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A Conceptual Model of Observed Physical Literacy

Dean A. Dudley

Abstract

Physical literacy is a concept that is gaining greater acceptance around the world with the United Nations Educational, Cultural, and Scientific Organization (2013) recognizing it as one of several central tenets in a quality physical education framework. However, previous attempts to understand progression in physical literacy learning have been limited to preexisting knowledge and psychosocial and physical assessment instruments and have been proved to be less than complete in the understanding of this construct. The aim of this article was to present a unique conceptual model of observed physical literacy and establish an assessment rubric on which future assessment protocols may be based. Seminal definitions of physical literacy and numerous models of physical education instruction were reviewed to establish common core elements of physical literacy. These core elements were then viewed through a Structure of Observed Learning Outcomes (SOLO) taxonomy lens to establish an assessment rubric that may be applied to extend understanding of student learning within this construct. The established core elements of physical literacy and the application of the SOLO taxonomy provide a potentially useful tool for future assessment item development.

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According to Whitehead (2013), physical literacy can be described as a disposition to capitalize on the human embodied capability wherein the individual has the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for maintaining purposeful physical pursuits/activities throughout the life course. Whitehead's (2013) definition is important in understanding how the construct of physical literacy is likely to manifest as a result of the learning students undertake during formal education programs. It also captures the central thesis of physical literacy expressed in other popular Organisation of Economic Co-operation Development (OECD) physical education (PE) instruction models adopted around the world. Many OECD nations even include references to specific curriculum models such as teaching games for understanding (Bunker & Thorpe, 1982), sport education (Siedentop, 1994), and teaching personal and social responsibility through physical activity (Hellison, 1983). However, those adopting any one of these models alone cannot support the multidimensional (cognitive, affective, and psychomotor) and interactive nature of the physical literacy construct, which has yet to be effectively articulated in a manner that has facilitated its application for effective pedagogical or assessment purposes.

Previous attempts to understand progression in physical literacy learning have been limited to preexisting knowledge, psychosocial and physical assessment instruments, or combinations thereof (Tremblay & Lloyd, 2010) and hence restrain understanding of the contemporary physical literacy construct to that which is already known within these domains.

Furthermore, many have argued that physical literacy is an individual journey, and therefore, observable assessment of such a construct is problematic beyond the psychomotor domain of observed behavior (International Council of Sport Science and Physical Education, 2013). However, the 20th century Dutch mathematician and psychologist George Rasch refuted the premise that any learning is beyond human ability of observational assessment. He posited in his seminal work that the manifestations of learning of a given person to a given stimulus of a certain set of allied stimuli can be observed and measured by allocating a parameter characterizing the person and a parameter characterizing the stimulus. It is then possible, in the analysis of the data, to detach the personal parameters from the stimulus parameters, and vice versa (Rasch, 1960). These are the manifestations of observed personal physical literacy that I

sought to articulate by assigning parameters characterizing physical literacy behaviors and their related stimuli.

In this article, physical literacy is not a concept strictly limited to the learning described within a PE curriculum. On the contrary, it was found in a previous systematic review of effective PE and school sport curricular interventions that many of the core outcomes these curricula set out to achieve (i.e., increasing physical activity participation and developing movement skills) are better addressed in a holistic and cross-curricular way (Dudley et al., 2011). Physical literacy should therefore be seen as a journey that a school and its wider community can service.

Core Elements of Physical Literacy

Physical literacy should be viewed as an umbrella concept that captures the knowledge, skills, understandings, and values related to taking responsibility for purposeful physical activity and human movement across the life course, regardless of physical or psychological constraint. The proposition in this paper is that there are four core elements contained within a model of physical literacy that can manifest in observable student behavior and be assessed via an evidence-derived observed learning taxonomy. Those core elements are (a) movement competencies; (b) rules, tactics, and strategies of movement; (c) motivational and behavioral skills of movement; and (d) personal and social attributes of movement (see Figure 1).

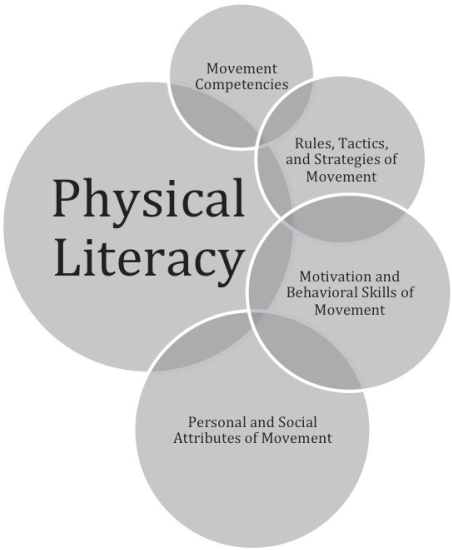

Figure 1. Core elements of physical literacy.

Each core element represents a loose progression from simple to complex in the physical, cognitive, and affective learning domains. Furthermore, students do not necessarily progress in a strictly linear fashion, but rather the focus is on the relationship and learning that exists among the elements. In fact, the Structure of Observed Learning Outcomes (SOLO) deconstruction of each element demonstrates that students are capable of being at different metacognitive points within each element simultaneously. The elements, however, provide relevant scaffolds for planning lessons, activities, and assessments for students and individualizing learning programs.

