value (two-sided)	Hedge's g (95% CI)
Control of Learning	T1	5.97 (0.77)	-			-
	T2	**5.42 (0.65)**	**0.55 (0.06 – 1.03)**	**2.516**	**0.03***	**0.70 (0.06 – 1.42)**
	T3	5.73 (0.74)	-0.30 (-0.67 – 0.06)	-1.838	0.10	-0.51 (-1.09 – 0.09)
	T4	5.97 (0.66)	-0.24 (-0.49 – 0.00)	-2.185	0.05	-0.61 (-1.20 – 0.01)
Self-Efficacy of Learning	T1	5.95 (0.86)	-			-
	T2	**5.59 (0.73)**	**0.36 (0.05 – 0.68)**	**2.589**	**0.03***	**0.72 (0.08 – 1.45)**
	T3	**6.16 (0.60)**	**-0.57 (-0.99 - -0.15)**	**-3.023**	**0.01***	**-0.91 (-1.61 - -0.19)**
	T4	6.27 (0.75)	-0.11 (-0.45 – 0.23)	-0.747	0.47	-0.21 (-0.76 – 0.35)

* $p < 0.05$, two-tailed

However, significant differences were noted between various timepoints for other measured MAL characteristics. Students had a significant decrease in extrinsic goal orientation between timepoints #1 (classroom) and #2 (beginning of clinical experience). This would appear to indicate that students had a reduction in motivation being driven by external rewards or pressures when moving from didactic to clinical instruction. Furthermore, this difference demonstrated the large effect size of 1.42. However, it is of note that due to the small sample size, the confidence interval for the effect size ranged from 0.58 to 2.22. Nonetheless, this still indicates a medium to large effect size for the difference between timepoints #1 and #2 for extrinsic goal orientation.

Interestingly, significant differences were also noted between timepoints #3 (end of clinical experience) and #4 (return to classroom) for extrinsic goal orientation. Students had a significant increase in their extrinsic goal orientation between these two points with a difference

in the means of 0.84. This difference was accompanied by a slightly smaller effect size of 0.82 with a confidence interval of 0.15 to 1.45 indicating anywhere from a small to large difference between the two timepoints.

Other scales and timepoints with significant differences included a decrease in the control of learning subscale between timepoints #1 (classroom) and #2 (beginning of clinical experiences), a decrease in the self-efficacy for learning subscale between timepoints #1 and #2, and a subsequent increase in the self-efficacy for learning subscales between timepoints #2 (beginning of clinical experience) and #3 (end of clinical experience). All of these differences were represented by negligible to large effect sizes based on the wide confidence intervals of the Hedges g.

Additionally, investigators calculated separate means and standard deviations for the 11 students who participated across all timepoints with those who only participated at specific timepoints to determine if there were any significant differences in any of the measured MAL characteristics between those students who fully participated and those who only partially participated (see Table 8). No significant differences were found for any of the variables at any timepoint indicating that the 11 students who fully participated may have been representative of the larger sample.

Table 8

Differences in Variables Between Full and Partial Participants

Variable	Timepoint	Participants Completing Survey at Specific Timepoint Mean (sd)	Participants Completing Survey at All Timepoints Mean (sd) (n=11)	Difference in Means (95% CI)	t-statistic	p-value (two-sided)
Social Medical Curiosity	T1	6.16 (0.65) (n=74)	6.15 (0.49)	0.02 (-0.39 – 0.43)	0.094	0.93
	T2	6.12 (0.69) (n=29)	6.02 (0.53)	0.11 (-0.36 – 0.57)	0.458	0.65
	T3	6.16 (0.79) (n=11)	6.22 (0.51)	-0.05 (-0.65 – 0.54)	-0.193	0.85
	T4	6.20 (0.72) (n=3)	6.09 (0.48)	0.11 (-0.64 – 0.85)	0.319	0.76
Intellectual Medical Curiosity	T1	5.98 (0.67) (n=74)	6.11 (0.66)	-0.13 (-0.56 – 0.31)	-0.577	0.57
	T2	6.09 (0.53) (n=29)	6.00 (0.69)	0.09 (-0.32 – 0.50)	0.442	0.66
	T3	6.18 (0.75) (n=11)	6.18 (0.67)	0.00 (-0.63 – 0.63)	0.000	1.00
	T4	6.20 (0.53) (n=3)	6.16 (0.62)	0.04 (-0.83 – 0.90)	0.092	0.93
Growth Mindset	T1	2.49 (1.04) (n=70)	2.10 (0.54)	0.40 (-0.02 – 0.82)	1.951	0.06
	T2	2.53 (1.18) (n=29)	2.21 (0.56)	0.32 (-0.25 – 0.88)	1.140	0.26
	T3	2.67 (1.10) (n=11)	2.27 (0.71)	0.39 (-0.43 – 1.22)	1.00	0.33
	T4	1.78 (0.38) (n=3)	2.33 (1.09)	-0.56 (-1.98 – 0.87)	-0.850	0.41

*no differences were significant at the $\alpha = 0.05$ level

Table 8 (continued)

Variable	Timepoint	Participants Completing Survey at Specific Timepoint Mean (sd)	Participants Completing Survey at All Timepoints Mean (sd) (n=11)	Difference in Means (95% CI)	t-statistic	p-value (two-sided)
Resilience	T1	3.46 (0.59) (n=70)	3.59 (0.52)	-0.13 (-0.51 – 0.24)	-0.707	0.48
	T2	3.52 (0.59) (n=29)	3.76 (0.35)	-0.24 (-0.55 – 0.07)	-1.579	0.13
	T3	3.24 (0.80) (n=11)	3.71 (0.27)	-0.47 (-1.02 – 0.08)	-1.851	0.09
	T4	3.22 (0.25) (n=3)	3.64 (0.41)	-0.41 (-0.96 – 0.13)	-1.648	0.13
Grit – Consistency of Interest	T1	3.27 (0.69) (n=68)	3.36 (0.47)	-0.09 (-0.52 – 0.34)	-0.424	0.67
	T2	3.47 (0.66) (n=29)	3.57 (0.59)	-0.09 (-0.56 – 0.37)	-0.412	0.68
	T3	3.30 (0.89) (n=11)	3.66 (0.50)	-0.36 (-1.02 – 0.29)	-1.183	0.25
	T4	3.42 (0.63) (n=3)	3.55 (0.80)	-0.13 (-1.23 – 0.98)	-0.254	0.80
Grit – Perseverance of Effort	T1	3.96 (0.44) (n=68)	4.05 (0.31)	-0.09 (-0.36 – 0.19)	-0.624	0.53
	T2	4.04 (0.43) (n=29)	4.07 (0.37)	-0.03 (-0.32 – 0.27)	-0.169	0.87
	T3	4.05 (0.40) (n=11)	4.00 (0.34)	0.05 (-0.28 – 0.37)	0.289	0.78
	T4	3.75 (0.43) (n=3)	4.16 (0.39)	-0.41 (-0.98 – 0.16)	-1.575	0.14
Intrinsic Goal Orientation	T1	5.34 (0.91) (n=61)	5.25 (0.78)	0.09 (-0.50 – 0.68)	0.295	0.77
	T2	5.58 (0.73) (n=29)	5.57 (0.53)	0.01 (-0.48 – 0.50)	0.039	0.97
	T3	5.93 (0.87) (n=11)	5.70 (0.63)	0.23 (-0.45 – 0.91)	0.699	0.49
	T4	5.25 (0.43) (n=3)	5.45 (0.84)	-0.20 (-1.32 – 0.91)	-0.401	0.70

*no differences were significant at the $\alpha = 0.05$ level

Table 8 (continued)

Variable	Timepoint	Participants Completing Survey at Specific Timepoint Mean (sd)	Participants Completing Survey at All Timepoints Mean (sd) (n=11)	Difference in Means (95% CI)	t-statistic	p-value (two-sided)
Extrinsic Goal Orientation	T1	4.78 (1.30) (n=61)	5.23 (1.00)	-0.45 (-1.27 – 0.38)	-1.086	0.28
	T2	4.33 (1.01) (n=29)	3.61 (1.10)	0.71 (-0.03 – 1.46)	1.949	0.06
	T3	4.25 (1.71) (n=11)	3.98 (1.33)	0.27 (-1.09 – 1.63)	0.419	0.68
	T4	5.25 (0.25) (n=3)	4.82 (1.56)	0.43 (-0.65 – 1.51)	0.877	0.40
Task Value	T1	6.07 (0.92) (n=61)	6.45 (0.50)	-0.38 (-0.95 – 0.19)	-1.326	0.19
	T2	6.59 (0.61) (n=29)	6.50 (0.49)	0.009 (-0.33 – 0.50)	0.420	0.68
	T3	6.57 (0.60) (n=11)	6.61 (0.48)	-0.05 (-0.53 – 0.44)	-0.196	0.85
	T4	6.58 (0.52) (n=3)	6.52 (0.51)	0.06 (-0.66 – 0.78)	0.183	0.86
Control of Learning	T1	5.49 (0.99) (n=61)	5.97 (0.77)	-0.49 (-1.12 – 0.14)	-1.555	0.12
	T2	5.71 (0.76) (n=29)	5.42 (0.65)	0.29 (-0.24 – 0.82)	1.105	0.28
	T3	5.67 (0.88) (n=11)	5.73 (0.74)	-0.06 (-0.79 – 0.66)	-0.174	0.86
	T4	5.56 (0.51) (n=3)	5.97 (0.66)	-0.41 (-1.32 – 0.49)	-1.001	0.34

*no differences were significant at the $\alpha = 0.05$ level

Table 8 (continued)

Variable	Timepoint	Participants Completing Survey at Specific Timepoint Mean (sd)	Participants Completing Survey at All Timepoints Mean (sd) (n=11)	Difference in Means (95% CI)	t-statistic	p-value (two-sided)
Self-Efficacy of Learning	T1	5.83 (0.90) (n=61)	5.95 (0.86)	-0.12 (-0.71 – 0.46)	-0.419	0.68
	T2	6.06 (0.70) (n=29)	5.59 (0.73)	0.47 (-0.04 – 0.98)	1.875	0.07
	T3	6.11 (0.86) (n=11)	6.16 (0.60)	-0.05 (-0.71 – 0.62)	-0.143	0.89
	T4	6.08 (0.88) (n=3)	6.27 (0.75)	-0.19 (-1.28 – 0.90)	-0.378	0.71

*no differences were significant at the $\alpha = 0.05$ level

Research Question #4: How do academic faculty and clinical instructors perceive that the learning environment they oversee is influencing the MAL characteristics of current students in the PT program?

Academic Faculty. Academic faculty discussed their perceptions of the influence of the learning environment on student characteristics across four major themes: Instructional Design & Pedagogical Structure, Presentation & Delivery Format, Social & Relational Dynamics, and Environmental Stressors & Pressures. These themes along with their sub-categories and the codes that went into developing them are presented in Appendix M.

Instructional Design & Pedagogical Structure. Academic faculty reported on how the design of learning activities, course content, and instructional strategies shaped student engagement and exploration. First, faculty reported that building in autonomy and choice into learning activities and assignments seemed to lead to increased curiosity and content exploration. One faculty member stated, “I think if there's a specific learning activity that's designed for them

to explore a topic on their own versus one being assigned to them is one way of encouraging that." Furthermore, faculty stated that when students hold value for a topic that is not covered in much depth within the curriculum, they tend to increase exploratory behavior outside of the classroom. One faculty member described it like this, "I think when they aren't getting topics that we cover in a lot of detail, then that causes them to go out there and research it more…but it is, It's the areas maybe I don't think are covered, they choose to feel like they need to go out and get more information on their own." Additionally, faculty commented that over the course of the program, students appear to shift their motivation and learning strategies; shifting from a grade-focused mentality to one that explores certain topics in more depth and is application focused. One faculty member stated it this way, "I think it's interesting...how students will move through the program in the classroom or didactic environment...just thinking about how some of my first years come in who maybe are struggling with anatomy because they have to have the perfect score. Maybe they're not failing, but they've just been in this mindset of, I have to have the perfect score to get into PT school. And then to see them change by year three to, I don't have to have the perfect score, but I need to know the information so I can apply it. And maybe getting the A is not as important as knowing...where to find the answer or understanding the information versus just recalling the information."

Faculty also commented on how the content itself seems to influence student characteristics. Some faculty commented that content that is new or unfamiliar to the student may drive increased curiosity and exploration about the topic. They made comments such as, "So in one of the classes that I teach, we talk about specialty settings. And I think that exposure has the effect of them wanting or being willing to explore specialty settings and clinical education. Whereas, if they aren't exposed to those earlier on, they don't seem as ready and willing to check

some of those places out." Additionally, faculty reported that the perceived relevance and value that a student has for particular content may either increase or decrease their motivation and engagement with that content. To drive home this point, faculty members made remarks such as, "…when students have a, they find a personal connection to what you're presenting, whether it be like in the community or like their community experience or something that you've presented in class. Maybe they have a family member with that disorder or they found some way to find some sort of personal connection. Then they take that next step to explore it on their own as opposed to just giving them a plate full of information." as well as "If they don't value the topic and you can't find a way to bring that value to them, then it's really hard to get them to engage or to explore." Faculty reported that the perceived value seems to arise from personal relevance or personal interest. One faculty member described it this way, "I also think that from my experience, the covered content in the course also helps students try to take what has been taught and apply it to potentially situations that are familiar to them and use that as a way to strengthen their clinical reasoning. So for instance, you know, when we are talking about various surgeries, things like that, students are like, oh, well, I had this surgery, you know, and then they start to really apply that clinical reasoning aspect of, you know, so based on what I now know, I know so much more and wish that I would have known that when I had my surgery because then I could have been even more prepared or better able to rehab myself, et cetera. And so that's always interesting to see how they start to add in that clinical reasoning aspect." Furthermore, faculty commented that the students' clinical experiences can either increase or decrease a student's perception of the relevance and value of particular content. One comment provided evidence to such, "...when students don't go to a rotation where they saw wounds or treated wounds, and then they're having to take the wound care class. And really their motivation then is knowing that it's

going to be on the NPTE [National Physical Therapy Examination] versus having seen the patients that make them want to pursue that information. Not to, nothing bad about integumentary, definitely we'll see those patients, even an outpatient, but I think it can be hard to transition to classroom topics when you don't see it as relevant as the topics you saw in the clinic."

However, they also note that the influence of clinical experiences may depend on the timing of that clinical experience when compared to the timing of content presentation within the curriculum - "…I can tell you that what I learned is that their value and their appreciation for each course in the semester doesn't always happen when the course is taught. It is very common for me to hear these students describe that their value for courses taught early in the semester, that they did not particularly express their value of at the time. They are only now, as they're in these final rotations, seeing and they're starting that transition away from being a student, that they're starting to see some of the value in some of their didactic content that they'll self-admittedly say, I didn't understand the point of that class at the time. So I think perspective and value of the classroom is really important and that it doesn't necessarily happen in real time."

Faculty observed that other aspects of content that may influence student characteristics include tension that is created via content. One faculty member reported that a dissonance of information between the classroom and clinical environments may lead to increased independent learning in an attempt to reconcile that dissonance. Faculty state, "We send our students out on integrated clinical experiences and clinical experiences and often the discrepancies between best practice that they're hearing in the classroom and what they're seeing in the clinic comes back to us ...and them trying to reconcile that information, I think presents that opportunity for them to explore the complexities of the profession and the topics that we're talking about as well."

Faculty also noted that some topics appear to be intimidating or complex to students and that this content may cause students to question their own learning ability. One faculty member remarked, “I think sometimes students get...um... not overwhelmed, but intimidated by some of the topics or things we talk about we're going to do in the classroom. And they feel like maybe this makes them feel like they don't have the ability.”

