

Review

Teaching for physical literacy: Implications to instructional design and PETE

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Abstract

Physical education teachers play an important role in helping students' development of the motor skills needed to be physically literate individuals. Research suggests that teacher made instructional design decisions can lead to enhanced motor skill learning. After presenting a model of evidence-based research this paper presents information that will help teachers plan and execute lessons designed to improve students' motor skills. Variables that impact motor skill learning in physical education including time, type of practice, content, presentation and organizational strategies, and student skill level are presented and discussed. A brief section on student attitudes, their relation to motor skill learning and to physical literacy is included. Motor skills are needed for physically literate people to enjoy lifelong physical activity. Physical education teachers and the decisions they make contribute to students' learning and whether the goal of physical literacy is met. Copyright © 2015, Shanghai University of Sport. Production and hosting by Elsevier B.V. All rights reserved.

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1. Introduction

The promotion of physically literate individuals, through their participation in physical education (PE) programs, is a somewhat recent goal. Researchers and national organizations from several countries (i.e., UK, Canada, and the US) have presented definitions of physical literacy^{1–3} and have incorporated its goals within national standards⁴ and provincial curricula.⁵ Components of definitions of physical literacy from these sources suggest that physically literate individuals are competent, confident, and motivated with the knowledge, skills and attitudes for lifelong physical activity (PA). Physical literacy promotes teaching the whole child, allowing for successful and appropriate participation in PA throughout life.

Conversations regarding the best ways to teach and demonstrate physical literacy within the three learning

domains (psychomotor, cognitive, and affective) and the role of monism (the view that the mind and body are whole) within the definition of physical literacy continue among professionals and policy makers in many countries.^{1,6,7} While the definitions, components, and areas of focus may vary slightly among groups, one constant component is the need for individuals to develop the skills associated with specific topics in order to become competent in that area. How teachers select, organize, and carry out tasks for students to perform plays a vital role in students' abilities to develop the skills needed to achieve physical literacy. The purpose of this paper is to provide an overview of instructional design decisions that teachers make where research suggests that motor skill learning can be enhanced. A second purpose is to show a connection between how developing motor competency is related to the development of positive attitudes, another component of physical literacy.

Teachers play an important role in students' development of motor skills. Good teaching results in learning for all students and for motor skill learning to occur, teachers must work to differentiate instruction for students in their classes.⁸ Without

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learning the act of teaching does not accomplish its purpose and many students will not develop the skills they need to become physically literate.

The development of motor skill requires teachers to develop lessons that are aimed toward student learning. Research on teaching in PE has now occurred for more than 40 years and there is a body of evidence to suggest that how instructional decisions are implemented and adjusted during classes has a large role in student learning. Teachers are vital to the process but informed decisions can help students learn.

We once thought that teachers taught and that students then implemented what the teacher told them—and then learning occurred.⁹ Most researchers no longer believe that is the way learning takes place in PE. Students mediate the instructions that are given to them by adjusting how they implement tasks and in how they complete the assigned practice. Without considering how instruction impacts individual students, learning likely will not occur for everyone and students will not become physically literate.

One way to think about how instructional design effects motor skill learning can be seen in Fig. 1. Teachers make instructional decisions by planning a lesson, a unit of instruction, and a curriculum. Then, they implement the plan and take actions to help students learn the material. For example, a teacher may plan a unit of instruction in fundamental movement skills for elementary school students by designing content to cover, what will be taught in each class session, how the material will be presented to students, and how students will practice to learn the skills. These last two activities, presentation of the content and instructional design for practice, are the keys to whether students learn.

You will note that the arrows in Fig. 1 go in two directions. The teacher's instructional design decisions impact the student, but how the student chooses to implement those decisions should influence how the teacher proceeds and adjusts the lesson. As we will detail later in this section, practice is essential to learning, but if the student does not perform the task assigned or if it is too difficult they will not learn. Within tasks, good teachers are constantly examining what students are and are not able to do and then appropriately modify their instruction.

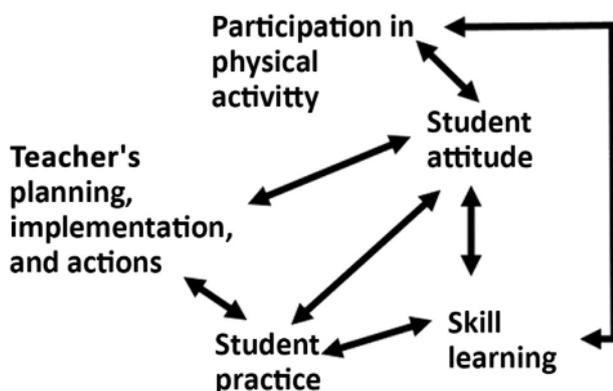


Fig. 1. A model of the instruction and learning variables in physical education.