To explain the nesting of the physical literacy elements, I will use a Russian (Matryoshka) doll metaphor used by Quay and Peters (2009) in their unpacking of the relationships that exist among models of instruction in PE. Throughout the physical literacy model described here, the four elements are entwined together into a reasoned compendium. They do not exist as separate resources to sit on a teacher's desk or to be selected according to a particular focus the teacher believes should be taken. They are deliberately described here as supporting each other and designed to be implemented in a sequence that weaves a meaningful context within which curriculum, co- and extracurricular content, and school environment become means to the students' ends in demonstrating their physical literacy.

To use the Quay and Peters (2009) analogy, the relationship among these concepts can be perceived metaphorically as a Russian doll, each one sitting inside the other (see Figure 1). They nest together to constitute cascading elements of purpose and meaning for students that, in practical terms, form a unified whole. Most important, however, this nesting begins not with the smallest doll, the movement competency, but with the largest doll, the personal and social context, which underpins the deeper and more purposeful interests of each student. This notion also links closely with Whitehead's (2010) discussion on the existential nature of physical literacy and that people create themselves through their interactions with the world around them.

Consistent with Whitehead's (2013) definition of physical literacy, bringing together these four core elements can only be achieved by beginning with the motivation and interests of students, attempting to connect students with their learning through their own interests and thus through the inherent meaning attributed by the student to the tasks and content involved. This is a process of attribution

through purpose that the teacher can influence via the structure of any teaching and learning strategy.

The teaching practices at the center of this physical literacy model enable a connection to be made with students' lives beyond merely the school context. Other contexts that engage students in personal, social, and physical ways become intimately connected with their journey in achieving physical literacy. This includes community and organized sport, but it is also the evident link with a students' play during school recess periods and less organized play that occurs at home and outside school hours when they do not require teacher input and require only minimal equipment that can easily be made available and therefore allow physical literacy to be played, practiced, enacted, and important, assessed. These understandings and abilities will also play an important role in peoples' lives after their formal years of schooling, enhancing the available opportunities for more physical activity across the life course.

A Metacognitive Model for Observing Physical Literacy

Recognizing that physical literacy is a complex phenomenon can make developing any assessment framework difficult. Effective assessment models and rubrics are grounded in effective models of metacognition (Biggs, 1999). Popular metacognitive models such as Bloom's taxonomy of learning objectives (Bloom, 1956) and the later revisions by Anderson (2005) were primarily concerned with the cognitive domain of learning. Even though adaptations were constructed for the affective (Krathwohl, Bloom, & Bertram, 1973) and psychomotor domains (Simpson, 1972), they remained plagued by lack of empirical support as to their validity and reliability at distinguishing between the learning domains, confusion with levels of knowing and forms of knowledge, and endemic semantic misinterpretations when used by teachers (Colder, 1983; Hattie & Purdie, 1998).

To describe a progression of increasing cognitive, affective, and psychomotor complexity for each of the core elements of physical literacy outlined in this article, a metacognitive model was sought that was not limited to any one of the aforementioned learning domains. In essence, the selected metacognitive taxonomy had to address all three learning domains simultaneously to address the multidimensionality of the physical literacy construct. For this reason, within each proposed physical literacy core item (Figure 1) is

an embedded dissection of observed learning behaviors using the SOLO taxonomy proposed by Biggs and Collis (1982). The SOLO taxonomy was used to understand the metacognitive complexity of physical literacy because it has been used to measure teacher understanding of PE pedagogy effectively (Baxter & Dudley, 2008; Dudley & Baxter, 2009, 2013; Dudley, Drinkwater, & Kelly, 2014) and to assess student understanding of concepts related to PE (Hook & Richards, 2013a, 2013b). Furthermore, the SOLO taxonomy (Biggs & Collis, 1982) is a metacognitive "model that values a balance of surface and deep learning" quantitatively and qualitatively (Hattie & Brown, 2004, p. 3), and unlike other learning taxonomies, it is not limited to any one domain in its application.

The SOLO taxonomy is based on Piagetian descriptions of learning and was constructed by observing the developmental pattern of student behaviors and responses in relation to a variety of school subjects. It is widely used by both schools and universities, most notably in Australia and New Zealand. It has been evaluated as particularly applicable to the measurement and categorization of levels of conceptual understanding (Boulton-Lewis, 1998; Chan, Tsui, Chan, & Hong, 2002; Hattie & Brown, 2004).

Biggs and Collis (1982) described the five SOLO levels as follows:

1. Prestructural (no understanding)
2. Unistructural (understanding of one element)
3. Multistructural (understanding of a number of elements but not the pattern of relationships between them)
4. Relational (understanding of the links between the elements)
5. Extended abstract (the ability to relate the concept to contexts and other concepts)

Relational and extended abstract responses have been linked to the conception of deep learning, whereas unistructural and multistructural responses reflect surface approaches (Hattie & Brown, 2004, pp. 5–6; Ramsden, 2003, p. 57).

Biggs and Collis (1982, p. 217) also maintained that SOLO levels were discernible in the Piagetian modes (sensory-motor, intuitive, concrete symbolic, and formal).

The SOLO taxonomy provides a rigorous, well-evidenced (Killen, 2005), and practical learning model that informs the powerful pedagogical approach of constructive alignment (Biggs, 1999). For this reason, it can be used to enhance understanding of physical lit-

eracy across the compulsory and noncompulsory years of schooling as it informs planning and monitoring student achievement and provides a universal understanding of assessment.