In addition to the content, faculty reported that the design structure of their instruction and the curriculum may play a part in influencing student characteristics. They commented that including active learning opportunities in real-world scenarios helped to increase student motivation and passion. One faculty member described this concept in action, “And then taking it that step further and not just delivering the content, but then kind of ending the class with some kind of charge or activity. So for example, we had an advocacy speaker come in...and then at the end, I charged them to look at the current advocacy issues, select one that they're passionate about. I asked them to write a letter to their legislator but didn't hold them to that. I just asked them to write a reflection on why they selected the one that they did...But, you know, again, kind of tying it back, giving them opportunities to immerse themselves in whatever that topic is...any of those opportunities where we have a classroom without walls, where we get them engaged early in the profession, invested in the profession, kind of seeking opportunities for them to truly apply and live those PT core values. I think reflect positively.” Faculty also stated that inclusion of problem-solving activities and a layered, recursive approach within the curriculum seemed to provide a vehicle to enhance students’ self-evaluation and revelation of knowledge gaps that in turn lead to independent learning. Faculty made supporting comments such as, “I hope the problem solving that we do in lab helps stimulate their ability to understand that they do have, you know, the ability to know where there are gaps in knowledge, know where they're strong in

their knowledge, and then how to change that and move forward." as well as "…if I think about the classroom environment, if we think about the curriculum, if the curriculum has that built-in recursiveness, And that makes a difference for the students and in an organized fashion...and having that type of consistency, I think, also has a big effect on the student's ability to go, okay, I've got this. starting to get this down and being able to apply it to different situations." and "there is this kind of layering of information that we can know where we sit in the curriculum and therefore scaffold and allow students almost like having some wins along the way where they recognize that they've learned something, that they've grown, and then that in turn gives them a positive response or feedback about their own intelligence and ability to learn." Moreover, building opportunities for students to reflect within instructional design can be used to drive and maintain student passion. One faculty member stated, "I think another place where we can, at least I try to, is having some type of a point of reflection as well. So that might be a hook at the beginning of a lecture or something at the close of the lecture as like an exit ticket kind of an activity. So the opportunity for the students to have multiple points throughout the program to become reflective practitioners can also drive passion as well." Finally, faculty mentioned that condensed 6-week or 8-week courses within the curriculum may have either a negative influence on students by increasing stress and decreasing motivation and curiosity or may have a positive influence by contributing to the development of resilience and grit. One faculty member suggested, "I think that has a negative impact on their motivation and probably curiosity short term. But then long term, I think, or even maybe as soon as it's over, they probably have an increase in their resilience and feeling like they can take on hard things at times."

Presentation & Delivery Format. Faculty commented that the presentation and delivery of content appeared to influence student responses to the learning environment. This discussion

seemed to have a significant focus on the elements of distance education within the program. Specifically, faculty reported that passive and lecture-heavy presentations seem to suppress students' curiosity and their perceptions of topic relevance. One faculty member mentioned, "I think it could be a negative result when our environments like very, very lecture-y, not much activity, not much engagement. So, we have to make sure that environment does capture them. So, it can have a negative effect, the environment can, if we're not doing things to keep them engaged." Despite this, faculty testified to multiple challenges in implementing more active learning within the distance education format. One faculty member reported with frustration, "…that is one of our challenges just as this distance program...But if, I would love to do, some more active things, but I can't, I don't know if [the distant campus] is doing it or not when I'm in [the other campus], they might be, but it, so it just limits or like you want to have materials in there, and if you want to have them to do it, you really have to plan ahead, get them up there, down here, wherever. And so I think some of that is just, we do lose some engagement that way and maybe that does impact their negatively impact their ability to explore." Faculty noted technology and logistical barriers that not only limited attempts at active learning but also were believed to contribute to stress and negative emotions in students. They made comments such as, "…the technology not working creates a lot of negative stress and emotion," and "If the distant technology is not working, the students might not be able to hear adequately to understand what's being said by the instructor. And that would very naturally increase stress levels."

Academic faculty also noted that increased faculty-student interactions appeared to have positive benefits for students. They mentioned these interactions led to improved student self-evaluation, increased self-efficacy, increased competency, and an improvement in students' perceptions of their own learning ability. They made comments such as, "But then when we go

into the lab classroom, getting to practice with supervision and having someone show you directly the psychomotor skill, I think then it has a positive impact on their own appreciation for their own learning abilities and intelligence." However, faculty again commented on logistical barriers that prevent more faculty-student interactions. One faculty member was exasperated, stating, "And I think getting into the smaller groups, even when, so, we try and do an activity...but then it's just the, there's me, managing 80 students. So, my ability to really interact with all the groups becomes limited. And even if I have a [colleague on the distant campus], it's just the ratios can still be hard when we have those small groups." These comments surrounded the large number of students in each cohort which may not only lead to decreased faculty supervision and support but also increased student self-doubt. One faculty member reported, "I think another way or another descriptor or adjective you could use is that the large classroom environment can allow the student to have some self-doubt about their intelligence. And then when, you know, then they're not willing to push their button or answer a question because they're doubting themselves versus those when you can get them to maybe quietly collaborate in very small groups, then that builds their belief in their own intelligence back up."

Finally, faculty discussed how creativity within content presentation and delivery may help enhance students' relevance for content as well as overcome some of the logistical barriers. Faculty reported that creative use of technology can help provide the students with opportunities for self-evaluation within courses and that the use of guest speakers to enhance specific content can help increase content relevance, passion, and motivation among students. One faculty member stated, "I will intentionally select guest speakers who, it's one thing for me to be able to deliver content at times, but if I know somebody that I could connect the students with where they can maybe connect that topic better to a person, or a human experience or an example of

excellence, I think that sometimes can inspire students, right? And then taking it that step further and not just delivering the content, but then kind of ending the class with some kind of charge or activity."

Social & Relational Dynamics. Academic faculty discussed how peer relationships, faculty modeling, and group structures influence components of the environment such as psychological safety as well as influences students' motivation, engagement, and self-regulation.

Faculty reported that small groups created either through coursework or socially may help foster collaboration, reduce anxiety, and support self-assessment. Faculty hypothesized that consistency within small group structure may play a valuable role in creating a sense of psychological safety and decreasing stress. One person described their courses: "I intentionally... have tried to keep the teams the same for the second year class...if you have any activities, this is who they were with before, because even though there might be some subtle shifts in the teaming, it might make it easier and potentially less stressful if they're not reinventing the wheel each time, which doesn't mean that we don't provide those opportunities at all during a curriculum, but anything that we can do to kind of minimize, especially in the beginning, keep things more standardized, they feel more comfortable." Furthermore, faculty reported that the shared experiences of small groups may create camaraderie and a social support system that supports emotional and stress regulation. One participant noted, "…it makes me think about how the classroom environment, regardless of size, can create camaraderie amongst students and finding people in their lives that they can lean on more, whether it's academic challenges and supporting each other…," and "they're all having the same lived experience. And that leans into a sense of relatedness regardless of the size of the group. Because any shared experience can create connection. And so I think the fact that there is a classroom environment for them that they are

all in at the same time, that in and of itself can create that connection that can impact them and how they process challenges that come up."

However, faculty noted that the make-up of the small groups can mediate its influence, making it either positive or negative. One individual noted that, "...finding your group of friends and that sort of thing and the positive impact it can have on the learning and motivation and resilience and all that. But I also have seen, the opposite of that where there are students that didn't do well making a friend and how that has really negatively impacted their resilience and motivation at times. And I mean, really resilience. A lot. I've seen a big negative impact when they don't find someone as a support system in the program that's a peer." Faculty noted that some students may be able to influence an entire group in either a positive or negative manner: "[T]hose one or two people, positive and negative, can influence the classroom culture as well, and just the mood and the willingness to engage in classroom activities and that sort of thing. If you've got someone that's really excited and like, you know, amping people up and answering questions, people tend to join in versus if you got someone that's grunting and complaining, everybody gets quiet and shuts down."

Additionally, faculty discussed how they themselves can model intellectual humility, provide individualized feedback, and encourage learning from mistakes to help facilitate a growth mindset. They commented on this role in this way, "I also think the classroom environment can show the students that in their, like when we come across a challenge, we don't know the answer to something, that it's okay to go searching for the answer. And I think the classroom environment can demonstrate that to them when someone asks us a question and we don't know the answer and we say, so let' go find the answer. Let's figure this out. Then they apply or they can then apply those same skills in their own lives. When I can't find the answer to

a question, I can go looking for it too. It doesn't mean I've failed. It means it's an opportunity to go find more information." Furthermore, faculty acknowledged how their provision of individualized feedback can help increase a student's sense of self-efficacy and decrease overall stress. They provided a specific example from class that demonstrated such: "I also think the hands-on portions of the lab really goes a long ways to helping students manage their stress. And because we can get in there and they're like, they're not sure about what they're doing, but sometimes, when I get my hands on it, I show the students okay and I help them place their hands. They really gain that confidence in those skills. They weren't sure how to do it, and with that little bit of facilitation, I think that makes a huge difference." Academic faculty also mentioned that either mentoring relationships with students through their inclusion in the faculty member's professional roles or the communication of unique or outstanding achievements of physical therapy professionals to students can inspire passion within students.

In general, academic faculty relayed their belief that a culture that balances high student expectations with high levels of environmental support can lead to increases in student motivation and engagement. One faculty member remarked, "I think having that high support, high, high support, but high expectations...being present and helping them and also having the support of their friends, but helping them make the connection early...having someone there to support them in that transition forward." Faculty also commented that the types of resources that are made available to students communicates to them the priorities of the culture. One faculty member even quipped, "when their well-being is well, their passion is well."

Environmental Stressors & Pressures. Academic faculty also discussed how classroom structure, pacing, and expectations contribute to student stress and pressures. However, they also report a belief that intentional, targeted, and organized challenges can help students build

resilience and grit. One faculty remarked, "…stress can be good, but being very mindful of the stress that we are giving and where our students are at in their academic program to set them up for success."

Faculty recognized that condensed courses, frequent assessments, and unclear expectations created in the classroom environment can lead to student burnout and emotional fatigue. According to the academic faculty, too many assessments or activities within a short period of time appear to create challenge and emotional stress for students. One faculty member said, "…I could see is when you have exams built, you have a couple of exams during the week and maybe checkouts on the same week. I definitely have seen the students respond with a lot of stress." Still another stated, "...we kind of have talked about a few activities, those activities that immerse the student in the profession or bring them into the community or community into the classroom, whatever it might be, are all great. But if you have too many of those, then that in itself can be stressful...And so sometimes, and I've seen it happen in other institutions, I've seen it happen here, our best intentions, right, are to drive that passion, but then are we producing burnout, right, or anxiety because now it's on another Friday, right, or there's just too many things going on." Increased pacing of courses such as that seen in condensed 6-week or 8-week courses can contribute to stress and other negative emotions. One of the faculty members explained, "I think that the workload is different when you jump into a short semester, an eight-week courses workload. Yeah, on average, it's the same amount of credit hours, contact hours, all of that, but because it's in a shorter period of time, it is more work for that shorter period of time. So you've got both things....transitioning from clinic and what that workload looked like to this intense short semester can very understandably feel overwhelming and difficult to transition to...So I think it's more of the transition from the semester length they're used to to the short

semester length. That's a big factor." Also, faculty reported that a perceived waste of resources such as an issue with classroom technology leading to perceived waste of time and financial investment in their coursework can further lead to stress and negative emotions in students. One of the faculty members noted, "Resources are valuable. When technology doesn't work, that takes time. That is not to the students and this is coming from course evals and conversations with students, but that's not a good use of their time from their perspective, and I don't disagree. Time is a resource. Time is valuable. And when there's issues, that takes up time."

Despite the apparent stress caused by these classroom environmental factors, faculty believe that at least some of it may be necessary for students to learn how to overcome stress and challenges to build skills such as resilience and grit that they see as necessary for professional practice. Faculty commented, "I think they're necessary challenges too, because the world is that way. So the world has stressful events in it. You have to be able to handle what's going on in front of you and still proceed to the next day." While still another stated, "I was just going to echo the same thing, that it helps students learn how to manage stress because it puts them in stressful situations. And relatively, I mean, to them it's not low stakes, but when you think of it in the context of stressful situations in the whole world that you might be into, it's relatively low stakes compared to what other people, so it gives them practice." In fact, at least one faculty member commented that they believed that creating progressive lower-stakes challenges within the classroom environment while simultaneously providing guidance and support can help students improve their stress management in higher stakes situations.

Finally, faculty discussed how clear expectations, rapport building, and individualized support can reduce anxiety and promote emotional regulation. These were discussed by faculty within the context of providing clear expectations and objectives for assessments as well as using

rapport building techniques to initiate class. One faculty in particular spoke of rapport building, “On the flip side, I know that, you know, I, not that I always get engagement, but I always try to establish, some type of rapport with the students at the beginning of every lecture where I kind of will open up and say, hey, is there anything to report? What are the kudos for the week or something like that?” While another spoke of providing clear expectations, “I was thinking like the exam, how we apply exam. That would be something student may have negative emotional experiences, especially they don't know...I'm just thinking the exam set up and whether it is clear for them to know how to prepare it may have some impact on this.”

Clinical Instructors. Clinical instructors discussed their perceptions of the influence of the clinical learning environment on student characteristics across four major themes: Clinic Structure & Culture, Clinical Instructor Role & Relationship, Professional Roles & Challenges, and Patient Relationships & Care. These themes along with their sub-categories and the codes that went into developing them are presented in Appendix N.

Clinic Structure & Culture. Clinical instructors commented on how they perceived the organizational and social climate of the clinic influenced student engagement, curiosity, and psychological safety.

Clinical instructors posited that an open and welcoming clinic environment with strong interaction and interpersonal connections gave students a sense of psychological safety and an environment in which they felt comfortable interacting with others and asking questions to assist them with their learning. One clinical instructor commented, “I would say that from experience, it feels like the more open a clinic is and the environment is between therapists or anybody else there, the more willing a student is going to be to ask questions or involve themselves without being asked.” While another followed with, “Just the intermingling of colleagues and stuff, if

that's mute from a student's perspective in a normal environment, I think that's more conducive to the student kind of following suit and doing that on their own." One clinical instructor stated that they even believed that upon entering the clinic that students needed an initial warm-up period to help them make determinations regarding the psychological safety of the environment. They remarked, "…there is like almost a warmup period. And I think that's for a couple of reasons. Number one, they're trying to get comfortable in the environment and figure out if they feel comfortable asking questions or like how people are going to view them for asking certain questions."

Clinical instructors also stated that they perceived that the pace and scheduling practices of a clinic influenced the student. One clinical instructor made the comment, "I also think maybe there's a little bit of note about how that specific clinic environment schedules their patients. So, you know, a little bit more rapidly and having a lot of other just a number of vast patients in the clinic can sometimes facilitate good or bad." They stated that a rapid pace and heavy time management needs within the clinic as well as a high learning curve of organizational systems upon entering the clinic led to low levels of curiosity and independent learning initially. One clinical instructor stated it this way, "…it [student curiosity and independent learning] starts a little bit less and gets more as the weeks go on and the experiences increase. I think at the beginning, it's a little bit of that fire hose method, stand in front and try to drink…There's a lot of inputs. The patient and the student are really trying to figure out what this is all about. Like they've been in some different clinics at a time. Like what is this clinic actually about? So I think there's a lot more energy and thought on that in the beginning and it maybe takes away from the student really plugging in and putting in their inputs and stuff like that. But as those things

become a little bit more normal, right, and expected, I think that they're more likely then to increase their kind of attributes and involvement in that process."

Following the initial time in the clinic, instructors stated that they believed that the pace of a clinic may influence curiosity and independent learning in either a positive or negative way based on the preferences and personality of the individual student. One clinical instructor remarked, "[A]s they kind of develop and you're able to talk through things, they you can see the like the clinical reasoning start to build, where they're going to be more inquisitive because they're able to start connecting dots or hopefully they can." Still another stated that they believed that challenges associated with pace and time management in the clinic were similar to time management challenges students experience in the classroom stating, "I think there's some parallels that you can learn and clinical rotations to apply to academia."

Finally, clinical instructors also acknowledged that the organizational culture and institutional policies of the clinic may influence a student's passion for physical therapy. One stated, "…there also may be some system, system kind of organizational kind of structure things that may also play into that…Yeah. I mean, aspects that students aren't going to be like, kind of privy to until you get into it. So like insurance approval, I mean, like all that stuff, like has a big impact." However, they reported that this influence could be either positive or negative based on the unique situation - "So there's, I mean, really everything in the clinic can have a positive or negative impact on it. And even how the company treats their therapist, how the company like, I mean, everything, scheduling, everything."

Clinical Instructor Role & Relationship. Clinical instructors spoke to the perceived influence that a clinical instructor has on a student. Specifically, they discussed how a clinical instructor provides feedback, guides learning experiences in the clinic, and models desirable

characteristics that will influence a student. They recognized the role that they play for the student, “I haven't had a bad experience as a student with feeling like I couldn't do something, but I've definitely heard stories and I try to not be that [clinical instructor] for, like I don't want to be the person that's turning someone into not liking PT.”

Clinical instructors hypothesized that the tone and framing of the feedback they provided influenced students’ confidence, resilience, and perception of their learning abilities. One instructor commented, “I think that as they're given the like affirmations of then whenever they do put input, it just, it typically has a positive relationship on it.” Still another stated, “Yeah, I think it can be between getting positive feedback and being a little bit more involved in perceiving themselves as a positive learner and kind of a like almost like a teammate in the team rather than, oh, this person that is visiting and doesn't have the same things going on. So, I think it's a direct relationship between the two things, right? If it's an environment that's fostering that welcoming and positivity, I think that'll be met well from the students and kind of vice versa in the other direction.”

The clinical instructors also described how support and guidance during clinical challenges can both encourage a growth mindset within a student as well as help them learn to manage stress. One instructor described, “And just making sure that they don't feel like they like failed. Like, because I mean, there are times when you just can't figure it out and that's okay. But as long as you're learning, like, we're good. As long as you're trying.” One clinical instructor even contrasted feedback in the clinic with feedback in the classroom stating, “in the clinic, it's very different than, you know, the palms are sweaty looking at the exam score. What did I get? ...So there was a yes and no that [instructor] has already mentioned, but there's also like a in the clinic world, no, but do it again or no, but do it this way. There's like an immediate feedback that

is not like a red X or like a deduction of points or a, hey, see me next week and we'll try this practical action. So, I think that environment still facilitates some growth."