Student practice, if done well and in sufficient quantities, results in skill learning. This impacts how students will practice on future tasks and in their attitude toward PE and PA.¹⁰ Their attitude then impacts whether they will participate in other PA outside of class.¹¹ Since all of us want to feel competent in any endeavor in which we participate, physical literacy, through the development of motor skills, is necessary for further and sustained participation.

In this section we will review instructional design decisions and their implementation that have been shown to impact student learning in PE. We will begin by discussing time and how it is used and then discuss student practice—quality and quantity—and motor skill learning. We then will discuss a number of instructional activities that can influence student practice in ways that promote learning.

2. Time

Time spent with the subject matter is strongly correlated with student motor skill achievement in PE.¹² Time is necessary for learning but how that time is used is as important as the time itself.^{13,14} Those two aspects—time allocated for practice and how the time is used are essential for learning. If students are not engaged during the allocated time then motor skill learning will not occur—no matter how much time is allocated. For example, if a teacher has students actively engaged then learning is occurring. If, however, the teacher has designed instruction where students spend a lot of time waiting in lines, waiting for equipment to practice, or are in situations that do not permit practice it may look like activity is occurring, but it is only for a few students at a time and learning is not occurring. In fact, Silverman et al.¹² found that time where students were waiting was negatively related to motor skill learning.

It is important to note the special case of game play and other game-like situations and their relation to motor skill learning. When PE classes are playing games motor skill learning probably is not occurring. For example, scrimmage—a game-like situation where the teacher is giving feedback about student performance—has been found to be negatively related to student motor skill achievement.¹² The more time students spend in these game-like situations the less learning occurs. This likely is because students who do not have the skill to participate in a game-like situation are not getting needed practice trials and may, in fact, avoid being placed in a situation where they will fail and embarrass themselves. Without the requisite skill, students will not be successful in a game. It is possible that skill-related games and modified games with others at a similar skill level would provide a transition to game play, but that only can occur if the teacher designs the activity so that students can practice skills. As will become clear in the next subsection practice is very important for motor skill learning.

3. Student practice

How individual students practice is the most important variable in motor skill learning in PE. In fact, student

appropriate practice—practice that is neither too difficult nor too easy—is highly correlated with student achievement.^{15–19} When student practice is inappropriate—for most students too difficult—students do not learn and their skill level deteriorates.¹⁹

It is important to note that it does not matter how much the class practices, but rather the amount and type of practice in which *each individual student* engages, which impacts student learning. For example, if a teacher directs an entire class to do a practice task (e.g., the forearm pass in volleyball back and forth to another student from a distance of 3 m) and all students are attempting to implement the task as assigned, some students will find the task too easy. Many students, however, will find the task too difficult. If students do not have the skill, it is possible that distance, how varied the ball will come to them from their partner, and having to adjust and pass the ball back may make the task impossible to do well. Their skill level does not allow them to complete the task and practice is inappropriate. When that happens learning does not occur and students' skill level will likely get worse from attempting practice where their form in performing the skill is so compromised they are developing bad habits.

Teachers can plan to deal with changing practice tasks so that all students can practice at an appropriate level. For example, continuing with the volleyball example above, the teacher can modify the practice task by doing a number of things for those not getting appropriate practice. The teacher can move students closer together, can have students in pairs where one student gently tosses the ball to the other so that it is received easily, can modify equipment or can have students aim the pass so that it can be caught. All of these modifications allow individual students to engage in appropriate practice and to develop skills that would eventually lead to successful participation in game play. Many teachers modify tasks for appropriate student practice all the time. One of us has taught a great deal of swimming and swimming instructors are constantly modifying tasks so that students can progressively increase their skill. If a swimming teacher was to move on to new skills before prerequisite skills were developed or if he or she put students into situations for which they do not have the skill it is possible that the student would drown. While most PE activities are not life threatening, having students practice skills for which they are not ready and that are too difficult will impact skill development and attitude toward the activity.²⁰

4. Content development

As is apparent from the discussion above, teachers need to modify tasks so that each student can obtain the maximum appropriate practice trials. One way to complete task modification and practice is Judy Rink's model of content development.^{21–24} In Rink's model five different tasks—informing, extension, refinement, application, and repeat tasks—are used to present and modify practice for students. A teacher begins a class with a task for students to practice and then changes the task based on student performance of the practice task.

Mastering the task presented allows the teacher to move to new and more complex tasks and having difficulty practicing tasks means adjusting tasks to students' skill level. For example, the first task in a sequence is an informing task where students are directed to practice. If, in this situation, students are having problems with opposition while doing a layup the teacher would implement a refinement task that focuses on that aspect of the skill. Every future task then would be modified, refined, and extended, so students are continually practicing at an appropriate level with few inappropriate trials. If the student is left to practice without these modifications, practice that is too hard will continue to be too hard, and practice that becomes too easy because a student having mastered a skill will not contribute toward learning and motor skill achievement.