Personal and Social Attributes of Movement

Don Hellison (1983) best described the importance of teaching the personal and social attributes of movement in his seminal work on the issue. Past and present PE, sport, and even political leaders have claimed that a number of personal and social benefits can be derived from participation in physical activity. The rhetoric of "sport builds character" and "play fair in class and you will play fair in life" are rooted in the educational testimonies of Thomas Arnold from the 19th century Rugby School and the ideals of Olympism spruced by Pierre de Coubertin. Unfortunately, this rhetoric and other idealistic claims about PE and sport are outdone by evidence sourced empirically (Rees, 1990).

According to Hellison (2003), however, this evidence and rhetoric is not to say that the potential for social benefit from physical activity is nonexistent. It is, however, a risky proposition to assume that such outcomes are achieved through mere participation in physical activity.

The holistic nature of physical literacy speaks to the potential learning that can occur through movement. According to Noddings (1992), this also coincides with the holistic nature of physical activity wherein the physical self is articulated still as only part of the self. The emotional, spiritual, and intellectual self must also be a concern, and clearly these are not discrete. Noddings also stated that it was a mistake to try and separate them sharply in the application of curricula.

Hellison (2003) also stressed that the conceptualization and implementation of teaching and learning of social responsibility through movement may be difficult because they involve more than a list of behaviors in a single context. However, he identified five hierarchical components of social responsibility an individual can exhibit (see Table 1).

Table 1
Personal and Social Attributes of Movement

Hierarchical level	Personal and social attributes of movement
Level 1	Respecting the rights and feelings of others Self-control Right to peaceful conflict resolution Right to inclusion
Level 2	Participation and effort Self-motivation Exploration of effort and new tasks Courage to persist
Level 3	Self-direction On-task independence Goal-setting progression Courage to resist peer pressure
Level 4	Helping others and leadership Caring and compassion Sensitivity and responsiveness Inner strength
Level 5	Outside the gym/formal learning environment Transfer into other areas of life Being a positive role model for others in how you live your life

Note. Adapted from *Teaching Responsibility Through Physical Activity* (2nd ed.), by D. Hellison, 2003, Champaign, IL: Human Kinetics.

Motivational and Behavioral Skills of Movement

Whitehead (2010) supported the notion that motivation to maintain physical activity across the life course is an important variable to consider in the physical literacy context. One of the primary reasons youth participate in physical activity is for the sheer enjoyment they experience while moving in social situations and interacting with their peers, but the concept of promoting personal and intrinsic motivation also needs investigation. Many researchers agree that intrinsically motivated youth are more likely to perceive their movement experiences as positive and therefore lead more active lifestyles (Biddle, 2001; Kilpatrick, Herbert, & Jacobsen, 2002; Weiss, 2000).

In their seminal work, Ryan and Deci (2000) described human beings as being proactive and engaged or passive and alienated from their personal health and well-being, promoting behaviors largely as a function of the social conditions in which they develop and function. They postulated that three innate psychological needs exist: competence, autonomy, and relatedness. When these needs are satisfied, they potentially yield enhanced personal motivation toward improved personal behaviors that promote health and wellness, but when they are not satisfied, they potentially lead to diminished motivation, health, and well-being.

The hallmark of physically literate individuals is that they foster a love of physical learning, so they seek physical challenges, value physical effort, and persist in the face of physical obstacles. Physical literacy therefore seeks to develop an individual's intrinsic motivation to pursue these values.

Current research indicates that development of students' intrinsic motivation has been associated with increased intentions to engage in health and skill promoting movement such as exercise (Standage, Duda, & Ntoumanis, 2003), step counts during PE classes (Lonsdale, Sabiston, Raedeke, Ha, & Sum, 2009), and physical activity during leisure time (Gordon-Larsen, McMurray, & Popkin, 2000; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003).

Rules, Tactics, and Strategies of Movement

Challenging students to find solutions to problems is a central feature of a tenable understanding of physical literacy. This teaching practice is engaged when students are faced with the dilemma of how to improve their own and their team's performance. The rule-bound tactical and strategic structure of game play and recreation now require investigation by the physically literate student.

The attention with rules, tactics, and game strategies and the creation of a model for addressing them in education have been attributed to Bunker and Thorpe (1982). These pioneering educators built on previous advances, bringing together aspects of a growing dissatisfaction with a limited focus on skills or techniques to develop their model. Table 2 shows how rules, tactics, and strategies are classified in a physical literacy context. They are hierarchical in nature, with strategy being the most complex cognitive task, followed by tactics and rules, which govern a game or physical activity.

Rules may be defined as the "means to an end, and to achieve the end by other means is not playing the game" (Grehaigne, Richard, &

Griffin, 2005). Tactics are the operations the players voluntarily execute during the game to adapt to the immediate requirements of an ever-changing opposition. It involves the spontaneous actions that occur during the game or those organized through a predetermined response strategy (Grehaigne et al., 2005). Strategy is different from tactics in that it is the plans, principles of play, and action guidelines decided upon before a game or activity. Strategy is associated with more elaborate cognitive processes because the decisions made are based on reflection and research without time constraints. Tactics operate under strong time constraints (Grehaigne et al., 2005).