In addition to feedback, clinical instructors perceived that their own behavior and interpersonal communication with students served to model characteristics such as enthusiasm and passion, motivation for independent learning, and growth mindset. One therapist even equated it with parenting, "Like, I mean, it's just it's just like our kids, right? Like they model if I'm anxious, my kids are going to be anxious, right? If I'm anxious, my students are going to be anxious. If I'm excited, my students hopefully going to be excited too. And so if I can have them reflect my emotion that of them learning something new, even if it is intimidating, even if it is scary, even if it's hard, I want them to be okay with being able to grind into that. And I know it's hard, but it's going to be all right. We're going to figure it out together."

Furthermore, clinical instructors noted that clinical instructors may play a key role in maintaining and developing student passion and motivation through their daily focus and emphasis as well as their ability to connect a students' individual interests to patient care within the setting. One instructor put it this way, "Like, so I think it's upon the CI to make it about the things that we become physical therapists for, right? Like the patient in front of us, meeting those populations that need us the most. things like that. So I really, I think the CI has a big role in playing the effect and what they put emphasis on a daily basis to facilitate that passion for the student."

Finally, clinical instructors reported that they may facilitate a student's value, resilience, and motivation for independent learning by selectively choosing the experiences with which a student participates within the clinical environment. One clinical instructor described it like this, "And then also willingness of the CI to kind of facilitate that and try to push them into like

moving towards it, whether it be like hands on stuff, like, hey, I know you don't really know everything about this, but like, let's talk through it together. Would it cause them to go look into more stuff so that they're able to do it too." Clinical instructors mentioned that placing students in a challenging situation while simultaneously providing them with encouragement and support seems to help them develop self-efficacy and resilience. One therapist provided an example, "I have this moment I've had with a few of my students where they're doing an eval and I'm kind of like standing back and they'll just kind of like slowly turn around on their chair and just look at me. And I'm like, what's going on? And then they're just like, I don't know. And that's a moment where you're like, okay, like I need to dig them out of this hole. Because like we put them, we put them in the deep end kind of sometimes just so that they can like see how it feels and then you can like help them out of it. Because that's, I mean, that's what it's for. That's where them, they're supposed to get their mistakes out."

Professional Roles & Challenges. Clinical instructors also commented on how the clinical learning environment shapes a student's understanding of professional roles, responsibilities, and challenges. This understanding in turn may influence a student's curiosity, growth mindset, resilience, or motivation.

Although clinical instructors did not perceive that a students' view of their own intelligence and learning ability changed over the course of their clinical experience, they did feel that the environment allowed students to develop a better understanding of their professional roles and responsibilities in real-world environment. Clinical instructors thought that this could lead to either increased or decreased passion within a student. They stated, "Could be, again, positive or negative, depending on the environment. And I think that means a whole lot for this discussion. [Another clinical instructor] mentioned documentation. That is a big look behind the

curtain for students sometimes. Like, what is it actually like? Because we get taught this lecture about, I don't know, web PT or whatever. I don't even know who is this, right? But if that is the focus and forefront of like the clinical rotation, I learned about that the perception of that, like that would rob me of some passion, right?" In particular, they stated that the match between a student's developing professional identity and the experiences available to them within the clinical setting may influence the value the students attribute to the clinical environment and thus how those experiences influence their passion. One instructor related this to potential future employment, "This is something I think I observe more in the students who are in their later rotations, but they kind of start to look at themselves in a way of like, do I fit in this environment in the sense of employment? I think characteristics of the clinic kind of make that a little bit more of an identity for them. So, I think that is pretty important for this conversation to mention as well." While another put it this way, "But I do get what [another clinical instructor] is saying, because like if, thinking back to me in school, I had already had a job in mind by the time I was on my 4th rotation. So, it's like, yeah, I'm here and I'm going to learn. But like, I don't really need to be like 100% in right now. Like as long as, you know, I'm studying for boards, like I have a lot of going on."

In addition to professional roles and responsibilities, clinical instructors stated that the clinical environment exposes students to particular challenges. Clinical instructors state that challenges in the clinical environment differ from those within the classroom environment. They see it this way, "Yeah, I think on a small scale, I can answer the question of sometimes there's a separation between clinical judgment in the clinic and what is necessary to pass a board exam. So, I kind of bring that to the forefront at the beginning with the student, right? And be like, hey, in the clinic, this is what you're going to see us do and this is how I usually do it. However, like

your textbook is going to be this way and this is what you need to know." They also perceive that clinical challenges for students are primarily attributable to their participation in direct patient care. They postulate that these patient care challenges increase a student's motivation and engagement for independent learning. One clinical instructor added, "Higher complexity is going to drive the student to need to feel more prepared."

Patient Relationships & Care. Correspondingly, clinical instructors suggest that the relationship a student develops with the patients and the care they are tasked with providing influences a student's motivation, learning, and emotional investment.

First, clinical instructors reported that the ability to actively engage in patient care influenced a student's passion, motivation, and independent learning. However, they also hypothesized that this influence was mediated by a student's relationship with the patient. They stated that strong rapport with a patient appeared to increase student investment in their care and thus their motivation for independent learning while interacting with patients who are not engaged in their own care may decrease that student investment. One faculty described it like this, "I think as you get patients who are more open, you're just going to be like, it's like picking a favorite kind of. I think everybody does it. Like that's the person who you're thinking, like, what can I do with them tomorrow? And they're like, for sure, I can think of a few instances where my student was like, I was thinking about this last night and I would about this and this. And then we have a conversation about progressing, regressing, stuff like that. But if a patient isn't bought into it and just isn't vibing with it, I don't see my student doing a lot of extra research on it." While another added, "I think it was another personality conversation we can have about this. I think it was true with clinicians as well. Like you said, like if we just like people, I think we pour into them a little bit more. You know, if we have a good rapport with them, that's usually

better clinical outcomes than me in the end anyway. So yeah, I do think that facilitates the desire from a student's perspective to look into different sources to pull out some of the aspects of clinical care."

Although clinical instructors recognized that unexpected patient care situations may cause students stress, they also provide them with an opportunity to engage in clinical reasoning and decision-making that often requires independent learning. One clinical instructor reported, "I noticed that the students I had tend to engage more, whether it be like following people on Instagram that are in PT or like, because they're trying to do their own research and find stuff for the patients that I give them, they're going to end up looking more into stuff because they know they need to find stuff to apply in clinic. So, I feel like there's a upward trend on them looking into stuff during clinicals." Moreover, clinical instructors thought that a diversity of patients and patient care experiences even further contributed to this influence and the ability to immediately apply newly gained knowledge was valuable for students.

Despite these potential benefits, clinical instructors raised concerns about how to best integrate this type of learning with the type of learning that students may experience in the classroom environment. One therapist stated, "Boy, that's the that's the $1,000,000 question. It's like, how do we mesh didactic learning to clinical learning, right? Because it's hard, because I mean, that NPTE [National Physical Therapy Examination] exam is, I mean, it's black and white, right? It's like there's a most correct answer or a most incorrect answer. And with clinical life, as the other people on here would probably agree, it's like most of our world is gray, right?...Yeah, because it's hard, right? Because whenever you whenever they're having to do multiple choice on exams, it makes it really hard to have that gray area…And how that all kind of flows together, it's hard. It's hard to maneuver that."

Research Question #5: To what extent do the perceptions of current PT students in the program regarding the influence of the learning environments on their MAL characteristics align with quantitative measures of those characteristics and the perceptions of faculty who contribute to those learning environments?

Classroom Environment. Students' perceptions surrounding the influence of the classroom environment on their characteristics of curiosity, growth mindset, resilience, and motivation occurred around four major themes: External Demands, Content, Social Interactions, & Personal Environment. In regard to external demands, students described the classroom learning environment as one filled with externally imposed goals and pressures. Motivation was often tied to grades or fear of failure and some students linked their self-worth to academic performance and described a mindset of survival. This theme appears to be supported by the measures of students' MAL characteristics which demonstrated a high level of extrinsic goal orientation at timepoint #1 which came near the end of a full year in the classroom environment. Furthermore, this extrinsic goal orientation appeared to decrease upon entering the clinical learning environment only to increase again upon returning to the classroom. Additionally, the academic faculty strengthened this finding as they acknowledged the performance-based mindsets of students. Furthermore, they noted that passive, lecture-heavy environments seemed to suppress a student's curiosity and intrinsic motivation while simultaneously stating that there were barriers to providing more individualized and active instruction.

When further considering this evidence together, it appears that the strategies that academic faculty believe they are taking may not be actually increasing students' intrinsic motivation. Although faculty and students described some similar positive influences such as new and unfamiliar content as well as making personal and relevant connections with classroom

topics, academic faculty mention several other instructional strategies such as problem-solving, active learning, modeling, and opportunities for reflection that are not mentioned by the students. Additionally, although faculty mention small groups as a potential positive support for students in the classroom environments, students tended to focus more on the comparisons they made with their peers than the support they provided.

Finally, students and academic faculty also appeared to agree that the pressures created by overlapping activities, assignments, and assessments influence the students' MAL characteristics in a negative way. However, despite the hypothesis made by faculty that these pressures would result in an increased ability to handle pressures, scores of resilience and perseverance of effort remained relatively consistent across all timepoints measured.

Clinic Environment. Students' perceptions surrounding the influence of the clinical environment on their characteristics of curiosity, growth mindset, resilience, and motivation occurred around three major themes: Personal Responsibility for Patients, External Demands, and Social Interactions. Students and clinical instructors alike reported that the clinical learning environment helped clarify professional goals and increased intrinsic motivation, curiosity, and independent learning through the connection to patient care. Despite these reports and although a decrease in extrinsic goal orientation was noted upon entering the clinic, the students' intrinsic goal orientation, social medical curiosity, and observable MAL behaviors remained stable across all timepoints of the classroom and clinical learning environments.

Additionally, both clinical instructors and students reported the idea that the clinical environment enhanced growth mindset through the reframing of mistakes as learning opportunities and positive encouragement via interactions between students and clinical

instructors. However, despite this fairly universal report, no significant changes were noted in the measure of students' growth mindset.

Transition Between Environments. Students' perceptions surrounding the influence that the transitions between environments has on their characteristics of curiosity, growth mindset, resilience, and motivation occurred around four major themes: Shifting Motivation, Changes in Learning Strategies, New Perspectives on Peer Influence, and Shifting Stressors. Students and academic faculty reported an eventual return to externally driven demands and pressures upon returning back to the classroom environment from the clinical environment. This seemed to be supported by the measured increase in extrinsic goal motivation that occurred during this same timeframe.

Both students and clinical instructors also discussed the period early in their transition from the classroom environment to the clinic environment as one of high cognitive load, adjustments to new organizational structures and policies, and changing professional identity. Measurements of MAL characteristics support this notion as both control of learning and self-efficacy of learning appear to decrease over the transition from classroom to clinic. However, this is also accompanied by a rebound increase by the end of their clinical experience. That appears to align with the comments by clinical instructors that there is a warmup or transition period that is followed by a maintenance or increase in MAL characteristics.

Chapter 5: Discussion and Conclusion

Classroom Environment

Results of this study showed that, in the classroom, students perceive that external demands, the content, and their social interactions all influenced their MAL characteristics. These perceptions seem to align with both measures of students' extrinsic motivation as well as perceptions of academic faculty. Furthermore, it appears that the presence and influence of these environmental factors is consistent with current theories related to SDL, MAL, and motivation.

External Demands

First, the aspects of external demands, content, and social interactions all appear to align with the social and organizational components of a learning environment as described within the MAL framework (Gruppen et al., 2020; Regan et al., 2022). The external demands, as described by participants in the current study, appeared to largely focus around demands created from organizational structure. Additionally, the content or topics discussed within a learning environment appeared to be predominantly generated by the curriculum, which is a part of the organizational structure of the learning environment as well. The influence of content appeared to have further influence on the learner and their characteristics due to the impact that domain-specific development from past experiences can have on the learner through its contributions to existing knowledge structures, attention, and motivation according to the MAL framework (Appendix C). Finally, social interactions described by participants such as those with faculty and peers align with the social component of learning environments described by Gruppen and colleagues (2020) as it represents the influence that interpersonal relationships of an individual have on that individual's engagement in the MAL process.

Results of this study also suggest that external demands in the classroom such as assessments, assignments, and class-related activities, led to decreased motivation to engage in independent learning as well as negative stress and emotional responses. Despite creating a potential motivation barrier to independent learning, students even described having to "self-motivate" to meet this externally imposed demands. Students and faculty also described that this seems to contribute to fatigue and burnout when experienced by students over a prolonged period of time. Furthermore, these external demands seem to be different when in the clinical environment.

Regan and colleagues (2022) similarly found that goal setting varied by the type of learning environment. The classroom learning environments described in this study driven by externally imposed goal structure aligns with the history of PT programs within university settings. As previously mentioned, universities were historically built on a scholar academic ideology and during the time of transition of PT programs from their hospital-based roots to their current academic-associated structures, the scholar academic ideology was at a high point of influence within education and society (Schiro, 2013). Therefore, it is likely that this scholar academic foundation may be continuing to contribute to the shaping of the classroom learning environment by its focus on these externally imposed goals.

Students in this study described that the externally imposed demands of the classroom environment led to a motivation for learning that was generated by a sense of compliance, grades, and a maintenance of their competency as seen by their peers and others. Therefore, within SDT, students' motivation appears to be not only extrinsic but also at the lower end of extrinsic, falling into the external regulation or introjection categories (Ryan & Deci, 2020). Furthermore, several authors have found that having an adequate time for reflection and

independent learning may be associated with engagement in the SDL/MAL process (Auerbach et al., 2020; Hauer et al., 2018; Regan et al., 2019). Students and faculty in this study described time constraints within the classroom environment as one of their perceived external demands. Thus, further evidence of the negative influence that the classroom environment may have on engagement in the SDL/MAL process and development of skills associated with adaptive expertise.

In addition to students reporting externally imposed goals and demands, they also reported being motivated to comply with them. From a SDT standpoint, it appeared their need to appear competent to themselves and others superseded the lack of autonomy they were experiencing. When viewed from an SEVT perspective, it seemed as though students held an identity that was based on their grades and school-based performance, therefore high levels of attainment value appeared to be enough to supersede the effort, emotion, and opportunity costs of the externally imposed demands. However, the sustained motivation toward these externally imposed goals appeared to take a toll on the participants. Students and faculty alike reported that students experienced things such as burnout, fatigue, and decreasing motivation over prolonged periods of time within the classroom environment. Recently, Heissel and colleagues (2021) demonstrated that high-stakes external goals and pressures such as assessments may lead to increased cortisol levels in students. Students in the current study described a sense of high-stakes pressures across all of the perceived externally imposed demands of the classroom environment. Therefore, students in this study are likely experiencing consistent and prolonged elevations in their cortisol levels. These elevations are likely to not only contribute to burnout and fatigue but have also been associated with decreased memory and recall, learning and retention, hand-eye coordination, impulsivity control, and cognitive flexibility (James et al.,

2023). Thus, these external demands may be contributing to burnout and fatigue as well as inhibiting learning and growth. Furthermore, Zhang and colleagues (2024) discussed how the perceptions of academic stress and high performance expectations such as the ones reported in the current study may lead to negative learning strategies in healthcare students such as the increased use and overreliance on artificial intelligence. This may further lead to lower levels of creativity needed for ill-structured problem-solving and adaptive expertise within the healthcare environment (Zhang et al., 2024). Together, this provides evidence that a consistently high-stakes environment may not only be hindering motivation, but also other cognitive functions that are critical to perform as a PT and particularly one with high levels of adaptive expertise which is considered the primary goal by proponents of the MAL.

Despite the reports of these externally imposed demands within this study, it still seems as though that goal structures within the same learning environment may be influenced by the perceptions of the individual student. In another study by the same author of the current study, students within the same PT program but specifically identified for frequently engaging in independent learning reported that they intentionally sought out and developed personal and professional relevance of imposed content and activities thus increasing their perceived utility value and a more intrinsically oriented motivation (Williams & Hennessey, 2025). Thus, it appears that goal structures within the classroom environment may depend on the perceptions and previously developed skills of the individual student. Students who have developed reframing strategies from previous experiences may be the most likely to develop performance mastery level goals and intrinsic motivation from apparent externally imposed demands within the classroom environment.