Planning for content development and for modifications will help students develop motor skill. Teachers who plan more have students who learn more.²⁵ While Rink's research largely focused on class-wide tasks, teachers can also make adjustments within a task in order to differentiate practice for different students. For example, in a partner passing while moving drill, if a student is having difficulty with a soccer pass the teacher can go to that student and make modifications by having the student practice a less complex task. The teacher could inform the student "you're having trouble getting the pass to your partner when he's running. Let's practice without him moving and then once you get that we'll go back to him running for the pass". In this way the teacher made the task less complex and the individual student can now have appropriate practice that will permit more complex practice in subsequent tasks.

5. Teacher presentations

As a part of every task, teachers present the skill and how the practice task should be completed. It is no surprise that if the teacher does not provide an explanation and demonstration of the task for the students their practice will not be of high quality. Students will not be able to practice appropriately if the teacher does not guide them toward what they should be doing.

Short and focused explanations are correlated with student motor skill learning.¹² If explanations and demonstrations are too long or too intricate, students likely will not remember everything that was presented, and they will practice in ways that are less appropriate. Likewise, teacher clarity in presenting the practice task is related to student learning.^{25,26} Students will more likely be able to complete appropriate practice in the given time if instructed by teachers who inform the students about form (i.e., what the movement should look like), outcome (i.e., where the target is for the task), number of repetitions, where they should practice, and the length of practice.

6. Task organization

Teachers can use different instructional strategies during practice tasks. Often thought of as a teaching method, task

organizations can range from individual student practice, to reciprocal practice where students are paired together, to small groups that practice a task, to larger groups that practice together, to game-like situations. While each of these can be used to practice motor skill when students practice as individuals or in reciprocal situations they get more appropriate practice and a greater percentage of their total practice is appropriate.^{27–29} It is clear that when teachers organize students in tasks where they work individually or reciprocally they get more practice and the teacher has the opportunity to modify practice to help students learn.

When students are placed in practice tasks that involve large groups (e.g., a group in a circle practicing a skill, a group in a line where students are waiting their turn to practice, or in a game where the teacher has made no modifications) they get less practice and that practice has more inappropriate trials than in other task configurations.¹² Two things seem to occur in these settings. First, everyone is doing the same task so individual modification is not possible. Second, when students are sharing equipment with many other students they cannot get as many practice trials in the same amount of time as they can when teachers use other organizational strategies. If student skill development is the goal large group settings will not contribute to maximizing appropriate practice.

Building on the previous discussion it is important to note game-like situations do not result in much appropriate student practice. When students are participating in games they get little appropriate practice.³⁰ As we noted earlier, often students are put into games before they have the skill to participate. They have moved from practice that is much less complex (e.g., practicing without a defender) to one that is so complex they cannot be successful. In this situation there is little content development from the less complex practice to the very complex game. In addition, the size of the group matters. If students are practicing by themselves or in pairs they do not have to share equipment or compete to get practice trials. In real-life games, where as many as 12–22 students may be participating, even if students get their share of practice trials it is far less than when using other organizations to practice. And, in a game students have to respond to the demands presented to them instead of practicing at an appropriate level. In many classes where games are played, skill complexity is more difficult than in the previous practice and the likelihood of students getting practice trials is greatly reduced by the number of people on the court. If skill development is the goal games will likely inhibit learning.

7. Number of tasks

There now is strong evidence to suggest that when teachers change instructional tasks more frequently students get more appropriate practice and learn more.^{12,27,28} This makes sense if we consider that most teachers change tasks to make modifications so students can adjust their practice. Some teachers are constantly adjusting tasks and this is an important aspect that leads to more appropriate practice. Conversely, when teachers do not adjust practice tasks those having difficulty continue

having difficulty, students get bored and may not practice as instructed. Students also might begin to misbehave because the teacher has not directed them to change their task so it is adjusted for lower or higher skill. A small number of long tasks were correlated with fewer practice trials and fewer appropriate practice trials per minute and students are doing other things than practicing when left on their own for relatively long time periods.

8. Student skill level

Instruction impacts students of differing skill levels in different ways.²⁰ In one study³¹ it was found that the relationship between appropriate practice and achievement was significantly higher for low skilled students than for medium or high skilled students. In addition, there was a significant negative correlation between the number of inappropriate practice trials and achievement for low skilled students, but not for medium and high skilled students. These results suggest that when low skilled students have more appropriate trials they make greater relative progress in their learning than do medium and high skilled students. And, when low skilled students are practicing in inappropriate ways, it effects them more strongly than other students. As a result, the evidence suggests that teachers who modify tasks and practice so their low skilled students can be successful are more likely to see learning gains and skill development for *all* their students.