Table 2
Classification of Rules, Tactics, and Strategies in a Physical Literacy Context

Hierarchical levels	Classification of rules, tactics, and strategies
Level 1 Rules	Rules are a means to an end, without which a game or organized physical activity may not exist or be accepted Fundamental/primary rules of team games and sports (Grehaigne et al., 2005, p. 4) Safety and ethical rules of organized physical activity
Level 2 Tactics	Tactics are the operations the participants voluntarily execute during the game to adapt to the immediate requirements of an ever-changing opposition, their spontaneous actions, or those organized through a predetermined strategy Offensive and defensive tactics of team games and sports (Grehaigne et al., 2005) Quality and efficiency tactics of organized physical activity
Level 3 Strategies	Strategies are higher order cognitive processes based on reflection and research Offensive and defensive strategy of team games and sports (Grehaigne et al., 2005) Quality and efficiency strategy of organized physical activity

Bunker and Thorpe (1982) described their alternative model as the teaching games for understanding (TGfU) model. Within the TGfU model, there are six basic phases: game, game appreciation (rules), tactical awareness, making appropriate decisions, skill execution, and performance. These phases act as a pedagogical framework for teachers to follow when employing the TGfU approach.

For students to understand the notion of rules, tactics, and strategies, Bunker and Thorpe (1982) also underpinned their TGfU model with the games classification system (GCS). The GCS essentially classifies most sports into one of four categories of similar tactical intent: (a) target games, (b) net/wall games, (c) striking/fielding games, and (d) invasion/territorial games. As the GCS is hierarchical, it is a useful model for understanding the complexity of tactical and strategic performance required in activities that fall within those classifications. It is, however, limited as a universal model to be applied to physical literacy because only dominant sports and popular forms of game play are captured in the model.

If it is accepted that a student's ability to understand rules, tactics, and strategies is an important progression in the physical literacy continuum, it also needs to be recognized that these opportunities present themselves in activities beyond conventional team games and sport.

Many recreational activities and sports that exist beyond the GCS require participants to follow rules, adopt tactics to adapt to their immediate requirements, and employ strategies to improve the likelihood of successful performance. To illustrate my point, consider surfing. Surfing sits outside conventional understanding of the GSC to show how rules, tactics, and strategic decision making are imperative to performance and capable of observation using a SOLO rubric.

Surfing has long been prided as a sporting and recreational activity that sat beyond the rules and conventions of modern life (Taylor, 2007). Its subculture of rebellion, however, now requires participants to observe a strict code of conduct that is enforced by other surfers and not referees or umpires. Before new surfers even enter the water, they are expected to understand rules such as (a) right of way, (b) not dropping in, (c) paddling behind, (d) not ditching, and (e) respecting the lineup. These rules are as important to achieving the "means to an end" as is the game appreciation phase in the TGfU model for more conventional sporting participation.

Unlike players in many team games, surfers adopt tactics that allow them to overcome the prevailing conditions to improve the

quality and efficiency of their surfing experience. Therefore, in terms of tactics, surfers employ several operations voluntarily, or adapt to the immediate requirements of the surf, or adopt actions organized through a predetermined strategy. Examples of these include paddling out to the break by using a rip current to save energy or paddling to the middle of the peak to ensure a longer ride. In terms of strategy, proficient surfers are students of weather. They research tides and wind to determine the best days and times to surf their favorite breaks.

Surfing is by no means an isolated exception to the GCS, whereby rules, tactics, and strategies of play are legitimate decisions made by participants. The same argument could be conceivable for dancers, gymnasts, swimmers, hikers, cyclists, skaters, skiers, and other nonteam sports or recreational activities. The point is rules, tactics, and strategies of play are an important progression beyond mere skill execution as they require a conscious interaction with others and the environment in which they occur.

Movement Competencies

The role of developing fundamental movement skills (FMS) in youth has been well documented in the literature. Fundamental motor skills are related to physical activity (Fisher et al., 2005; Okely, Booth, & Patterson, 2001b; Saakslahti et al., 1999; Williams et al., 2008), and these fundamental movement skills are likewise related to physical fitness (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008; Haga, 2008; Okely, Booth, & Patterson, 2001a).

However, most studies in which the role of FMS has been examined have been limited to able-bodied students, land-based activities, and the role they play in providing access to popular sport participation. Most attempts to rationalize these skills into a singular resource or testing battery have met controversy in the physical literacy context because they fail to capture the broader physical literacy components of moving for play, enjoyment, recreation, health, or fitness. Nonetheless, although relying on traditional notions of FMS may limit a full understanding of physical literacy, the evidence provided toward understanding what it takes to lead a healthy and active life is substantial. In a review of the associated health benefits of developing fundamental movement skills in children and adolescents, Lubans, Morgan, Cliff, Barnett, and Okely (2010) determined that teaching children to become competent and confident performers of FMS may lead to a greater willingness to participate

in physical activities that may also provide opportunities to improve fitness levels and reduce the risk of unhealthy weight gain. Specifically, it is important that such skills are taught during the primary school years as children are at an optimal age in terms of motor learning and motor skill proficiency tracks through childhood.

To recognize this evidence, all of the traditional components of FMS (i.e., locomotor, stability, and object manipulation) have been included in this model. However, unlike traditional understandings of FMS, here the land- and water-based skills have been segregated (air-based skills such as hang gliding or skydiving could have also been included, but activities of this nature are not commonplace in school-based education). In addition to segregating the environment in which the movement skills are executed, "object locomotor" skills have been added.

Object locomotor skills facilitate locomotion when the human body manipulates a secondary source of movement other than the body itself. More often than not, these skills require the participant to combine a range of traditional movement skills (i.e., locomotor, stability, manipulative) to complete them successfully. For example, skiing, skating, cycling, paddling, rowing, or wheelchairing would constitute object locomotion. Including these elements may go some way to providing a solid foundation on which to build a new role of movement skill and competence in a physical literacy model.