Given these results, it appears that faculty and administration who help develop the classroom learning environment may need to make modifications to increase students' intrinsic motivation and develop the skills associated with SDL and ill-structured problem solving. This may require faculty to break with traditional philosophies such as scholar academic ideology and develop more learner-centered approaches. Several such strategies have been promoted. Hernandez and Judd (2025) received positive feedback from PT learners regarding the use of an "ungrading" approach designed to increase student engagement, reflection, and self-regulation skills. Although promising, future studies should explore the influence that this type of approach has on the components of student motivation as well as skills associated with the MAL to determine if this is a successful strategy in changing student perceptions related to externally imposed demands. Other authors have promoted the use of competency-based education as a means of providing more learner-centered education and progression (Timmerberg et al., 2022). Such an approach would allow students to focus on the development of skills within particular areas at their own pace and in alignment with their own prior experiences. However, such an approach still requires students to develop intrinsic motivation to engage with material and topics that are determined to be competencies but do not align with individual student interest.

Developing curriculum based on external competencies and standards presents a challenge for faculty in establishing a truly learner-centered classroom environment. Competencies, objectives, and knowledge standards have not been developed to externally impose demands on students but instead have been created to provide protection for a public that receives their services and care. This protection has led to program accreditation requirements as well as the requirement to pass a National Physical Therapy Examination to achieve licensure upon graduation. Therefore, students should and will likely continue to face these externally

imposed standards. Thus, to meet the challenge of developing intrinsic motivation in students for external standards while simultaneously creating individualized growth and development toward SDL and MAL skills, faculty will likely need to focus on integrating innovative strategies into the classroom environment that help students reframe motivation toward more intrinsic motivation for independent learning and engagement in ill-structured problem solving.

First, the use of alternative instructional design models such as the Four Component Instructional Design (4C/ID) model may provide a means to help reframe their motivation. The 4C/ID model is a model developed by van Merrienboer and colleagues (2022) which focuses on designing instruction based on whole-task real-world complex situations that are organized in a simple to complex sequence with appropriate scaffolding. It involves four components: real-world learning tasks, repetitive part-task practice that allows the learner to develop routine automated skills, appropriately scaffolded supportive information, and just-in-time information that provides the learner with procedural information presented at the exact moment it is needed. This model has been promoted as an instructional design that helps support the development of adaptive expertise through its focus on complex real-world problems, the development of routine and automated expertise, and the development and transfer of schemas to support ill-structured problem solving (Costa et al., 2022; Kalyuga et al., 2010; Verheyden et al., 2011). Although this design was developed through a cognitivist lens, it may help support an internalizing shift toward intrinsic motivation in students. The model is a more learner-centered approach by granting students the autonomy to explore within the boundaries of the task. Furthermore, the application to real-world problems theoretically should help students find increased value in the knowledge and information being learned. Finally, an approach such as the 4C/ID model may allow for an increased focus on informational feedback as opposed to the controlling significance of feedback

communicated strictly by grades (Ryan & Deci, 2020). This combination of increased autonomy, increased value, and decreased perceived pressures from feedback may lead to the internalization of motivation for SDL and ill-structured problem solving within the classroom environment (Ryan & Deci, 2020).

Given that students reported an increased and more internalized motivation in the clinic environment based on an apparent emotional connection to real-world patients, faculty may also consider other instructional strategies to supplement design such as the 4C/ID approach to further enhance the internalization of motivation for SDL and ill-structured problem solving. First, incorporating real-world patients into classroom instruction may help facilitate this internalization. As mentioned, students appeared to be driven by a component of relatedness and emotional connection to patients and their care in the clinic environment. Classroom faculty may utilize this by centering real-world situations within the 4C/ID model not only on paper cases, but on real patients with whom the students interact and build relationships. However, it is recognized that this may provide organizational and logistical barriers to instructional design given the situation of programs within academic institutions. Studies within the field of immersive virtual reality have shown that the tool may provide for an increase in emotional connection and empathy when used as a learning environment and it allows for potential mistakes and subsequent feedback that may not be acceptable in real-world applications (Hamilton et al., 2021). Therefore, future studies should explore whether such a tool, when combined with instruction related to real-world tasks, may be an effective means to enhance internalization of motivation similar to the connections experienced in a clinical environment. Additionally, interventions such as the Teaching for Transformative Experiences in Science (TTES) model by Pugh (2002), have shown to potentially increase enjoyment and intrinsic

motivation for students in higher education contexts (Heddy & Sinatra, 2013). Therefore, using a model such as this to promote active use of learned concepts, the expansion of perception of those concepts, and an increase in value for those concepts through their connection to real-world experiences may further support or enhance instruction within the classroom environment in a manner that leads to the internalization of motivation for SDL and ill-structured problem solving.

Content & Social Interactions

In addition to external demands from the classroom environment, students and faculty both reported on the apparent large role that the content itself influences a student's motivation toward independent learning and ill-structured problem-solving. Students and faculty alike reported that new or unfamiliar content as well as content that had personal connection to students appeared to increase their motivation for independent learning and exploration of topics. These findings appear to align with the Four-Phase Model of Interest Development in that triggered and maintained situational interest can be facilitated through surprising information, personal relevance, and personal meaningfulness (Hidi & Reninger, 2006). Students and faculty both reported that for a period of time following their clinical experiences, that students seemed to have an increased motivation for independent learning that was driven by an increased value for the information being presented due to its potential relevance to patient care. Thus, appearing to align with meaningfulness, personal involvement, and/or stored value that characterizes either maintained situational interest or emerging individual interest. Additionally, these findings align with the concepts of utility value and attainment value as described in SEVT. Specifically, students appear to develop an increased value for the information and how it relates to both their

ability to treat patients in the future as well as the personal goals and sense of self that students develop surrounding the type of therapist they want to become (Eccles & Wigfield, 2020).

Both students and faculty reported a social influence on the motivation of students to engage in independent learning and problem solving. However, the focus and perception of this influence differed somewhat between the two groups. Students focused on the increase in motivation that comes from social interaction with faculty and other PTs, particularly outside the classroom setting due to the physical therapy related topics contained within those discussions. The increase in motivation created from specific topics and content appears to align with the concepts of interest and task value as previously discussed regarding motivation from specific content. Regarding relationships with their peers within the classroom environment, students appeared to focus on comparisons with others and how those comparisons influence their self-evaluation. These comparisons, along with the students' discussion related to performance feedback in the form of grades, appeared to align with the formation of self-efficacy through social comparisons and subsequent cognitive appraisals as outlined in social cognitive theory (Schunk & Meece, 2005). Given the conceptual relationships between self-efficacy in social cognitive theory, competence in SDT, and expectancies for success in SEVT, these comparisons likely influence a student's motivation in either a positive or negative manner based on their cognitive appraisals. This may explain the report from faculty that small groups created either through coursework or socially may help foster collaboration, reduce anxiety, and support self-assessment, but also may negatively influence students' engagement. This finding aligns with reports of previous studies that students who seemed to engage in the MAL process more often than their peers tended to report intentionally developing social groups and communities of

practice that would allow for organic interactions that supported their engagement in independent learning and ill-structured problem-solving (Regan et al., 2022; Williams & Hennessey, 2025).

Academic faculty should consider how they can leverage the motivating nature of content and social interactions to develop classroom learning environments that support motivation and engagement of students in SDL. Faculty should continue to provide content in a manner that focuses on its personal relevance to the students. Faculty should also consider how they present feedback to students and strive to do so in a manner that provides cognitive appraisals consistent with a growth mindset and encourages intrinsic motivation (Fong & Schallert, 2023; Koenka, 2020b). Furthermore, faculty may be able to use social cognitive theory to both develop the make-up of intentional social groupings as well as to help students develop healthy attributions for their comparisons so that they may reframe them in a manner that supports motivation (Schunk & Meece, 2005).

Clinic Environment

Historically, the physical therapy clinical education environment developed based on an ideology consistent with the social efficiency model that purported education should aim to develop a person's ability to perform specific skills in as efficient manner as possible. However, this study supports that the social efficiency ideology that initially shaped the physical therapy clinical education environment may have evolved over time. Although the clinical education environment continues to revolve around active engagement, maximizing feedback, and creating a motivating environment, students and clinical instructors in this study did not mention the development of specific learning objectives, the use of a formal assessment, or a focus on feedback as a means to communicate a right-wrong nature within a stimulus-response pairing within the clinical education environment. Students and clinical instructors did, however,

describe an attempt to focus on what was most meaningful to the student as well as using feedback as a means to stimulate individualized meaning and growth within each student. These factors appear to be more consistent with a learner-centered environment. The potential influence of these different curricular ideologies and the students' transition between them is discussed later.

Results of the current study show that, in the clinic, students perceive that external demands, the personal responsibility for patients, and their social interactions all influenced their MAL characteristics. These perceptions seemed to align with the perceptions of clinical instructors as well. Furthermore, it appears that the presence and influence of these environmental factors is consistent with current theories related to SDL, MAL, and motivation.

Personal Responsibility for Patients

Students and clinical instructors alike reported that taking on personal responsibility for a patient's care appeared to increase their motivation for and persistence in SDL. This is consistent with a study by Regan and colleagues (2022) who reported that students within their study conveyed that being empowered by a senior team member to take on personal responsibility and ownership for patient care decisions was a driving force for their engagement in the MAL process. Students in the current study described a sense of emotional and ethical responsibility to patients and that ownership over patient care decisions served as a means of self-evaluation and a reframing toward a growth mindset. Additionally, they reported an increased value for the immediate application of new knowledge that occurred through their patient care responsibilities. Several of these factors align with the findings of Regan and colleagues (2022) as well who reported that patients motivated students to learn through an internal sense of responsibility to their patients, the view of learning as a life-long pursuit, and the management of negative

emotions such as shame or guilt for inadequate knowledge. However, participants in that study also shared that patients provided a means by which to connect knowledge and information that served to enhance the learning and recall of information (Regan et al., 2022), a perception not reported by participants in the current study.

Based on its significant impact on motivation and persistence, personal and direct responsibility for patient care should continue to be a cornerstone of the clinical education environment. Clinical instructors should provide opportunities and empower students to take this responsibility. This study did not provide a clear picture of whether or not clinical instructors feel like they have the training to appropriately manage this aspect of the clinical environment. Therefore, it may be beneficial for the academic program to explore whether or not such training would be beneficial for clinical instructors.

Social Interactions

Students described relationships and emotional connections with both patients and clinical instructors as influencing their motivation, growth mindset, and resilience. The emotional connections they developed with patients drove independent learning and persistence as described previously. Additionally, students described their relationships with their clinical instructors as providing a source of accountability, encouragement, and guidance that helped them reveal knowledge gaps, manage stress, and reframe toward a growth mindset. The influence of these relationships appears to align with the concept of relatedness within SDT (Ryan & Deci, 2002, 2020). Comments from both students and clinical instructors were consistent in that a sense of belonging and community within the environment increased motivation and resilience. These results align with research in other types of students such as medical students who saw trusted sources and relationships as a means to provide expertise,

uncover knowledge gaps, offer opinions and advice, and/or provide feedback that facilitated engagement in SDL and MAL processes (Regan et al., 2022; Sawatsky et al., 2017).

Cutrer and colleagues (2018) describe coaching as a special component of the learning environment that can be utilized to facilitate a student's engagement in MAL processes. They hypothesize that a coach may help stimulate reflection, maintain focus, provide feedback and accountability, internalize values consistent with the MAL, help calibrate self-evaluation, and model MAL behaviors (Cutrer et al., 2018; Deiorio & Juve, 2020; Hauer et al., 2018). Other authors suggest that this coaching relationship is maximized when the relationship is able to provide a sense of mutual trust and respect that creates an environment of psychological safety (Auerbach et al., 2020; Cutrer et al., 2018; Liu & Sullivan, 2021). Comments by both student and clinical instructors in the current study suggest that clinical instructors can serve as coaches and create psychologically safe learning environments within the clinical learning environment. Finally, this appears to be in contrast to how students and academic faculty described the classroom learning environment. It appears that the more individualized mentorship approach of the clinical environment along with a lack of technological barriers that were described in the classroom environment may help facilitate this view of the clinical environment being more psychologically safe. However, future research is needed to determine if this is the case as well as strategies that may be used to increase psychological safety within the classroom environment.

The Physical/Virtual Clinical Environment

Although academic faculty discussed the physical/virtual environment in regard to its influence on student characteristics with a particular focus on distance education and academic technology, neither students nor clinical instructors discussed any aspect of the physical/virtual clinical environment. This aligns with similar studies in medical residents where participants did

not comment on the physical/virtual environment (Regan et al., 2022). Therefore, it remains unclear if the physical/virtual environment plays a role in influencing students' motivation, growth mindset, curiosity, and resilience in the clinical environment or if there are aspects of influence that have yet to be uncovered. Future studies may look specifically at the physical/virtual environment to help clarify its influence in both the classroom and clinical environments.

Transitions Between Environments

Authors have reported that challenges may exist in engaging in SDL or MAL processes across transitions between organizational learning environments such as that of the classroom and the clinic (Cutrer et al., 2018; Regan et al., 2022). The current study appears to support this notion as students, academic faculty, and clinical instructors all commented about these transitions.

Students and clinical instructors within the current study reported challenges for students and their engagement in SDL/MAL processes upon entering the clinic from the classroom. They reported that students were challenged by the pace, schedule, and responsibilities of the new and unfamiliar environment. Measurements taken in the current study also showed a reported decrease in students' control of learning and self-efficacy for learning during their initial time in the clinic prior to increasing by the end of their clinical experience. Regan and colleagues (2019, 2022) have reported similar challenges and hypothesized that increased cognitive load, decreased time, and reliance on poorly developed self-assessment skills may contribute to these challenges.

The transition between the clinical environment back to the classroom environment appeared to be marked with a wider variety of perceptions as compared to the transition between the classroom and clinical environment. Academic faculty and students reported aspects of the

learning environment as both facilitators as well as barriers for engagement in independent learning during the transition time back to the classroom. However, participants consistently reported a return to extrinsic motivators over time following transition back to the classroom. This aligned with measures of extrinsic motivation which increased following a return back to the classroom. To our knowledge, no other studies have discussed this transition from the clinic back to the classroom environment.

In addition to the aforementioned challenges of cognitive load, decreased time, and reliance on poorly developed self-assessment skills, the current study brings to light the potential for challenges being created by variations in curricular ideologies across the transitions between learning environments. It is possible that students are impacted by implicit curriculum that is being generated by one particular ideology in the classroom environment and then having to adjust to another implicit curriculum created by another ideology in the clinical environment and then back again. Furthermore, transitions in the two types of environments reflect changes and transitions in the social environment which appears to be critical in many ways to students' engagement in SDL/MAL processes. Although Schiro (2013) discusses how educators may change their curricular ideological stances over time, it appears to remain unclear how transitions and shifts back and forth across curricular ideologies are experienced by students themselves. This study appears to provide some preliminary evidence in this regard. However, future studies should investigate these ideologies more specifically and how they are experienced by both educators and students across different learning environments.

Perceptions as Reality

Previous studies have shown that alignment between perceptions of teachers, actual learning environment related behavior, and the perceptions of students may not always exist in

regard to motivation (Asadpour et al., 2025). The current study corroborates this finding as reports from students did not always align with reports from clinical instructors or academic faculty. Additionally, all three groups seemed to propose that a particular aspect of the learning environment may not only be perceived differently by different students but also lead to apparently opposing beliefs or behaviors. Participants in this study reported that these differences in perceptions may be attributed to trait characteristics of the student or be based on their individual previous experiences. This finding highlights the challenges in developing learning environments that positively influence MAL characteristics in all students as well as the potential benefits of an individualized, long-term, teacher-student relationship such as that seen in the clinical environment.

Trustworthiness

Within qualitative or mixed-methods research, trustworthiness has been described as the worthiness of the research and whether the claims made from it are warranted (Levitt et al., 2016). Four different criteria have been described as being useful for evaluating the trustworthiness of a qualitative investigation: (1) credibility (the confidence in the truth and interpretations of the data), (2) dependability (the stability/reliability of data over time and conditions), (3) confirmability (the objectivity of data analysis), and (4) transferability (the extent to which findings can be transferred or have applicability to other settings or groups) (A. P. Alexander, 2019).

In the current study, several techniques were used in study design and analysis to maximize trustworthiness. First, triangulation has been described as a technique to help support both credibility and confirmability (A. P. Alexander, 2019; Patton, 1999). Triangulation is the use of multiple methods or perspectives to provide confidence in data interpretation and limit

subjectivity within data analysis. Patton (1999) describes four different types of triangulation to enhance credibility and confirmability. Methods triangulation is the use of different data collection methods. In this study, both qualitative and quantitative data through a mixed-methods design were used to provide methods triangulation. Next, triangulation of sources is the consistency of different data sources within the same method. In the current study, three different qualitative data sources were used (students, academic faculty, and clinical instructors) as a means of triangulation of sources. Additionally, student qualitative data was collected from two different cohorts which provides some triangulation of sources as well. Analyst triangulation is the use of multiple analysts to review findings. As described below, all qualitative analysis was performed by two different analysts who then collectively met to discuss and agree upon the findings. Finally, theory or perspective triangulation is the use of multiple perspectives or theories to interpret the findings. The discussion section of this paper demonstrates this approach. In addition to the four types of triangulation described by Patton (1999), A. P. Alexander (2019) describes the use of time triangulation. This is the collection of data from the same people at different timepoints. In the current study, students participated in focus group interviews across four different timepoints. Although each timepoint had its own focus, students had the opportunity to communicate expanding or divergent information relative to the discussion at their subsequent timepoints and many comments demonstrated that students took advantage of this opportunity.