9. Summary of instructional design

The body of research in motor skill learning is clear: students need time to practice where they are actively engaged. When students are waiting in line or otherwise not active learning will not occur because students are not getting practice. Appropriate practice is the most important variable in motor skill learning and is highly correlated with student achievement. Appropriate practice is the variable through which motor skill learning occurs and maximizing appropriate practice should be the goal of teachers who want their students to learn motor skill. Furthermore, inappropriate practice is negatively related to achievement and teachers should work to modify instruction so that inappropriate practice is minimized.

There is a variety of evidence-based instructional design decisions teachers can make to promote appropriate practice. First, a focus on content development and changing tasks will permit teachers to adjust practice for their students. Second, certain organization and teaching strategies seem to better permit students to engage in appropriate practice. Individual and reciprocal tasks result in greater appropriate practice. Large group practice and game-like situations result in far fewer overall practice trials in a similar timeframe and the percentage of inappropriate trials is greater. Third, when teachers change tasks more often students have greater appropriate practice—and learn more. Finally, student skill level is an important variable to consider in planning tasks as both appropriate and inappropriate trials have a stronger influence on low skilled students than on other students.

Teachers who make instructional decisions and teach students instead of teaching a class are likely to be more successful in promoting motor skill learning and thus developing physical literacy.

10. A note on student attitude

In this paper we were not able to conduct a complete review of student attitude in PE. In the context of motor skill learning, however, it is important to address this concept since if students' attitudes are not good, it is likely they will mediate instruction and their engagement in practice tasks will decrease. Theory posits that attitude influences behavioral intentions and this, in turn, influences whether a person follows through on a behavior.^{32,33} In Carroll's^{13,14} Model of School Learning he suggests that perseverance is related to learning and that students persevere when they are interested in the subject matter and enjoying learning. In the PE context if students are not enjoying themselves and having fun³⁴ it is less likely they will fully participate in any practice task. In our view, being successful and experiencing learning certainly contributes to attitude development.

Student attitude is influenced by many things, most notably the teacher and the curriculum.^{35–41} Some have suggested that teachers may have a stronger influence on negative attitudes than positive ones⁴¹ but other research suggests the teacher has a strong influence on all aspects of attitude. Teachers' interactions with students and instructional decision making influence students' attitudes toward PE.^{10,38} When teachers interact with students in ways that show respect and that promote learning students seem to develop more positive attitudes. When teachers place students in situations in which they cannot or are unlikely to be successful they do not see the teacher as their ally in learning.

The curriculum is the other main factor in student attitude. One aspect of curriculum related to instructional design that seems to impact students is the repetitive nature of many PE curricula.^{10,38} In instances where the same activities are taught every year—often with the same drills and practice tasks before quickly moving onto games—students do not experience learning and often do not understand the relevance of the activity and, therefore, do not believe they are learning enough to actively engage in the activity. Perceptions of curriculum and the influence of attitude are clearly intertwined with instructional decision making.

Competition in the form of games also seems to influence students' attitude toward the curriculum. In a qualitative study of competition in middle school PE¹⁰ students were clear, if they do not have the skill for competitive activities it makes them feel less competent and they do not understand why they are in that situation since they cannot be successful. These students understood that competition without skill was not fun and they did not see the benefit of it. Though this paper focused primarily on motor skill learning in PE, it is necessary to emphasize how attitudes are related to students' motor skill learning and ultimately related to the development of physically literate individuals.

- **Time** allocated for motor skill practice where students are actively participating and practicing is correlated with motor skill achievement.
- **Student appropriate practice** is highly correlated with motor skill learning and maximizing appropriate practice is essential for learning motor skill.
- **Content development** is essential for students to get maximum appropriate practice. If the complexity of the practice task is too difficult students will not learn. Gradually increasing task complexity allows students to develop skill.
- **Short, focused explanations and demonstrations and greater clarity** in promoting the practice task is correlated with student learning.
- **Individual and reciprocal organizational strategies** result in more appropriate practice and motor skill learning. Large group teaching techniques result in fewer practice trials and more inappropriate practice trials.
- **Varying tasks** result in greater skill learning, particularly for low skilled students.
- **Designing instruction with an attention to skill level** will result in more learning for low skilled students.

Fig. 2. Instructional design variables that impact motor skill learning in physical education.

11. Summary

Research on teaching motor skills provides results that can be incorporated into how teachers plan and execute instruction (Fig. 2). When teachers provide time and within that allocated time allow for students to be engaged in practice at an appropriate level, students will learn. Teachers can make a number of organization decisions and develop content in ways that helps students learn. Teachers who are constantly adjusting the complexity of practice tasks and who avoid situations where students cannot be successful will see students develop motor skill—and their students' attitude toward PE will be better. If being physically literate is a goal of PE students need to learn skill so they can use it outside of PE class. The goal of a physically literate population begins with good instructional design.

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