To dispel the stigma attached to FMS in physical literacy, the term *movement competencies* has been adopted from the physical literacy literature to be used in the context of this taxonomy. Whitehead (2010) reframed the building block of FMS as a "bank of movement competencies" (p. 53). In other words, the more skills individuals have in their bank, the more they will be able to respond to situations in a way that is automatic and meaningful to them. These movement competencies have been referred to as one's vocabulary and relate the process of becoming fluent in such action to the Piagetian notion of assimilation and accommodation (Whitehead, 2010).

Just as Piaget moves away from the sensing body by the prioritization of abstract thought in his formal operations stage, movement competencies may not simply infer directionality (e.g., stacking) and banking (e.g., filling) metaphors. The focus moves toward progressive complexity, and there is an inferred departure from "the realm of sheer kinetic" (Sheets-Johnstone, 1999, p. 136) within movement competencies.

Put simply, movement competencies allow humans to engage in meaningful physical activity within their physiological capability. Unlike previous understandings of movement in physical literacy, they recognize that most people throughout their life course will be inhibited through injury or incapacity to perform certain human movements, and therefore, it is redundant to subscribe to a deficit model when assessing them. They also recognize proficiency or artistry in certain movements linked to popular sport. It is not by any means an exhaustive capacity to be physically literate.

Table 6 shows how the components of movement competencies can be categorized for deeper understanding and planning. Each component contains examples of skills that may be classified as a movement competency in that setting.

Table 3
Movement Competency Classifications

Movement competencies	
Land-based	**Water-based**
1. Locomotor (e.g., walking, running, skipping, jumping, galloping)	1. Locomotor (e.g., flutter kicking, crawling, gliding, diving,)
2. Stability (e.g., balancing, landing, bending, twisting)	2. Stability (e.g., floating, treading water, tumble turning)
3. Manipulative (e.g., catching, striking, kicking, throwing)	3. Manipulative (e.g., using fins or snorkel, throwing in water, towing in water)
4. Object Locomotor (e.g., skating, skiing, cycling, wheelchairing)	4. Object Locomotor (e.g., paddling, rowing, waterskiing, wakeboarding)

SOLO Levels of the Core Elements of Physical Literacy

Table 4 shows each of the core elements of physical literacy articulated in terms of their metacognitive SOLO progressions. For the reasons stated earlier, and for meaningful application in school settings, the manifestations and SOLO description of social development through movement are described as observed learning behaviors only. These criteria can be applied in any context of physical activity participation, but special mention is made to PE, school

sport, co- and extracurricular activities, recess and lunch breaks, and community events.

It is also prudent that any continuum of learning associated with physical literacy include a method of observing legitimate manifestations of personal responsibility toward health-promoting movement and not lay causality purely on social factors. At one end, the continuum must capture the state of when competence, autonomy, and relatedness are being satisfied and personal motivation toward health-promoting movement occurs. Conversely, it should identify when elements of competence, autonomy, and relatedness are absent and include points of intervention to move students along the continuum.

The SOLO descriptions of motivation and behavioral skills of movement have been described as observed learning behaviors only. As previously mentioned, these criteria can be applied in any context of physical activity participation, but as with personal and social attributes of movement, special mention is made to PE, school sport, co- and extracurricular activities, recess and lunch breaks, and community events.

The metacognitive SOLO rubric for understanding a student's progression in rules, tactics, and strategies of movement is also contained within the Rubric of Observed Learning in Physical Literacy (see Table 4). This rubric can be modified to accommodate any of the games classifications (Bunker & Thorpe, 1982) or activities that sit beyond the GCS that are argued for in this paper. Furthermore, unlike movement competencies, understanding of these concepts may manifest in several roles students adopt in their physical activity experiences. Examples and support for this notion of diverse student participation may be derived from the work of Siedentop (1994) with sport education. Students can and should conceivably be able to demonstrate their knowledge, skills, and understanding of rules, tactics, and strategies of play by adopting roles as player, coach, manager, or official. For this reason, the rubric for this core element was written broadly to provide a general structure for each aspect of play regardless of context or role. Existing assessment instruments of rule, tactical, and strategic understanding will need revision to be used within the physical literacy context described in this paper.

Finally, Table 4 shows a metacognitive SOLO rubric for understanding a student's progression in movement competencies. There are numerous assessment protocols that currently exist for understanding movement skill in youth and adults, and they provide valuable insight into the movement skill development of a population. However, in future protocols, researchers should consider the challenges set by this article in establishing movement competencies as legitimate manifestations of psychomotor development.

Applying a Rubric of Observed Learning in Physical Literacy

In this article, I explained the use of an observed physical literacy model as a metacognitive framework for an authentically student-centered approach to learning. The rubric in Table 4 exemplifies an integrated core element classification system that can be used to observe student behavior to infer cognitive, affective, and psychomotor achievement.

The development of a rubric of observed learning in physical literacy based on the taxonomy described within this article should enable educationalists, practitioners, and teachers to begin the informed development of assessment items to be used in the assessment and reporting of physical literacy. These instruments should be used to determine the progress students make based on varied starting points in any given physical learning context over time.