In addition to triangulation, A. P. Alexander (2019) describes other strategies to help establish credibility, dependability, confirmability, and transferability. Peer debriefing is described as a strategy to help enhance credibility. This approach was also utilized throughout the course of the study as the primary investigator and their mentor met regularly to discuss the

methods, data collection, results, analysis, and interpretation. A. P. Alexander (2019) describes an audit trail and inquiry audits as means of supporting confirmability and dependability. An audit trail is the systematic collection and storage of materials and documentation associated with a study. For the current study, all study materials including interview guides, interview recordings, interview transcripts, line-by-line coding, codebooks, raw quantitative data, and quantitative datasets have been retained in their original forms. Previously mentioned meetings between the investigator and their mentor served as a form of an inquiry audit and all data described previously can be used for any future external inquiry audit. Finally, A. P. Alexander (2019) recommends the use of think description to support transferability. The current study attempted to provide in-depth, rich descriptions of the program, its students, and its clinical instructors so that readers could make their own determination regarding the transferability of this study to their own context.

Limitations

Despite the findings of this study, several limitations do exist. The most significant of these limitations appears to be a small sample size of students, particularly for the longitudinal survey data, where only 11 students completed all timepoints despite 91 beginning the initial survey. Some of this may be due to survey length or the nature of the questions as evidenced by only 80% of students completing the initial survey who began it. Furthermore, there appeared to be a significant drop in response after students began their clinical experiences. This is in line with what academic faculty typically experience as the autonomy and time demands of the clinical experience along with the voluntary nature of responses to academic faculty often result in decreased communication and disconnect with academic faculty during these timeframes. The limited ability to detect changes in measured MAL characteristics due to this small sample size

may raise concerns about the generalizability of the results. However, there appears to not be any significant differences within demographics between the initial sample and the summary programmatic data of all students with the program. Furthermore, no significant differences were found for survey responses between participants who completed the full survey across all timepoints and those that only completed a survey at a single given timepoint. Therefore, it is possible that in spite of the small numbers, the participants who did complete the survey across all longitudinal timepoints are representative of all students within the program. Finally, the authors recognize that given the nature of the study, the generalizability outside of this single PT program is likely limited.

Small sample size also contributes to limitations of interpretation of the data of observed student MAL behaviors. Although this was programmatic data, access to the data was challenging. The additional IRB requirement of including a second consent to access programmatic data resulted in a significantly decreased number of students providing consent on the second form compared to the initial study consent documents. This was likely due to the need to e-mail this consent separately and after the students had entered the clinical environment. Additionally, even when both consents were obtained, it did not guarantee that the clinical instructors had completed the full survey across both timepoints which further limited the data.

In addition to the small sample size, the timing of data collection may have also influenced results. Although the initial point of data collection was intentionally chosen to coincide with an extended period of experience within the classroom environment so that students would have a rich history of experiences on which to comment, responses within the study revealed that this timeframe may represent a time of considerable fatigue generated by an extended period of external demands. This may not only have influenced survey response rates

but also may have created more negative responses during focus group interviews regarding the classroom environment than if focus group interviews had occurred at another time within the year-long classroom environment timeframe. In addition to providing clearer interpretations of data, a more prolonged period of engagement with the students may have improved the trust and rapport that students had with the focus group facilitator and thus potentially creating more candid responses and further enhancing the credibility of the study. However, additional data from both survey and focus group interview were collected following return to the classroom environment which represents the beginning of the year-long classroom timeframe.

Saturation is described as the ability of data to contain all the information necessary to answer the research questions (Lowe et al., 2018). As opposed to theoretical saturation as discussed in grounded theory, thematic saturation is achieved when further observations or analysis do not reveal any new themes or provide additional data to help answer the research questions (Low et al., 2018). In the current study, it does not appear that full thematic saturation occurred, particularly the student and clinical instructor focus groups. This is primarily due to both a small number of participants within those focus groups as well as a lack of follow-up probing questions by the interview facilitator of the student groups. These were unfortunate limitations that occurred despite significant recruitment and reminders sent to potential focus group participants as well as training supplied to the student interview facilitator. Due to this lack of saturation, it is possible that some perceptions of students or clinical instructors were not included in this study. The academic faculty focus group did not face the same limitations as a majority of the academic faculty were able to attend and contribute to the focus group interview. However, thematic saturation in all groups may not have occurred due to a lack of member checks. Member checks allow investigators to present the emerging interpretations, categories,

and themes to the participants so that participants may provide reaction and response (A. P. Alexander, 2019). This reaction and response ensures that interview data has been interpreted appropriately as well as allowing participants to contribute any new or additional insights that further develop the themes. Since member checks did not take place in this study, limitations to accuracy of interpretations and thematic saturation exist thus providing limitations to the studies credibility. However, analysis and reporting of the qualitative data was able to generate categories and themes and these categories and themes were supported by the various triangulation components of the study.

Finally, although this was a mixed methods study, it did rely on self-report data. Therefore, social desirability or retrospective bias may influence the results. Investigators attempted to minimize this possibility by using interviewers with no direct relationship to the participants within the focus groups and collecting survey data in an anonymized fashion in the absence of any of the investigators. Additionally, the study did not include any observation of the actual learning environments. As discussed previously, educator and student perceptions may differ from what is actually occurring in the environment. However, we hope by including perceptions of academic faculty, clinical instructors, and students and triangulating these with one another during analysis that this limitation may have been minimized.

Future Research

To the knowledge of investigators, this study represents the first study to explore the influence of context and learning environment on motivational factors in a single cohort of students across multiple and changing environments. Although motivation research has recently explored the contextual nature of motivation, studies have often focused on motivation within a single domain, and these domains have typically revolved around topics or subjects within

undergraduate or K-12 education. PT education provides a unique situation in that it represents a transition between traditional school-based learning and adult learning and places students in learning environments that change over the course of the curriculum. Additionally, PT itself consists of a variety of practice specialty areas of practice. Therefore, PT education provides multiple layers of context in regard to motivation including PT topics in general, PT topics within a specialty practice area, and/or the motivation for learning itself. Therefore, future research should continue to explore motivation in several of these areas. More studies are needed to help better understand motivation and motivational factors within adult learning. This may be particularly true for healthcare professions such as PT where adult learning is considered such a critical skill for the profession.

In the current study, students transitioning across multiple contexts altered or adapted the factors associated with their motivation to be successful within each specific environment. This is a particularly interesting result as learners at a variety of different educational levels may experience shifts or transitions in learning environments. How these shifts or transitions impact learners and their motivation warrants continued and further investigation.

The current study also demonstrated that the more internalized motivation of students in the clinic environment was not necessarily maintained upon returning to the classroom environment where students described more extrinsic motivation. This may present an issue with the ability for the learning environment to maintain individual interest within the students. As SDT, SEVT, and interest theory all promote that aspects of task value are tied to increased and more internalized motivation, the transition back to extrinsic forms of motivation may represent a decline in value for SDL. Students in the current study connected the internalization of their motivation within the clinical environment to be associated with their relationships with their

clinical instructors and patients. Therefore, the concept of relatedness within SDT may play a large role in developing and maintaining this type of internalization. Future research should thus not only continue to explore this apparent increased weighting of relatedness within adult learning contexts but also how specific instructional strategies and environmental design features can be optimized to support relatedness, especially across transitions in learning environments.

The current study also demonstrated that the ideologies that underpin learning environments may play a significant role in influencing the motivation of learners within those environments. However, most PT educators have evolved into their roles through their professional and content expertise and not through formalized training in education or instructional design. Therefore, future studies should explore the knowledge and awareness that academic faculty and clinical instructors possess regarding the curricular ideologies that serve as the cornerstones of the systems in which they educate as well as how their own personal ideologies influence how they design instruction within those environments. Such studies should also include how students perceive these system and instructor ideologies influence the learning environments as well as their motivation for processes such as ill-structured problem-solving and SDL.

The characteristics of curiosity, growth mindset, resilience, and motivation described by Cutrer and colleagues (2020) as being critical to the development of a MAL remain ambiguous within the framework. To the knowledge of the investigators, this is the first study to attempt to connect these characteristics with theories of motivation and learning. The MAL framework describes these characteristics in both trait and state forms without distinguishing between them. The characteristics also have considerable overlap with constructs of various theories of motivation and learning. The present study identified that learning environments may influence

students differently based on their past experiences and individual perceptions. Therefore, continued exploration of the interaction between the trait and state nature of these characteristics warrants further exploration. We recommend that future research should attempt to more specifically delineate trait and state characteristics that are theoretically associated with engagement and high performance in SDL and MAL processes. This would then allow for larger studies across a greater variety of programs to explore how students perceive that learning environments influence their state characteristics and if this perception is mediated in any way by their trait characteristics.

Longitudinal, mixed-methods studies with larger and more diverse samples are needed to confirm the findings of the current study and to examine how these characteristics evolve over time and in response to targeted interventions. Future work might investigate the role of autonomy-supportive teaching practices, feedback framing, or the integration of patient narratives through technology such as virtual reality in fostering meaningful independent learning. As the call for new educational models and frameworks such as ungrading and competency-based learning have occurred in PT education, the influence that these frameworks have on the engagement of learners in SDL and ill-structured problem-solving should be compared to current approaches. Finally, given the results of this study related to the apparent success of individualized coaching in positively influencing a student's motivation to engage in SDL and MAL processes, considerations for how this approach may be incorporated into the classroom environment should be developed and studied as this line of inquiry may help shift the focus from cultivating individual grit to designing environments that reduce unnecessary barriers and foster sustainable motivation.

Conclusion

This study examined how classroom and clinical learning environments shape the critical characteristics of the MAL in physical therapy students and provide motivation to engage in learning processes such as SDL and ill-structured problem-solving. Findings revealed that students, faculty, and clinical instructors perceive motivation differently depending on the context, with classroom environments characterized by externally imposed demands, compliance, and performance pressures, while clinical environments fostering intrinsic motivation through personal responsibility, emotional connection to patients, and supportive social interactions. These differences highlight the powerful role of environmental structures and curricular ideologies in shaping motivational orientations.

In the classroom, external demands such as assessments and time constraints were frequently associated with extrinsic forms of motivation, fatigue, and burnout. Yet, some students demonstrated the ability to reframe these demands into personally meaningful goals, suggesting that individual perceptions and prior experiences can mediate motivational outcomes. In contrast, the clinical environment emphasized responsibility, relatedness, and mentorship, which facilitated deeper engagement, resilience, and growth mindsets. Transitions between these environments posed challenges, particularly when students shifted from externally regulated classroom structures to more learner-centered clinical contexts, underscoring the importance of preparing students for these shifts.

Limitations include the study's reliance on qualitative perceptions within a single program, which may limit generalizability. Future research should explore how curricular ideologies and transitions between environments influence motivation across diverse health professions programs, and whether innovative instructional strategies—such as ungrading,

competency-based education, immersive virtual reality, and transformative experience models—can reframe externally imposed demands into more intrinsically motivating experiences.

Overall, this study underscores that motivation is not merely an individual trait but a dynamic process shaped by the interplay of environment, ideology, and perception. Faculty and clinical instructors play a critical role in designing environments that support autonomy, relevance, and psychological safety, thereby fostering the development of resilient, adaptive, and intrinsically motivated healthcare professionals who are prepared to operate in today's healthcare environments as Master Adaptive Learners.

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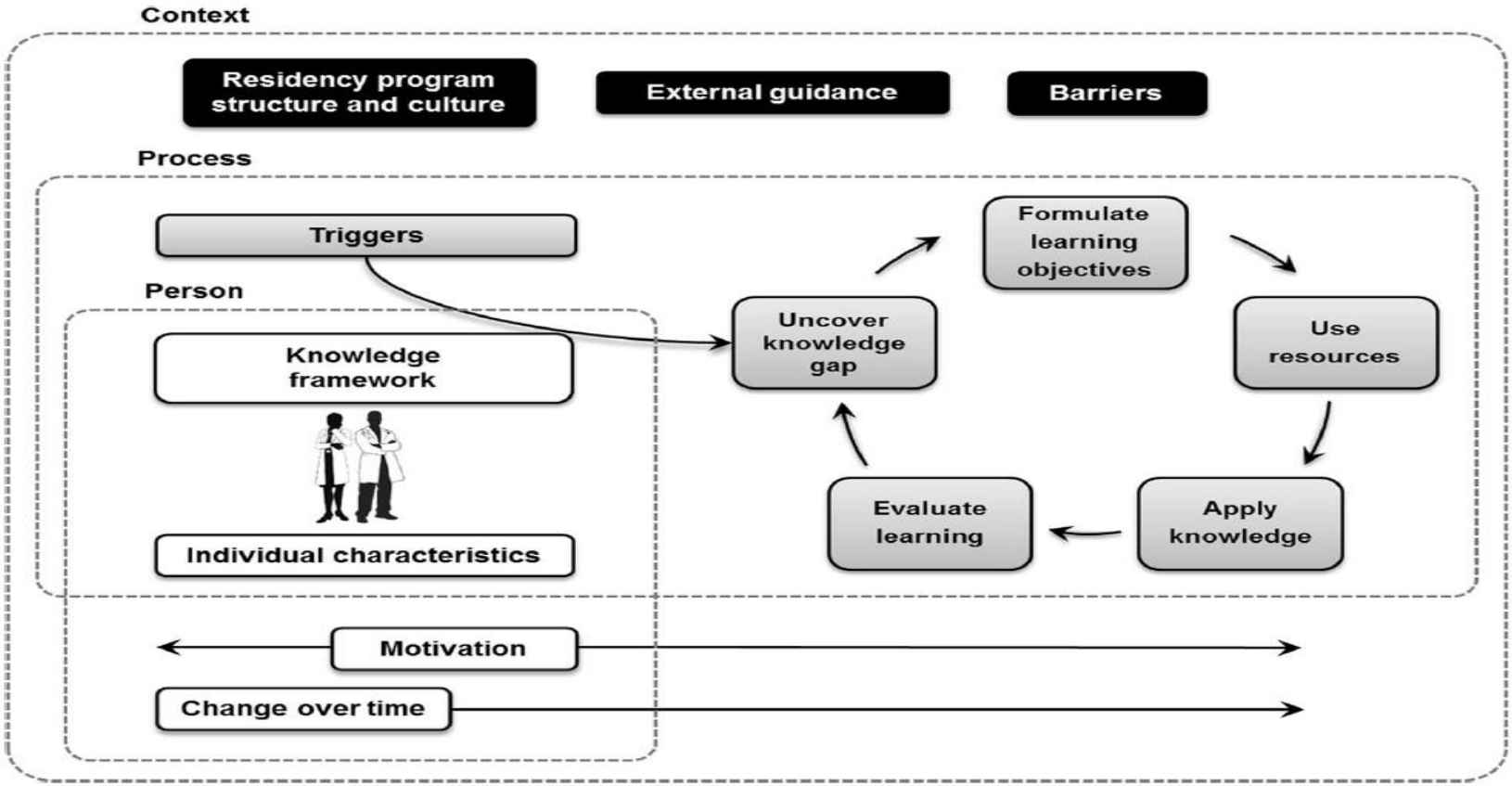
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Appendix A

