Adult Learning Perspectives and Motor Learning Models: An Investigation of Commonalities

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Abstract: Researchers have yet to agree on an approach that supports how adults best learn motor skills. The literature fails to adequately discuss adult motor learning from an adult educational standpoint; instead, the subject is largely addressed by other disciplines. This investigation attempts to integrate seemingly disparate models and perspectives in order to enhance understanding of adult motor learning. Several potential integrations are noted: (a) the representational framework common to motor learning models and reflective practice; (b) the overlapping theoretical bases of modeling and experiential learning; (c) the shared active learning emphasis in chaining, motor programs, variability of practice, analogy learning, and the experiential perspective; and (d) the use of embedded motor learning practices within situative settings. Research should further examine how variables unique to didactic instruction impact the modeling approach, and how situative settings naturally utilize motor learning models.

Introduction

Motor learning occurs when individuals learn how to move muscles in a precise way (Tiemann & Markle, 1983). Such learning is a significant part of adult vocational and technical education practice, and theorists have long acknowledged how it differs from other forms of learning. Mezirow (1990), for example, has suggested that how to do something or how to perform involves instrumental learning, a process differentiated from the more closely scrutinized communicative learning. A unified pedagogical approach to motor learning, however, remains conspicuously absent in adult education. As a result, educators searching for effective methods must turn to outside disciplines, which often provide contradictory explanations and propose dissimilar learning activities. Educators, then, are faced with a myriad of choices: motor programs, variability of practice, analogy learning, modeling, chaining, etc. In addition, learning activities based on these models are often imbedded within adult learning perspectives that concomitantly affect adult motor learning. If as Ingvalsden and Whiting (1997) have argued, choosing a particular theoretical perspective on motor learning constrains subsequent instructional methods and activities, how do adult educators proceed?

The current state demonstrates a real need for a coalescent approach to adult motor learning that builds upon congruent models and perspectives. Although the author acknowledges this need, it is not the intention of this paper to specify prescribed teaching techniques; rather, it is to empower educators with interdisciplinary knowledge that may lead to more effective practice. This investigation will attempt to analyze adult learning perspectives and motor learning models for commonalities that may facilitate the attainment of that goal.
The paper begins with a general overview of didactic, experiential, and situative approaches to adult learning. The three perspectives were selected based on their frequent use and applicability to pedagogical activities that promote motor skill acquisition and performance.

**Didactic Approach.** Brouse, Basch, and Kubara (2005) describe the didactic perspective as one in which the educator, acting as expert or authority, disseminates information to the learner. In their view, didactic participants are seen as passive recipients of knowledge, largely uninformed, and needing to be fixed. A didactic approach to motor learning may use lecture or demonstration and rely on the belief that adults acquire skills by obtaining verbal or visual information. Learners are given no opportunity to practice the motor skill in the educational setting, and are expected to independently transfer mental images into concrete motor skills. Ingvaldsen and Whiting (1997) suggest the implication of these types of approaches (i.e., those that rely on establishing inner standards or mental images) is that motor skills can be acquired solely through mental training.

**Experiential Approach.** Dewey (1938) states that, “All principles by themselves are abstract. They become concrete only in the consequences which result from their application” (p. 20). His view emphasizes one of the foundations of the experiential perspective, i.e., the learner is active and learns by doing rather than observing. Ingvaldsen and Whiting (1997) support this view, arguing that motor learning is the process by which an individual’s movement behavior changes due to experience. This perspective is often manifested in “hands-on” education, which directly involves the learner in motor activities, including the manipulation of instruments and tools. In Kolb’s (1984) view, experiential learning is synthesized of four elements: (a) concrete experience, (b) reflective observation, (c) abstract conceptualization, and (d) active experiment. Although reflective observation and abstract conceptualization do not require physical performance, they are essential for learning. This is consistent with Dewey (1938) who argues that experience alone does not constitute learning; rather, learning occurs when individuals connect current and past experiences to create meaning. Experiential learning, then, involves more than simple repetitive practice; it includes reflective activities that allow learners to decide if/how the skill relates to prior learning, as well as to educational or occupational objectives.