In physical literacy, as with any other concept in education, there needs to be a shift from an overreliance on simply providing "success" experiences and judging against nebulous "standards" to assessing "growth over time" (Masters, 2013, pp. 1–3). The power of applying this rubric to a learning continuum or reporting engine of physical literacy is to direct the discussion and thinking of teachers, students, and parents to knowing about what students think, do, and feel. Once this becomes the dominant learning discussion among these key stakeholders in learning, they may then focus their efforts in making students aware at the start of a physical experience what success is expected to look like (based on appropriate level of challenge) and then engaging them in the challenge to achieve that success (Hattie & Yates, 2013).

Table 4
A Rubric of Observed Learning in Physical Literacy

Unistructural	Multistructural	Relational	Extended abstract
Personal and Social Attributes of Movement: Contexts may include physical education and other subject areas, school sport, co- and extracurricular activities, recess and lunch breaks, and community events.			
I am able to control my own behavior so I don't interfere with others. I do this without prompting and constant supervision.	I not only show respect for others, but I am also willing to play and move with others. I accept challenges, practice movement skills, and train for fitness/health with my peers.	…and I am able to work without supervision. I can identify my own movement needs and the relationship between my movement needs and those of my team/peers (i.e., strengths and weaknesses)… …and I am able to extend my sense of responsibility to others by cooperating, giving support, showing empathy, or showing the inner strength to deal with adversity…	…and/or I demonstrate effective and compassionate leadership of my team/peers during physical activities… …and/or I can see how I can adopt my social learning experiences through movement beyond my participation in physical activity to broader life lessons.
Motivation and Behavioral Skills of Movement: Contexts may include physical education, school sport, co- and extracurricular activities, recess and lunch breaks, and community events.			
I can move in ways that will improve my health or skill if I am prompted, if I am reminded, or if they are modeled.	I can move in ways that will improve my health or skill because I am self-motivated to improve a specific aspect of my physical self using different strategies (e.g., cardiorespiratory fitness, strength, endurance, speed, agility, dribbling, tackling, shooting).	I can move in ways that will improve my health AND skill because I understand the relationship between health and skill and am self-motivated to improve many aspects of my physical self…	…and I can evaluate the effectiveness of my movement in improving my health and skill… …and/or I can help others to make moves to improve their health and skill… …and/or I can create new movements for improving health and skill… …and/or I can see how I can adopt my movement decisions for health and skill beyond my participation in physical activity.

Table 4 (cont.)

Rules, Tactics, and Strategies of Movement: Contexts may include physical education, school sport, co- and extracurricular activities, and recess and lunch breaks.			
I can demonstrate that I understand the rules of play/movement and the need for rules when others set them in similar movement contexts.	I can demonstrate that I understand the rules of play/movement and the need for rules that others set in many movement contexts… …and I can participate within the confines of rules in different movement contexts.	…and I demonstrate different tactical decisions to adapt to changing rules/circumstances in different movement contexts… …and I demonstrate a capacity to develop basic strategy for different movement contexts…	…and I can evaluate the effect different rules, tactics, or strategy have in any given movement context… …and/or I can create new strategies, tactics, and rules for improving play/movement… …and/or I demonstrate how strategy, tactics, and rules of play/movement should be adopted in contexts beyond participation in physical activity.
Movement Competencies: Contexts may include physical education, school sport, co- and extracurricular activities, and recess and lunch breaks.			
I can complete that movement skill if I am assisted, if I am imitating, or if others model the movement.	I can complete that movement skill unassisted or by following instructions independently.	…and I can combine it with other movement skills to perform successful movement sequences with few errors…	…and I can appraise my own movement competence with this skill as it varies… …and/or I can assist others to learn this movement skill… …and/or I can create new adaptations to these skills to make them more effective in different contexts… … and/or I can apply these skills in contexts for which they were not intended.

Furthermore, the dangers and overreliance on either surface or deep learning is circumvented through use of this rubric of observed learning in physical literacy. As supported by Hattie (2009), application of this rubric to think about assessment instrument design should shift learning focus toward a balance of surface and deep learning. When teachers and students can engage with and balance surface and deep understanding of physical literacy, the student can begin to construct notions of what it means to be a physically literate person. Biggs and Collis (1982) discussed these notions of surface, deep, and constructed (conceptual) understanding when they initially developed their SOLO taxonomy. The critical application aspect of this rubric for teacher consideration is that students need to have surface knowledge, skills, or behavior to reach deep knowledge, skills, or behavior of any core physical literacy domains discussed in this article. They need to have surface knowledge, skills, or behavior and deep knowledge, skills, or behavior before deep understanding of what it means to be physically literate can occur. According to Hattie (2009), when students can regulate or use metacognition (apply knowledge and skillfulness) to their learning, they eventually become their own teachers.

The application of the observed learning in physical literacy rubric in initial assessment design should also be aimed at promoting teacher dialogue and student awareness of physical literacy. As argued by Dudley, Okely, Pearson, and Cotton (2011), many of the outcomes articulated in the PE curricula of developed nations and by the United Nations need to be tackled in cross-curricula and holistic school interventions if they are to be achieved. In much the same way that literacy and numeracy are often addressed in schools across many subjects and learning experiences, the rubric of observed physical literacy outlined in this article indicates areas within and beyond the formal curricula in which progression may be judged. For this reason, it can be used to inform the planning for and active teaching of physical literacy in a way that is developmentally appropriate and sufficiently challenging for students across their school learning experiences.