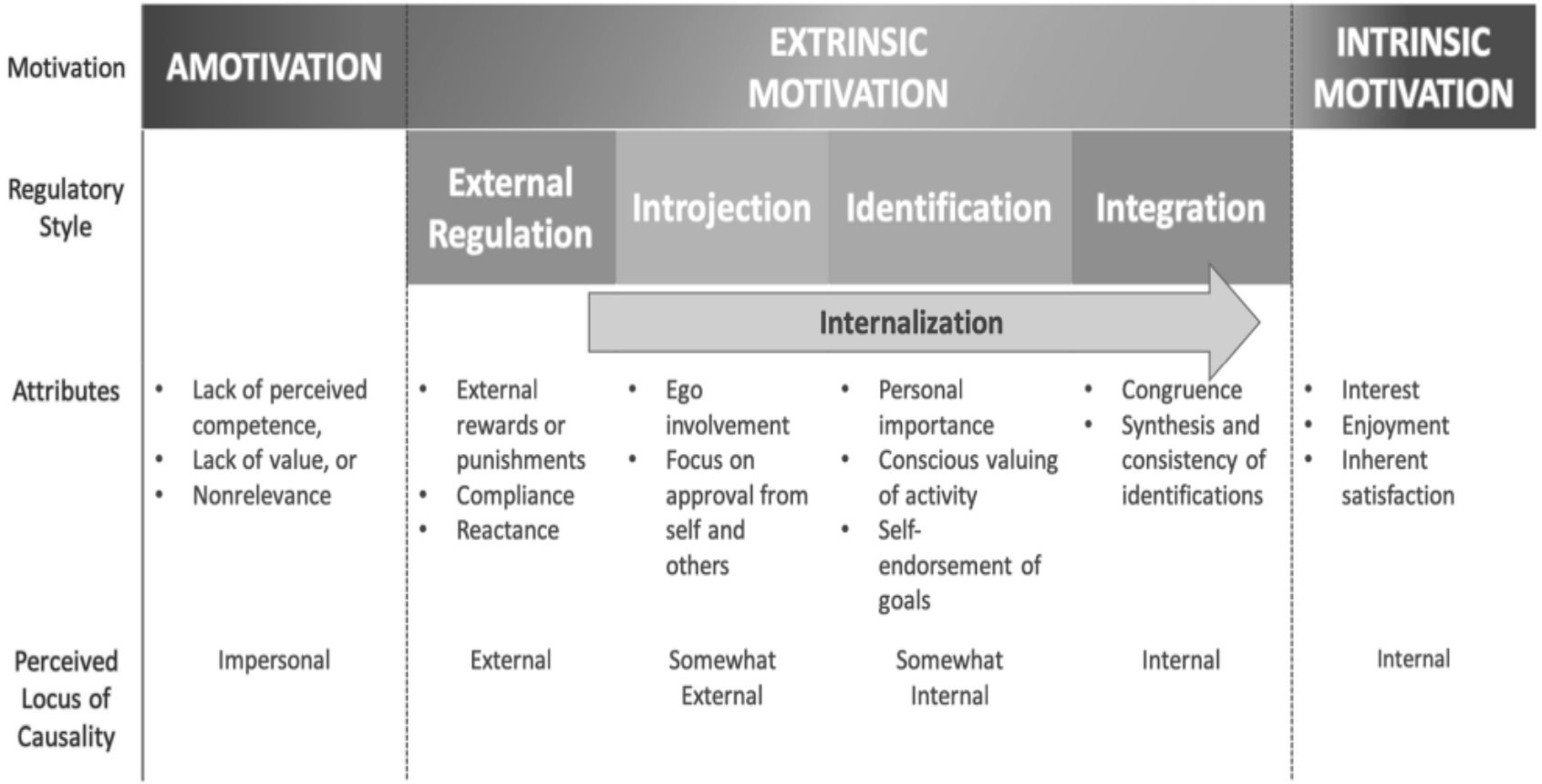
Theoretical Model of Self-Directed Learning (SDL)



Reprinted from Sawatsky, A. P., Ratelle, J. T., Bonnes, S. L., Egginton, J. S., & Beckman, T. J. (2017). A model of self-directed learning in internal medicine residency: A qualitative study using grounded theory. *BMC Medical Education, 17*, 31. https://doi.org/10.1186/s12909-017-0869-4

Appendix B

Taxonomy of Motivation in Self-Determination Theory

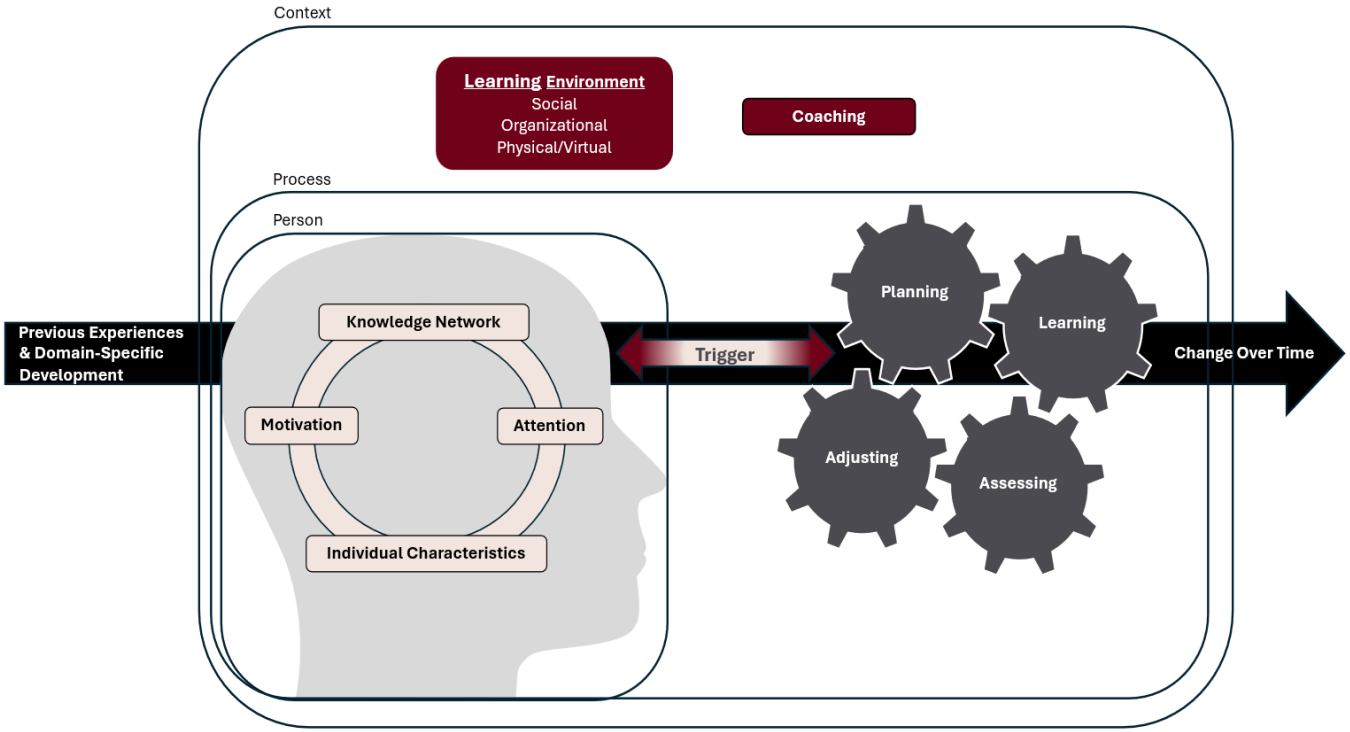


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Appendix C

A Self-Updated Conceptualization of the Master Adaptive Learner Framework

Utilizing Additional Theories of Cognition and Motivation



Appendix D

Survey Demographic Questions

1. Are you 18 years of age or older?
   Yes
   No

2. Are you enrolled in Summer 2025 coursework in the physical therapy program at the University of Oklahoma as a part of the Class of 2026 or Class of 2027?
   Yes
   No

3. Which components of the study are you agreeing to participate (check all that apply)?
   Four digital surveys
   Focus group interviews
   Educational data release

4. Name (First & Last) _____

5. E-mail address _____

6. Physical Therapy Program Cohort
   Class of 2026
   Class of 2027

7. Age in Years _____

8. Sex
   Male
   Female
   Prefer not to say

9. Race
   Native American or Alaska Native
   Asian
   Black or African American
   Native Hawaiian or Other Pacific Islander
   White
   Two or More Races
   Prefer not to Say

10. Ethnicity
    Hispanic or Latino
    Not Hispanic or Latino
    Prefer not to say

11. Previous Education
    High School Diploma or Equivalent
    Some College, No Degree
    Associate Degree (i.e., AA, AS)
    Bachelor's Degree (i.e., BA, BS)
    Master's Degree (i.e., MA, MS, MEd)
    Professional Degree (i.e., MD, DDS, DVM)
    Doctorate (i.e., PhD, EdD)
    Prefer not to say

12. 5-Voices Personality Profile
    Guardian/Nurturer
    Guardian/Creative
    Guardian/Connector
    Guardian/Pioneer
    Nurturer/Guardian
    Nurturer/Creative
    Nurturer/Connector/Creative
    Nurturer/Connector/Guardian
    Nurturer/Pioneer
    Creative/Pioneer
    Creative/Connector/Pioneer
    Creative/Connector/Nurturer
    Creative/Nurturer
    Creative/Guardian
    Connector/Creative/Pioneer
    Connector/Creative/Nurturer
    Connector/Guardian
    Connector/Nurturer
    Connector/Pioneer
    Pioneer/Creative
    Pioneer/Connector
    Pioneer/Guardian
    Pioneer/Nurturer
    Do Not Know

Appendix E

Student Survey

Please respond to the following items according to how you feel currently. Please take your time, read each item carefully, and respond honestly. There are no right or wrong answers.

	Curiosity	**Medical Curiosity Scale (modified)**						
		Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree
1	Interacting with people is what interests me about being a physical therapist.							
2	I try to understand other people's feelings.							
3	Being interested in people is an important reason why I chose to study physical therapy.							
4	I am interested in patient's life stories.							
5	I am interested in the person behind every physical therapy condition.							
6	I enjoy learning as much about physical therapy as possible.							
7	I've got strong intellectual curiosity about physical therapy topics.							
8	I am fascinated by physical therapy topics.							
9	Even if I knew all the questions on an exam or asked of me in clinic, I would still study past them out of sheer curiosity.							
10	I care deeply about understanding physical therapy issues.							

	Mindset	**3-Item Implicit Theories of Intelligence Scale**					
		Strongly Disagree	Disagree	Mostly Disagree	Mostly Agree	Agree	Strongly Agree

11	You have a certain amount of intelligence and you can't really do much to change it.					
12	Your intelligence is something about you that you can't change very much.					
13	You can learn new things but you can't really change your basic intelligence.					
	Resilience	**Brief Resilience Scale**				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14	I tend to bounce back quickly after hard times.					
15	I have a hard time making it through stressful events.					
16	It does not take me long to recover from stressful events.					
17	It is hard for me to snap back when something bad happens.					
18	I usually come through difficult times with little trouble.					
19	I tend to take a long time to get over set-backs in my life.					
	Grit	**Grit-S**				
		Not like me at all	Not much like me	Somewhat like me	Mostly like me	Very much like me
20	New ideas and projects sometimes distract me from previous ones.					
21	Setbacks don't discourage me.					
22	I have been obsessed with a certain idea or project for a short time but later lost interest.					
23	I am a hard worker.					

24	I often set a goal but later choose to pursue a different one.						
25	I have difficulty maintaining my focus on projects that take more than a few months to complete.						
26	I finish whatever I begin.						
27	I am diligent.						

	Motivation	Motivated Strategies for Learning Questionnaire (MSLQ) Short Form – Motivation Subscale (modified)					
		Not at all true of me					Very true of me
28	In my courses/clinical rotations, I prefer material that really challenges me so I can learn new things.						
29	In my courses/clinical rotations, I prefer material that arouses my curiosity, even if it is difficult to learn.						
30	The most satisfying thing for me in my courses/clinical rotations is trying to understand the content as thoroughly as possible.						
31	When I have the opportunity in my courses/clinical rotations, I choose activities that I can learn from even if they don't guarantee a good grade.						
32	Getting a good grade in my courses/clinical rotations is the most satisfying thing for me right now.						
33	The most important thing for me right now is improving my overall grade point average, so my main concern in my courses/clinical rotations is getting a good grade.						

34 If I can, I want to get better grades in my courses/clinical rotations than most of the other students.

35 I want to do well in my courses/clinical rotations because it is important to show my ability to my family, friends, potential employers, and others.

36 I think I will be able to use what I learn in my courses/clinical rotations in my future career.

37 It is important for me to learn the content in my courses/clinical rotations.

38 I think the material in my courses/clinical rotations is useful for me to learn.

39 I like the subject matters covered in my courses/clinical rotations.

40 If I study in appropriate ways, then I will be able to learn the material associated with my courses/clinical rotations.

41 If I try hard enough, then I will understand the material covered in my courses/clinical rotations.

42 If I don't understand the material covered in my courses/clinical rotations, it is because I didn't try hard enough.

43 I'm certain I can understand the most difficult material presented in my courses/clinical rotations.

44 I'm confident I can learn the basic concepts taught in my courses/clinical rotations.

45	I'm confident I can do an excellent job on the activities associated with my courses/clinical rotations.
46	I'm certain I can master the skills being taught in my courses/clinical rotations.

Appendix F

Student Focus Group Question Guides

Introduction

Thank you for your time and willingness to participate in this project. As you know, I am conducting a study to investigate the influence that classroom and clinical learning environments have on various student characteristics. These characteristics may naturally fluctuate across time and in different situations. Therefore, there are no expectations of you nor right or wrong answers to these questions. Please answer as honestly as you can. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty nor any effect on your grades within the program. If you choose to discontinue your participation in the study at any time, any prior information collected from you will be discarded and not included in the results. Also, during these discussions, you have the option to decline to answer any of the questions. Upon completion, the results of this study may be published, but your name will not be used.

If you have any questions concerning the study, please contact the Principal Investigator, Josh Williams at 405-271-2131 extension 47114. For questions about your rights as a research participant, you may contact the OU Health Sciences Director of Human Research Participant Program at 405-271-2045. I will place both of these numbers in the chat at this time.
Do any of you have questions before we start?

Timepoint #1: Completion of Year 1 or Year 2 Coursework; Prior to Start of Clinical Rotation

1. How has this past year in the classroom gone for you? Do you feel like it has changed you as an individual in any way?

2. Do you believe that your time in the classroom has either positively or negatively influenced your desire to seek out knowledge related to physical therapy topics? Why or why not?

3. During this past year of classroom work, how often have you found yourself exploring topics that were covered in class further on your own? Why do you believe this was the case?

4. Has the past year of classroom work influenced your beliefs about your own intelligence and ability to learn in any way? If so, how?

5. Has the past year of classroom work influenced your passion for becoming a physical therapist in any way?

6. Are you any more or less interested in physical therapy topics right now compared to what you were at the beginning of last fall? Why do you think that is the case?

7. Do you believe that the last year of classroom work has influenced your ability to press forward toward a goal and overcome challenges, setbacks, and failures in any way? If so, how?

8. Do you believe that the last year of classroom work has influenced your ability to bounce back from stressful and negative emotional experiences in any way? If so, how?

9. Do you believe that your past year of classroom work has been important? Why or why not?

10. Has the past year of classroom work influenced the confidence you have in yourself to learn about physical therapy topics in any way? If so, how?

11. During this past year of classroom work, what has been your main motivator or reason for learning the material?

Timepoint #2: End of Clinical Rotation

1. How has clinical rotation gone for you? Do you feel like it has changed you as an individual in any way?

2. Do you believe that your time in the clinic has either positively or negatively influenced your desire to seek out knowledge related to physical therapy topics? Why or why not?

3. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

4. During your clinical rotation, how often have you found yourself exploring topics that come up during the day further on your own? Why do you believe this was the case?

5. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

6. Has your clinical rotation influenced your beliefs about your own intelligence and ability to learn in any way? If so, how?

7. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

8. Has your clinical rotation influenced your passion for becoming a physical therapist in any way?

9. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

10. Are you any more or less interested in physical therapy topics right now compared to what you were prior to beginning your clinical rotation? Why do you think that is the case?

11. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

12. Do you believe that your clinical rotation has influenced your ability to press forward toward a goal and overcome challenges, setbacks, and failures in any way? If so, how?

13. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

14. Do you believe that your clinical rotation has influenced your ability to bounce back from stressful and negative emotional experiences in any way? If so, how?

15. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

16. Do you believe that your clinical rotation has been important? Why or why not?

17. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

18. Has your clinical rotation influenced the confidence you have in yourself to learn about physical therapy topics in any way? If so, how?

19. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

20. During your clinical rotation, what has been your main motivator or reason for learning the material?

21. How was this different, if at all, during your early transition between the classroom and the clinic compared to now?

Timepoint #3: 6 Weeks After Returning to Classroom

1. How has transition back to the classroom gone for you? Do you feel like it has changed you as an individual in any way?

2. Do you believe that the transition back to the classroom has either positively or negatively influenced your desire to seek out knowledge related to physical therapy topics? Why or why not?

3. During your transition back to the classroom, how often have you found yourself exploring topics that were covered in class further on your own? Why do you believe this was the case?

4. Has the transition back to the classroom influenced your beliefs about your own intelligence and ability to learn in any way? If so, how?

5. Has the transition back to the classroom influenced your passion for becoming a physical therapist in any way?

6. Are you any more or less interested in physical therapy topics right now compared to when you finished your clinical rotation? Why do you think that is the case?

7. Do you believe that the transition back to the classroom has influenced your ability to press forward toward a goal and overcome challenges, setbacks, and failures in any way? If so, how?

8. Do you believe that the transition back to the classroom has influenced your ability to bounce back from stressful and negative emotional experiences in any way? If so, how?

9. Do you believe that your return to the classroom has been important? Why or why not?

10. Has the transition back to the classroom influenced the confidence you have in yourself to learn about physical therapy topics in any way? If so, how?

11. During the transition back to the classroom, what has been your main motivator or reason for learning the material?

Closing

Now that we are done, do any of you have any questions regarding this project?
If any further questions arise or you recall more information that you would like to share, feel free to contact me at a later time. I will place my contact information in the chat for you. Also, would it be ok for me to reach out if I need to contact any of you at a later time for additional questions or clarifications?