Most important, it is envisaged that as students and teachers become familiar with the rubric of observed learning in physical literacy, it will lead to the development of "road maps" for the students in plotting their own achievements, strengths, and weaknesses in their own manifestations of physical literacy. Each student's road map will vary, but the application of the observed physical literacy

rubric in schools could be used as a visual tool to show students their surface, deep, and conceptual understandings of physical literacy and in turn become an instrument used to encourage students to lead active and purposeful physical lives.

Empirical evaluation of its effect on student achievement across the three learning domains and further insight from teachers about ways in which this rubric may be applied as a tool to empower their understanding of student physical literacy is now needed.

Each of the core elements in this observed physical literacy model are derived from dominant PE pedagogy, behavior motivation, and metacognitive models. The importance of integrating each of the pedagogical and behavior motivation models in a nonhierarchical fashion while using the SOLO taxonomy as the hierarchical scaffold is noteworthy. Many teaching programs in developed nations already demonstrate particular bias toward one or two pedagogical models at the expense of others in their core and noncore curricula design. For example, games-based instruction permeates from North American, United Kingdom, and Australian curricula, whereas skills-based and behavioral motivation models are commonplace in many Asian nations (Dyson, Griffin, & Hastie, 2012). The placing each model in an integrated fashion, but within a common metacognitive schema, should allow for inclusive conversations by schools and teachers who wish to develop physical literacy beyond merely a PE context. Empirical investigation, however, is needed to ascertain the depth of knowledge teachers require in the fields of metacognition, behavior motivation, and pedagogy to make the application of an observed physical literacy model efficacious in teaching practice.

References

Anderson, L. W. (2005). Objectives, evaluation, and the improvement of education. *Studies in Educational Evaluation, 31*(2–3), 102–113.

Barnett, L. M., Van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2008). Does childhood motor skill proficiency predict adolescent fitness? *Medicine & Science in Sports & Exercise, 40*, 2137–2144.

Baxter, D., & Dudley, D. (2008). *Assessing for deeper understanding in tertiary examinations in physical education using a SOLO taxonomy* (Online Refereed Articles No. 52). Carlton South, Australia: Australian College of Educators.

Biddle, S. J. H. (2001). Enhancing motivation in physical education. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (2nd ed.). Champaign, IL: Human Kinetics.

Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher Education Research and Development, 18*(1), 57–75.

Biggs, J., & Collis, K. (1982*). Evaluating the quality of learning: The SOLO taxonomy.* New York, NY: Academic Press.

Bloom, B. S. (1956). *Taxonomy of educational objectives: Handbook I—The cognitive domain.* New York, NY: David McKay.

Boulton-Lewis, G. (1998) Applying the SOLO taxonomy to learning in higher education. In B. Dart & G. Boulton-Lewis (Eds.), *Teaching and learning in higher education* (pp. 201–221). Melbourne, Australia: ACER.

Bunker, D., & Thorpe, R. (1982). A model for teaching games in secondary schools. *Bulletin of Physical Education, 18*(1), 5–8.

Chan, C., Tsui, M. S., Chan, M., &. Hong, J. H. (2002). Applying the Structure of the Observed Learning Outcomes (SOLO) taxonomy on students' learning outcomes: An empirical study. *Assessment and Evaluation in Higher Education, 27*(6), 511–527.

Colder, J. R. (1983). In the cells of the 'Bloom Taxonomy.' *Journal of Curriculum Studies, 15*(3), 291–302.

Dudley, D., & Baxter, D. (2009). Assessing levels of student understanding in pre-service teachers using a two-cycle SOLO model. *Asia-Pacific Journal of Teacher Education, 37*(3), 283–293.

Dudley, D., & Baxter, D. (2013). Metacognitive analysis of pre-service teacher conception of teaching games for understanding (TGfU) using blogs as an assessment tool. *Asia-Pacific Journal of Teacher Education, 41*, 219–229.

Dudley, D., Drinkwater, E., & Kelly, R. (2014). Relationship between blogs and high stakes examinations in pre-service teacher understanding of the teaching games for understanding approach to physical education. *Sydney University Papers in Human Movement, Health, and Coach Education, 3*(1), 1–16.

Dudley, D., Okely, A., Pearson, P., & Cotton, W. (2011). A systematic review of the effectiveness of physical education and school sport intervention targeting physical activity, movement skills and enjoyment of physical activity. *European Physical Education Review, 17*(3), 353–378.

Dyson, B., Griffin, L., & Hastie, P. (2004). Sport education, tactical games, and cooperative learning: Theoretical and pedagogical considerations. *Quest, 56*, 226–240.

Fisher, A., Reilly, J. J., Kelly, L. A., Montgomery, C., Williamson, A., Paton, J. Y., & Grant, S. (2005). Fundamental movement skills and habitual physical activity in young children. *Medicine & Science in Sports & Exercise, 34*, 684–688.

Gordon-Larsen, P., McMurray, R. G., & Popkin, B. M. (2000). Determinants of adolescent physical activity and inactivity patterns. *Pediatrics, 105*, 63–70.

Grehaigne, J. F., Richard, J. F., & Griffin, L. L. (2005). *Teaching and learning team sports and games.* London, England: Routledge.

Haga, M. (2008). The relationship between physical fitness and motor competence in children. *Child: Care, Health, and Development, 34*, 329–334.

Hagger, M. S., Chatzisarantis, N. L. D., Culverhouse, T., & Biddle, S. J. H. (2003). The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behavior: A transcontextual model. *Journal of Educational Psychology, 95*, 784–795.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* London, England: Routledge.

Hattie, J. A. C., & Brown, G. T. L. (2004). *Cognitive processes in asTTle: The SOLO taxonomy* (asTTle Tech. Rep. #43). Auckland, New Zealand: University of Auckland/Ministry of Education.

Hattie, J. A. C., & Purdie, N. (1998). The SOLO model: Addressing fundamental measurement issues. In B. C. Dart & G. M. Boulton-Lewis (Eds.), *Teaching and learning in higher education* (pp. 145–176). Melbourne, Australia: ACER.

Hattie, J., & Yates, G. (2013, August). *Understanding learning: Lessons for learning, teaching and research. How the brain learns: What lessons are there for teaching?* Paper presented at the Australian Council for Educational Research Conference, Melbourne, Australia.

Hellison, D. (1983). Teaching self-responsibility (and more). *Journal of Physical Education, Recreation, and Dance, 54*, 23–28.

Hellison, D. (2003). *Teaching responsibility through physical activity* (2nd ed.). Champaign, IL: Human Kinetics.

Hook, P., & Richards, N. (2013a). *SOLO taxonomy in physical education: Learning through movement contexts: Book 1*. Invercargill, New Zealand: Essential Resources.

Hook, P., & Richards, N. (2013b). *SOLO taxonomy in physical education: Learning through movement contexts—Book 2*. Invercargill, New Zealand: Essential Resources.

International Council of Sport Science and Physical Education. (2013). Physical literacy. *Journal of Sport Science and Physical Education, Bulletin 65*, 1–448.

Killen, R. (2005). *Programming and assessment for quality teaching and learning*. Melbourne, Australia: Thompson.

Kilpatrick, M., Herbert, E., & Jacobsen, D. (2002). Physical activity motivation: A practitioner's guide to self-determination theory. *Journal of Physical Education, Recreation, and Dance, 73*(4), 36–41.

Krathwohl, D. R., Bloom, B. S., & Bertram, B. M. (1973). *Taxonomy of educational objectives, the classification of educational goals: Handbook II—Affective domain.* New York, NY: David McKay.

Lonsdale, C., Sabiston, C. M., Raedeke, T. D., Ha, S. C. A., & Sum, K. W. R. (2009). Self-determined motivation and students' physical activity in PE classes and free-choice periods. *Preventive Medicine, 48*, 69–73.

Lubans, D. R., Morgan, P., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents: Review of associated health benefits. *Sports Medicine, 40*, 1019–1035.

Masters, G. N. (2013). *Towards a growth mindset in assessment* (ACER Occasional Essays). Melbourne, Australia: ACER.

Noddings, N. (1992). *The challenge to care in schools*. New York, NY: Teachers College Press.

Okely, A. D., Booth, M. L., & Patterson, J. W. (2001a). Relationship of cardiorespiratory endurance to fundamental movement skill proficiency among adolescents. *Pediatric Exercise Science, 13*, 380.

Okely, A. D., Booth, M. L., & Patterson, J. W. (2001b). Relationship of physical activity to fundamental movement skills among adolescents. *Medicine & Science in Sports & Exercise, 33*, 1899.

Quay, J., & Peters, J. (2008). Skills, strategies, sport and social responsibility: Reconnecting physical education. *Journal of Curriculum Studies, 40*, 601–626.

Ramsden, P. (2003). *Learning to teach in higher education*. London, England: Routledge.

Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. Copenhagen, Denmark: The Danish Institute of Educational Research.

Rees, R. C. (1990). Do high school sports build character? A quasi-experiment on a national sample. *The Social Science Journal, 27*, 303–315.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.

Saakslahti, A., Numminen, P., Niinikoski, H., Rask-Nissila, L., Viikari, J., Tuominen, J., & Valimaki, I. (1999). Is physical activity related to body size, fundamental motor skills, and CHD risk factors in early childhood? *Pediatric Exercise Science, 11*, 327–340.

Sheets-Johnstone, M. (2009). *The primacy of movement*. Philadelphia, PA: JB Publishing.

Siedentop, D. (1994). *Sport education: Quality PE through positive sport experiences*. Champaign, IL: Human Kinetics.

Simpson, E. (1972). *The classification of educational objectives in the psychomotor domain: The psychomotor domain—Vol. 3*. Washington, DC: Gryphon House.

Standage, M., Duda, J. L., & Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology, 95*, 97–110.

Taylor, B. (2007). Surfing into spirituality and a new, aquatic nature religion. *Journal of American Academy of Religion, 75*, 923–951.

Tremblay, M., & Lloyd, M. (2010). Physical literacy measurement: The missing piece. *Physical and Health Education, 76*(1), 26–30.

United Nations Education, Scientific, and Cultural Organization. (2013). *Quality physical education (QPE) guidelines for policy-makers* (Draft). Paris, France: Author.

Weiss, M. R. (2000). Motivating kids in physical activity. *The President's Council on Physical Fitness and Sports Research Digest, 3*(11), 1–8.

Whitehead, M. (Ed.). (2010). *Physical literacy: Throughout the lifecourse*. London, England: Routledge.

Whitehead, M. (2013). Definition of physical literacy and clarification of related issues. *Journal of Sport Science and Physical Education, 65,* 28–33.

Williams, H. G., Pfeiffer, K. A., O'Neill, J. R., Dowda, M., McIver, K. L., Brown, W. H., & Pate, R. R. (2008). Motor skill performance and physical activity in preschool children. *Obesity, 16*, 1421–1426.

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