Thank you so much.

Appendix G

Clinical Instructor Master Adaptive Learner Behavior Observation Survey

Please rate how often you have observed the student display the following behaviors. Please take your time, read each item carefully, and respond honestly. There are no right or wrong answers and there are no expectations regarding how often a student should be exhibiting any of the behaviors

.

	Never	Rarely	Sometimes	Often	Always
The student initiates, guides, and engages in the reflective process by seeking out feedback on performance.					
The student integrates data from multiple sources to create a mental framework for diagnosis, therapeutic, or instructional purposes and this is often shared with others.					
The student identifies the limits of diagnostic and treatment algorithms/guidelines and decides when and how to move outside of an established pattern to provide optimal patient care.					
The student verbally explores, often with clinical instructor or other therapists, the ways in which contrived variations in presenting characteristics, available resources, etc. would affect clinical decision-making to broaden their understanding.					
The student engages in critical examination of recent cases to identify their own personal learning and performance gaps. This information is often shared with a trusted source for further feedback and advice.					
The student expresses their synthesis of information through independent decision-making and creation of a concrete clinical plan even when they may have some degree of uncertainty about their conclusions.					
The student proactively discusses, explores, and/or seeks out clinical exposure to perceived areas of deficit to build skills and fill knowledge/performance gaps.					
The student critically compares their own knowledge and performance to external standards.					
The student cultivates a network of mentors to help guide their learning and fill their personal needs.					

Appendix H

Academic Faculty Focus Group Question Guide

Introduction

Thank you for your time and willingness to participate in this project. As you know, I am conducting a study to investigate the influence that classroom and clinical learning environments have on various student characteristics. These characteristics may naturally fluctuate across time and in different situations. Therefore, there are no expectations of students nor right or wrong answers to these questions. Please answer as honestly as you can. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty nor any effect on your standing as a faculty member. If you choose to discontinue your participation in the study at any time, any prior information collected from you will be discarded and not included in the results. Also, during these discussions, you have the option to decline to answer any of the questions. Upon completion, the results of this study may be published, but your name will not be used. Students will not have access to any individual faculty comments and will only have access to aggregate information collected from faculty via final reports and publications.

If you have any questions concerning the study, please contact the Principal Investigator, Josh Williams at 405-271-2131 extension 47114. For questions about your rights as a research participant, you may contact the OU Health Sciences Director of Human Research Participant Program at 405-271-2045. I will place both of these numbers in the chat at this time.
Do any of you have questions before we start?

Academic Faculty Questions

1. Do you believe that the classroom environment influences a students' desire to seek out knowledge related to physical therapy topics in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

2. Do you believe that the classroom environment influences the frequency and depth with which students explore physical therapy topics further on their own in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

3. Do you believe that the classroom environment influences a students' beliefs about their own intelligence and ability to learn in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

4. Do you believe that the classroom environment influences a students' passion for becoming a physical therapist in any way? If so, how? Have you observed any behaviors

that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

5. Do you believe that the students' interest in physical therapy topics fluctuates over the course of their classroom time? If so, how so and why do you believe this is the case? Have you observed any behaviors that support this?

6. Do you believe that the classroom environment influences a students' ability to press forward toward a goal and overcome challenges, setbacks, and failures in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

7. Do you believe that the classroom environment influences a students' ability to bounce back from stressful and negative emotional experiences in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

8. Do you believe that students find their work in the classroom important? Why or why not? Have you observed any behaviors that support this? Do you believe this fluctuates over the course of their classroom time? How so?

9. Do you believe that the classroom environment influences a students' confidence in their ability to learn in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their classroom time? How so?

10. What do you believe are the main motivators or reasons that students have for learning the material presented to them in the classroom? Why do you think this is? Have you observed any behaviors that support this? Do you believe their motivators change or fluctuate over the course of their classroom time? How so?

Closing

Now that we are done, do any of you have any questions regarding this project?
If any further questions arise or you recall more information that you would like to share, feel free to contact me at a later time. I will place my contact information in the chat for you. Also, would it be ok for me to reach out if I need to contact any of you at a later time for additional questions or clarifications?

Thank you so much.

Appendix I

Clinical Instructor Focus Group Question Guide

Introduction

Thank you for your time and willingness to participate in this project. As you know, I am conducting a study to investigate the influence that classroom and clinical learning environments have on various student characteristics. These characteristics may naturally fluctuate across time and in different situations. Therefore, there are no expectations of students nor right or wrong answers to these questions. Please answer as honestly as you can. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty nor any effect on your standing as a clinical instructor for our program. If you choose to discontinue your participation in the study at any time, any prior information collected from you will be discarded and not included in the results. Also, during these discussions, you have the option to decline to answer any of the questions. Upon completion, the results of this study may be published, but your name will not be used. Students will not have access to any individual comments from clinical instructors and will only have access to aggregate information collected from clinical instructors via final reports and publications.

If you have any questions concerning the study, please contact the Principal Investigator, Josh Williams at 405-271-2131 extension 47114. For questions about your rights as a research participant, you may contact the OU Health Sciences Director of Human Research Participant Program at 405-271-2045. I will place both of these numbers in the chat at this time.
Do any of you have questions before we start?

Clinical Instructor Questions

1. Do you believe that the clinical environment influences a students' desire to seek out knowledge related to physical therapy topics in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

2. Do you believe that the clinical environment influences the frequency and depth with which students explore topics further on their own in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

3. Do you believe that the clinical environment influences a students' beliefs about their own intelligence and ability to learn in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

4. Do you believe that the clinical environment influences a students' passion for becoming a physical therapist in any way? If so, how? Have you observed any behaviors that

support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

5. Do you believe that the students' interest in physical therapy topics fluctuate over the course of their time in the clinic? If so, how so and why do you believe this is the case? Have you observed any behaviors that support this?

6. Do you believe that the clinical environment influences a students' ability to press forward toward a goal and overcome challenges, setbacks, and failures in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

7. Do you believe that the clinical environment influences a students' ability to bounce back from stressful and negative emotional experiences in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

8. Do you believe that students find their work in the clinic to be important? Why or why not? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

9. Do you believe that the clinical environment influences a students' confidence in their ability to learn in any way? If so, how? Have you observed any behaviors that support this? Do you believe this influence fluctuates over the course of their time in the clinic? How so?

10. What do you believe are the main motivators or reasons that students have for learning the material presented to them in the clinic? Why do you think this is? Have you observed any behaviors that support this? Do you believe their motivators change or fluctuate over the course of their time in the clinic? How so?

Closing

Now that we are done, do any of you have any questions regarding this project?
If any further questions arise or you recall more information that you would like to share, feel free to contact me at a later time. I will place my contact information in the chat for you. Also, would it be ok for me to reach out if I need to contact any of you at a later time for additional questions or clarifications?

Thank you so much.

Appendix J

Codebook for Timepoint #1: Classroom Environment

#	Code	Sentiment	Category	Theme	Data Excerpts
1.	time cost to classroom	negative			Class of 2026/time 1/lines 69-70 Class of 2027/time 1/lines 220-222 Class of 2027/time 1/lines 234-238 Class of 2027/time 1/lines 296-297
2.	you just kind of have to ride it out and work towards it step by step	negative	Time & Load Pressures		Class of 2027/time 1/lines 193-195 Class of 2027/time 1/lines 220-224 Class of 2027/time 1/lines 234-238 Class of 2027/time 1/lines 240-246
3.	fluctuating emotional costs	negative			Class of 2027/time 1/lines 222-223 Class of 2027/time 1/lines 234-238 Class of 2027/time 1/lines 240-246
4.	externally developed & required goals	negative	Imposed Goals	EXTERNAL DEMANDS	Class of 2026/time 1/lines 127-129 Class of 2027/time 1/lines 193-195 Class of 2027/time 1/lines 220-224 Class of 2027/time 1/lines 234-238 Class of 2027/time 1/lines 240-246 Class of 2027/time 1/lines 255-261
5.	you're either going to accomplish this or you're done	negative	High-Stakes		Class of 2027/time 1/lines 228-232 Class of 2027/time 1/lines 240-246
6.	our self-worth is tied up in our grades	negative	Mindset & Fear of Failure		Class of 2027/time 1/lines 255-261 Class of 2027/time 1/lines 263-266
7.	increased knowledge leading to change in interest	negative/positive			Class of 2026/time 1/lines 107-112
8.	new knowledge leading to desire to learn	positive	Knowledge Acquisition & Intellectual Curiosity		Class of 2027/time 1/lines 85-86 Class of 2027/time 1/lines 90-91 Class of 2027/time 1/lines 185-188
9.	new knowledge leading to recognition of new opportunities and a desire to explore them	positive			Class of 2027/time 1/lines 93-94 Class of 2027/time 1/lines 96-101 Class of 2027/time 1/lines 141-143

					Class of 2027/time 1/lines 150-153 Class of 2027/time 1/lines 180-183 Class of 2027/time 1/lines 359-364
10.	increased knowledge leading to changes in value-cost perceptions	negative/positive			Class of 2026/time 1/lines 110-112 Class of 2027/time 1/lines 134-139 Class of 2027/time 1/lines 174-178 Class of 2027/time 1/lines 205-208 Class of 2027/time 1/lines 210-213 Class of 2027/time 1/lines 312-319
			Knowledge		Class of 2027/time 1/lines 355-357
11.	knowledge application leading to mastery avoidant goals related to competence	negative	Relevance & Application		Class of 2026/time 1/lines 129-131 Class of 2026/time 1/lines 207-211
12.	personal connection to content leading to increased utility value	positive			Class of 2027/time 1/lines 347-357
				CONTENT	Class of 2027/time 1/lines 367-371
13.	connection to patient care as reason to learn	positive			Class of 2026/time 1/lines 83-85 Class of 2027/time 1/lines 164-169 Class of 2027/time 1/lines 171-178 Class of 2027/time 1/lines 312-314 Class of 2027/time 1/lines 345-347 Class of 2027/time 1/lines 364-365
14.	receiving tools for learning	positive			Class of 2026/time 1/lines 192-194
			Cognitive Tools &		Class of 2027/time 1/lines 332-340
15.	practice using learning tools along with reflection leading to increased knowledge of self	positive	Strategies		Class of 2026/time 1/lines 194-196
16.	practice what you preach	positive			Class of 2027/time 1/lines 197-201
			Evolving Views of		Class of 2027/time 1/lines 203-205
17.	increased focus on knowledge application leading to changed view of intelligence	positive	Learning		Class of 2027/time 1/lines 106-111 Class of 2027/time 1/lines 113-118
18.	positive feedback maintains self-efficacy & interest	positive			Class of 2026/time 1/lines 100-101 Class of 2027/time 1/lines 134-139
			Feedback		
19.	using feedback to reflect & improve	positive			Class of 2027/time 1/lines 271-277 Class of 2027/time 1/lines 283-287

20.	social interactions leading to desire to learn and explore	positive	Curious Conversations	SOCIAL INTERACTIONS	Class of 2027/time 1/lines 86-88
21.	comparison contributing to view of intelligence and competence	negative/positive	Comparison		Class of 2027/time 1/lines 120-123 Class of 2027/time 1/lines 125-129 Class of 2027/time 1/lines 145-148 Class of 2027/time 1/lines 279-283 Class of 2027/time 1/lines 314-317
22.	personal mindset reminders to manage stress	positive			Class of 2027/time 1/lines 297-306
23.	Personal mindset reminder to cope with failure	positive	Self-Talk		Class of 2027/time 1/lines 266-269 Class of 2027/time 1/lines 271-277
24.	Personal mindset reminder to reframe comparisons	positive			Class of 2027/time 1/lines 127-129 Class of 2027/time 1/lines 279-287
25.	personal characteristic interacting with learning environment	negative/positive	Personal Disposition	PERSONAL ENVIRONMENT	Class of 2026/time 1/lines 70-71 Class of 2026/time 1/lines 158-160 Class of 2027/time 1/lines 75-77
26.	self-efficacy leading to interest	positive			Class of 2026/time 1/lines 99-100
27.	perceived positive outcome after challenge led to increased self-efficacy	positive	Self-efficacy		Class of 2026/time 1/lines 91-93 Class of 2026/time 1/lines 160-162 Class of 2026/time 1/lines 167-171 Class of 2027/time 1/lines 120-123 Class of 2027/time 1/lines 134-139

Appendix K

Codebook for Timepoint #2: Clinic Environment

#	Code	Sentiment	Category	Theme	Data Excerpts
1.	exposure to unfamiliar in clinic reveals gap in knowledge & desire to learn	positive	Patient Care Reveals Gaps for Learning		Class of 2026/time 2/lines 69-70 Class of 2026/time 2/lines 114-117 Class of 2026/time 2/lines 184-185 Class of 2026/time 2/lines 197-205 Class of 2027/time 2/lines 59-62 Class of 2027/time 2/lines 284-286 Class of 2027/time 2/lines 288-294
2.	desire to help patient leading to desire to learn	positive			Class of 2026/time 2/lines 70-71 Class of 2026/time 2/lines 77-79 Class of 2026/time 2/lines 93-95 Class of 2026/time 2/lines 185-188 Class of 2026/time 2/lines 197-205 Class of 2027/time 2/lines 78-79 Class of 2027/time 2/lines 255-261
3.	complexity of real patients leading to increased interest and desire to learn	positive			Class of 2027/time 2/lines 60-62 Class of 2027/time 2/lines 67-72 Class of 2027/time 2/lines 74-79
4.	new experience leading to recognition of new opportunities and a desire to explore them	positive			Class of 2027/time 2/lines 138-141 Class of 2027/time 2/lines 152-153
5.	exposure to less common leading to increased interest	positive			Class of 2026/time 2/lines 117-119 Class of 2027/time 2/lines 67-72
6.	patient care presents opportunity to realize mistakes	positive/negative		Personal Responsibility for Patients	Class of 2026/time 2/lines 150-153 Class of 2027/time 2/lines 187-192 Class of 2027/time 2/lines 196-201 Class of 2027/time 2/lines 208 Class of 2027/time 2/lines 214-215
7.	being given personal responsibility for patients is meaningful	positive			Class of 2026/time 2/lines 174-176
8.	adaptation and individualized care is best for patient	positive			Class of 2026/time 2/lines 176-179

9.	more immediate application leads to increased motivation	positive			Class of 2026/time 2/lines 188-190 Class of 2027/time 2/lines 143-147
10.	ability to apply knowledge is great experience	positive			Class of 2027/time 2/lines 57-59 Class of 2027/time 2/lines 105-106
11.	I almost need that information to really work with this patient	positive	Ownership of Clinical Decisions & Mistakes		Class of 2027/time 2/lines 95-96
12.	clinical experience leading to increased self-efficacy over time	positive			Class of 2027/time 2/lines 105-109 Class of 2027/time 2/lines 266-269 Class of 2027/time 2/lines 271-274
13.	changed perspective on mistakes over course of clinical experience	positive			Class of 2027/time 2/lines 208-210 Class of 2027/time 2/lines 212-217
14.	clinic reveals areas of competence & areas of growth	positive			Class of 2026/time 2/lines 84-86
15.	desire to help patient fuels persistence	positive			Class of 2026/time 2/lines 93-95 Class of 2026/time 2/lines 197-205
16.	increased pace requires increased focus & attention to work toward goals	negative			Class of 2026/time 2/lines 130-135
17.	increased pace leading to reactive coping	negative			Class of 2026/time 2/lines 140-143
18.	patient scheduling or patients with potentially serious conditions can lead to stress	negative	Time & Scheduling Pressures		Class of 2026/time 2/lines 164-166
19.	load & time management leading to stress	negative			Class of 2027/time 2/lines 224-225
20.	externally developed & required goals	negative		External Demands	Class of 2027/time 2/lines 240-241
21.	decreased cognitive load over course of clinical experience allows for increased information seeking	positive			Class of 2027/time 2/lines 91-93
22.	clinical experience reveals unknown aspects of professional responsibility	positive/negative			Class of 2027/time 2/lines 111-117 Class of 2027/time 2/lines 123-127
23.	new knowledge of professional responsibility leading to changes in value-cost perceptions	positive/negative	System Influences on Patient Care		Class of 2027/time 2/lines 111-117 Class of 2027/time 2/lines 123-127 Class of 2027/time 2/lines 129-132

24.	nature of clinical experience supports goal setting	positive/negative			Class of 2027/time 2/lines 163-168
25.	demands of clinic & patient care create challenge	negative			Class of 2027/time 2/lines 177-182
26.	clinical instructor guides response to mistakes	positive			Class of 2026/time 2/lines 153-156
27.	clinical instructor serving as accountability and encouragement for goals	positive			Class of 2027/time 2/lines 158-161
28.	questioning & guidance from clinical instructor revealing gap in knowledge and need to learn	positive/negative	Mentorship & Feedback from Clinical Instructor		Class of 2027/time 2/lines 282-284
29.	balance of social support & challenge leading to improved ability to handle stress	positive			Class of 2027/time 2/lines 225-228
				Social Interactions	
30.	humility & professional communication in response to mistakes	positive			Class of 2027/time 2/lines 193-194 Class of 2027/time 2/lines 212-217
31.	relationships built during clinical experience are meaningful	positive	Relationships with Patients		Class of 2027/time 2/lines 249-253
32.	real patients more meaningful than paper cases	positive			Class of 2026/time 2/lines 77 Class of 2026/time 2/lines 101-102
33.	patients present challenge	negative			Class of 2026/time 2/lines 141-142 Class of 2026/time 2/lines 197-205
34.	time with patients is meaningful	positive			Class of 2026/time 2/lines 173-174

Appendix L

Codebook for Timepoint #3: Transition Between Clinical & Classroom Environments

#	Code	Sentiment	Category	Theme	Data Excerpts
1.	less exposure to unfamiliar leading to decreased desire to seek information	negative			Class of 2026/time 3/lines 63-64
2.	less interaction with patients equals lower motivation	negative	Loss of Patient-Centered Context		Class of 2026/time 3/lines 82-84 Class of 2026/time 3/lines 120-124
3.	lack of real patient to reveal knowledge gaps in classroom leads to decreased desire to seek information	negative			Class of 2026/time 3/lines 64-65
4.	clinic increased self-efficacy	positive			Class of 2027/time 3/lines 70 Class of 2027/time 3/lines 227
5.	limited clinic time leading to desire for more clinic experience	negative/positive		Shifting Motivation	Class of 2027/time 3/lines 72-73
6.	classroom goals more external & formalized than goals in clinic	negative	Return to External Regulation		Class of 2026/time 3/lines 74-77 Class of 2026/time 3/lines 93-95 Class of 2026/time 3/lines 104-108 Class of 2026/time 3/lines 166-167 Class of 2027/time 3/lines 162-168
7.	need to find self-motivation for external goals	negative			Class of 2026/time 3/lines 107-108 Class of 2026/time 3/lines 167-170
8.	clinic increased classroom motivation	positive			Class of 2027/time 3/lines 71-72 Class of 2027/time 3/lines 276-279
9.	new knowledge leading to recognition of new opportunities and a desire to explore them	positive	Reinvigorated Interest via Clinical Connection		Class of 2027/time 3/lines 122-125
10.	clinic experience clarifying professional goals & interests	positive			Class of 2027/time 3/lines 127-130 Class of 2027/time 3/lines 138-142
11.	shift to focus on targeted depth in learning & knowledge seeking	positive			Class of 2027/time 3/lines 84-90 Class of 2027/time 3/lines 256-259 Class of 2027/time 3/lines 284-286

12.	experience in clinic leading to learning in the classroom	positive	Clinical Relevance & Targeted Depth	Changes in Learning Strategies	Class of 2026/time 3/lines 92-93 Class of 2027/time 3/lines 61-64 Class of 2027/time 3/lines 79-82 Class of 2027/time 3/lines 144-152 Class of 2027/time 3/lines 154-157 Class of 2027/time 3/lines 246-249
13.	unfamiliar leading to interest	positive			Class of 2026/time 3/lines 98-99
14.	shift from test-focused learning to clinically relevant knowledge-seeking	positive			Class of 2027/time 3/lines 79-82 Class of 2027/time 3/lines 92-95 Class of 2027/time 3/lines 114-119 Class of 2027/time 3/lines 178-180 Class of 2027/time 3/lines 261-264 Class of 2027/time 3/lines 281-286
15.	on-going self-assessment of study habits to support long-term learning	negative			Class of 2027/time 3/lines 266-269
16.	transition doesn't change view of own intelligence or ability	positive	Self-Evaluation		Class of 2026/time 3/lines 74 Class of 2026/time 3/lines 77 Class of 2027/time 3/lines 100-102 Class of 2027/time 3/lines 104-106
17.	failure related to performance on test	negative			Class of 2026/time 3/lines 129-133
18.	immediate grade feedback influences self-efficacy	negative			Class of 2026/time 3/lines 175-179
19.	classmates meaningful in transition back to classroom	positive	Social Belonging & Shared Experience	New Perspectives on Peer Influence	Class of 2026/time 3/lines 164-165 Class of 2027/time 3/lines 237-239 Class of 2027/time 3/lines 241-244
20.	different clinical experiences leading to increased knowledge variability among self & peers	negative/positive			Class of 2027/time 3/lines 202-205 Class of 2027/time 3/lines 237-239 Class of 2027/time 3/lines 241-244
21.	external motivation - grades & peer comparison	negative	New Means of Comparison		Class of 2026/time 3/lines 186-191 Class of 2027/time 3/lines 195-200 Class of 2027/time 3/lines 202-205
22.	clinic stress and classroom stress are different	negative/positive			Class of 2026/time 3/lines 149-153 Class of 2026/time 3/lines 156 Class of 2027/time 3/lines 218-224
23.	clinic stress due to patient care	negative			Class of 2026/time 3/lines 151-153 Class of 2027/time 3/lines 227-230

24.	increasing academic depth & expectations	negative/positive			Class of 2027/time 3/lines 185-190 Class of 2027/time 3/lines 246-249
25.	clinic challenges and classroom challenges different	negative/positive	Source		Class of 2026/time 3/lines 117-120 Class of 2027/time 3/lines 173-176
26.	transition marked by changes in schedule	negative/positive			Class of 2027/time 3/lines 56-58
27.	challenge in adjusting to pace of classroom	negative		Shifting Stressors	Class of 2026/time 3/lines 55-57
28.	classroom stress due to attempt to meet external goals	negative			Class of 2026/time 3/lines 149-150 Class of 2027/time 3/lines 221-223
29.	classroom stress managed with increased effort	positive			Class of 2026/time 3/lines 153-155 Class of 2026/time 3/lines 156-158
30.	classroom stress more known & controllable, clinic stress more unpredictable	negative/positive	Control & Coping		Class of 2026/time 3/lines 153-159 Class of 2027/time 3/lines 227-230
31.	clinical experience reduces stress by revealing flexibility and patient-centered care priorities	positive			Class of 2027/time 3/lines 211-216 Class of 2027/time 3/lines 218-220 & 223-224
32.	reflection in response to failure	positive			Class of 2026/time 3/lines 133-135 Class of 2027/time 3/lines 191-193

Appendix M

Codebook for Academic Faculty Focus Group

#	Code	Sentiment	Category	Theme	Data Excerpts
1.	autonomy in learning activities lead to curiosity & exploration	positive			lines 58-59
2.	exploration results from not covering topic of personal interest or value to student	positive/negative	Autonomy & Choice		lines 133-142 lines 149-162 lines 164-166
3.	change in learning motivation across time in program	positive			lines 449-460
4.	new or unfamiliar content leads to curiosity & exploration	positive			lines 67-71
5.	personally relevant content leads to deeper exploration	positive			lines 78-88 lines 90-98 lines 105-110 lines 121-1129 lines 176-181
6.	perceived lack of value for content inhibits exploration	negative			lines 187-195
7.	clinical experiences help motivate students upon return to classroom	positive			lines 755-758 lines 773-776 lines 778-782
8.	timing of clinical experiences influences the motivational benefits students get from them	positive/negative			lines 797-803 lines 782-786
9.	opportunities to apply & actively engage in real-world helps develop professional behaviors	positive	Novel or Relevant Content		lines 805-828
10.	clinical experiences may alter value-cost perceptions of classroom environment	negative/positive		Instructional Design & Pedagogical Structure	lines 858-866 lines 876-885 lines 966-972 lines 974-984
11.	motivation surrounding environment transitions may	positive/negative			lines 926-944

	depend on personal interest in course topics and clinical settings			
12.	exposure to unfamiliar in clinic drives motivation upon return to classroom	positive		lines 955-961
13.	lack of exposure to topics in clinic may decrease motivation of those topics in classroom	negative		lines 966-972
14.	problem solving as a means of self-evaluation & revealing knowledge gaps	positive		lines 281-287
15.	recursive teaching in classroom environment allows for increased student self-evaluation of competency	positive		lines 362-372 lines 374-381 lines 383-390
16.	creating opportunities to apply & actively engage with topics in real-world scenarios as means to create passion	positive	Intentional Design	lines 632-646 lines 655-658 lines 910-916
17.	providing opportunities for reflection as means to drive passion	positive		lines 716-720
18.	condensed classroom courses following clinical experiences may decrease motivation & curiosity but enhance resilience	positive/negative		lines 905-908
19.	dissonance of information leads to exploration & attempts to reconcile	positive	Content Tension	lines 112-119
20.	intimidating topics cause students to question learning ability	negative		lines 273-276
21.	passive learning environment inhibits exploration & passion	negative	Passive Lecture-Based Formats	lines 197-205 lines 648-653
22.	distance nature of program limits ability to include active learning	negative		lines 209-217 lines 219-227

23.	large number of students limits engagement	negative			lines 229-230 lines 289-291 lines 301-308
24.	distance education technology causing stress & negative emotions	negative	Technology & Logistical Barriers		lines 486-487 lines 491-495 lines 500-502 lines 572-577
25.	distance education technology limits engagement	negative			lines 230-234 lines 236-243 lines 326-327
26.	decreased engagement limits opportunities for self-evaluation of competency	negative		Presentation & Delivery Format	lines 249-258
27.	practice with supervision positively influences students' perceptions of their learning ability	positive	Faculty-Student Interaction		lines 276-279
28.	large numbers limits faculty supervision and support	negative			lines 318-322 lines 331-340
29.	large groups allow students to have self-doubt regarding their intelligence	negative			lines 324-327
30.	creative use of technology can provide opportunities for student self-evaluation of competency	positive	Creativity		lines 258-264
31.	attempt to inspire students through use of guest speakers to make better connections with students	positive			lines 627-631
32.	connecting with like-minded individuals limits revelation of knowledge gaps	negative			lines 289-299
33.	small groups can positively influence students' views of own learning ability	positive			lines 294-295 lines 313-316 lines 327-329
34.	shared experiences of classroom environment create camaraderie and social support system	positive/negative			lines 413-417 lines 423-426 lines 428-433 lines 435-439

35.	social group influences response to stress & negative emotions	positive/negative	Small Groups & Peer Interaction		lines 512-528 lines 1057-1059 lines 512-528 lines 1003-1009 lines 1011-1014 lines 1016-1020
36.	small groups lead to better management of stress & negative emotions	positive			lines 537-542 lines 597-603
37.	maintaining consistency of small group to decrease stress & improve stress management	positive			lines 609-619
38.	social groups formed early and typically include similar individuals or individuals with similar experiences	positive/negative			lines 1032-1083
39.	positive support of growth mindset approach from faculty in response to student questions leads to positive student views of own intelligence and learning ability & increased engagement	positive		Social & Relational Dynamics	lines 346-358
40.	faculty modeling intellectual humility, answer seeking, & growth mindset helps instill these qualities in students	positive	Faculty Modeling & Feedback		lines 441-447 lines 916-924
41.	individualized faculty feedback increases self-efficacy & decreases stress	positive			lines 561-566
42.	faculty modeling professional involvement to inspire passion in students	positive			lines 687-692
43.	including students in faculty professional involvement leads to small wins and enhances passion	positive			lines 722-730
44.	communicating achievements of others within profession can enhance passion	positive			lines 732-740

45.	combo of high expectations and high support leading to changes in motivation	positive			lines 462-468
46.	when their well-being is well, their passion is well	positive	Culture of Care		lines 694-714
47.	types of resources available to students communicates priorities of culture	Positive			lines 1085-1104
48.	several formal assessments in a confined period can create challenge & stress	positive			lines 395-397
49.	wasted resources can create stress & negative emotions	negative			lines 507-512 lines 572-577
50.	non-intentional stress added to intentional stress & challenge can lead to burnout & exhaustion	negative			lines 660-668
51.	too many classroom related activities can create stress	negative			lines 670-682 lines 782-787
52.	prolonged period in classroom leads to goal of being done	negative	Pace, Load, & Assessment		lines 758-761 lines 771-773
53.	changes in load & pace of work between classroom & clinic may create stress & burnout upon returning to the classroom	negative		Environmental Stressors & Pressures	lines 830-840 lines 849-854 lines 876-885 lines 937-941
54.	condensed courses create increased pace & stress	negative			lines 876-885 lines 887-892 lines 894-903
55.	challenges created by classroom environment necessary to help students develop skills to overcome future challenges	positive			lines 402-411 lines 568-572
56.	creating progressive challenge in classroom environments creating lower stakes stress can help students improve stress management in higher stakes situations	positive	Intentional Challenge		lines 568-572 lines 587-594 lines 619-620

57.	clear expectations decrease stress & negative emotions	positive	Support	lines 544-554 lines 603-609
58.	rapport building to initiate class as attempt to decrease stress	positive		lines 594-597

Appendix N

Codebook for Clinical Instructor Focus Group

#	Code	Sentiment	Category	Theme	Data Excerpts
1.	open clinic environment increases likelihood of student asking questions	positive	Openness & Interpersonal Connections	Clinic Structure & Culture	lines 57-59
2.	clinic employees more interactive leads to student being more interactive	positive			lines 63-65
7.	students experience initial warm-up period where they decide whether environment is safe to ask questions	positive/negative			lines 127-130
3.	pace of clinic scheduling can influence student curiosity in positive or negative way based on interaction with individual student	negative/positive			lines 63-75 lines 80-84 lines 86-89
4.	high learning curve at beginning of clinical leads to lower curiosity	negative	Scheduling & Workflow Demands		lines 96-105 lines 130
5.	curiosity increases after initial portion of clinical experience	positive			lines 96-97
6.	after initial, curiosity may maintain or increase based on level of student	positive			lines 112-121 lines 130-133
21.	pace & time management challenges similar between clinic & classroom	positive			lines 298-305
15.	organizational factors may influence student passion	positive/negative	Organizational Influences		lines 221-223 lines 225-234
8.	type of feedback from clinical instructor may influence student's view of their own intelligence & learning ability	positive/negative			lines 139-159 lines 163—168 lines 183-184 lines 334-336

23.	support & guidance from clinical instructor can help student manage stress	positive	Feedback & Guidance		lines 315-317 lines 320-325
25.	support & guidance from clinical instructor to encourage growth mindset	positive			lines 334-336
39.	feedback in classroom & clinic different – shovel to dig vs. riot shield of survival	positive/negative			lines 601-608 lines 610-614
11.	daily focus & emphasis of clinical instructor may influence student passion	positive/negative			lines 195-199 lines 532-539
13.	attitude & personality of clinical instructor may influence student passion	positive/negative		Clinical Instructor Role & Relationship	lines 212-217
14.	clinical instructor's ability to connect students to an interest may influence passion	positive/negative	Modeling Passion & Professional Identity		lines 217-221
35.	clinical instructor excitement & investment in student learning increases student independent learning	positive			lines 491-494 lines 497-499 lines 506-510 lines 518-520 lines 528-530 lines 657-664
36.	modeling of clinical instructor	positive			lines 494-497 lines 506 lines 520-523 lines 663-684
26.	clinical instructors place students in place of challenge but are available to provide support	positive			lines 342-348 lines 353-368 lines 370-378
28.	clinical instructor helps create value for clinical experience	positive	Facilitating Autonomy & Value		lines 393-395
34.	independent learning increased with clinical instructor encouragement	positive			lines 483-487
37.	clinical instructor creating environment of psychological safety	positive			lines 499-506 lines 510-511 lines 637-638

					lines 651-657
9.	students view of their own intelligence & learning ability does not change over course of clinical experience	positive			lines 174-178
10.	new views of professional responsibilities may decrease or increase passion	positive/negative	Clarity of Professional Roles & Responsibilities		lines 190-195
27.	don't think that students start feeling like free labor	positive			lines 384-388
29.	match of clinic with student's professional identity helps determine value for clinical experience	positive/negative		Professional Roles & Challenges	lines 406-410 lines 412-416 lines 423-427
20.	academic challenges different between clinic & classroom	positive/negative			lines 294-298
31.	challenge presented in patient care influences student independent learning	positive/negative	Clinic Challenges		lines 434-440 lines 451-454 lines 465-466
12.	ability to actively participate in patient care may influence passion	positive/negative			lines 206-208
18.	patient not engaged may lead to less independent student learning	negative	Relationship Drives Engagement		lines 270-276
19.	relational connection with patient may lead to increased student learning	positive			lines 270-275 lines 284-289
16.	student independent learning increases as they take on more patient responsibility	positive			lines 241-245 lines 247-252
17.	independent learning via social media	positive		Patient Relationships & Care	lines 252-254
22.	unexpected patient care situations can cause students stress	negative			lines 317-320
30.	diversity of patients & experiences provide value	positive	Patient-Centered Learning		lines 421-423
32.	immediate application of learned information increases value	positive			lines 454-456
33.	independent learning dictated by patient care demands	positive			lines 481-483

38.	classroom learning equals one right answer & clinical learning equals reasoning in the gray	negative	lines 548-579 lines 581-594 lines 618-630 lines 632-637