**Situated Approach.** The situated perspective emphasizes context. It suggests that learning can only be understood when considering the practice as a whole, including the wealth of relations within the community and the world that are indelibly intertwined with knowledge or skills (Lave & Wenger, 1991). It departs from other perspectives by de-emphasizing isolated skills, instead focusing on direct participation in the context and community in which the skill is practiced. For example, a masonry student may learn how to trowel a mortar bed by constructing the exterior wall of a home, on a job site, alongside an established expert. The student, then, learns the motor skill in the procedural, social, and environmental context in which it has meaning. The approach closely resembles the apprenticeship model, focusing on the importance of the master/apprentice relationship. However, Lave and Wenger (1991) caution that situated learning oftentimes departs from more contrived vocational apprenticeship programs, specifically in the area of legitimate peripheral participation, a process understood to describe a learner’s engagement with the tools, social networks, and processes used within a community of practice.
The following section describes five theoretical models of motor learning, which are based on theories from disciplines such as behavior analysis, kinesiology, sport psychology, and cognitive psychology. These models were selected according to their prevalence in the literature.

**Chaining.** Chaining as defined by Leslie and O'Reilly (1999) is “a process whereby a series of discrete behaviors are linked together to achieve some reinforcing outcome” (p. 250). A skill, the authors argue, consists of a sequence or chain of individual responses. When a learner performs the final response in the sequence, a form of reinforcement is obtained which indicates the end of the chain. Each individual component of the chain reinforces the previous step and functions as a discriminative stimulus for the next. Distinguished from “whole” teaching methods, which present the skill as a single behavior, chaining focuses on its “parts” (Walls, Zane, & Ellis, 1981). In short, when an instructor teaches a motor skill using this model, the larger skill is deconstructed into smaller, more manageable skills which are presented and practiced sequentially until the whole skill is mastered.

**Motor Programs.** Schmidt (1982) defines a motor program as an abstract memory structure readied in advance of the movement. When executed, muscles are contracted and relaxed causing movement without using feedback to correct for errors in selection. Instruction, therefore, focuses on the whole skill, with corrections made to the entire performance rather than a component of it. Schmidt (1982) distinguishes two types of motor programs: (a) those that are very short in time (i.e., 200 msec or less), and (b) those that last longer (e.g., a few seconds). Longer motor programs involve what he terms “closed-loop control,” requiring the brain to utilize two abstract mechanisms he calls the “executive” and “effector.” The “executive” commands the “effector” to carry out a specific motor function, and in course the “effector” signals relative movement information back to the “executive” in a process labeled feedback. Closed-loop control permits the learner to alter and control the motor program as it occurs. Schmidt (1982) maintains that this type of feedback allows learners to correct “errors in execution,” which occur when individuals choose the correct motor program but perform it incorrectly. This is in contrast to “errors in selection,” which do not allow for this type of feedback, as learners have selected the incorrect program to execute.

**Variability of Practice.** Asbell (1989) argues that variability in practice promotes the correct performance of a motor program regardless of environmental parameters. When discussing the use of motor programs in teaching motor skills, Asbell (1989) suggests that variability drills should be guided by an instructor. Keeping practice conditions constant while varying the practice will prevent confusion and help learners develop a flexible motor program. Further, he argues, variability of practice works to create a more adaptable motor skill by delaying the establishment of invariant characteristics until an adaptable pattern has been formed through multiple performance variations. Therefore, initial repetition of identical performance is to be avoided.

**Analogy Learning.** A number of researchers state that motor learning occurs both implicitly and explicitly. Reber (1993) largely defines implicit learning as skill acquisition without knowledge of the information underlying performance. Masters (1992) describes explicit learning as knowledge composed of facts and rules that individuals are aware of and able to articulate. One possible explanation for skill breakdown is the conscious processing of explicit knowledge (Masters, 1992), an idea based on the conscious processing hypothesis (Hardy, Mullen, & Jones, 1996), which, it is understood, states that individuals have limited working
memory resources. Learners, therefore, who consciously attempt to control new motor skills, utilize more of these resources, resulting in increased performance errors. Masters (1992) argues that by limiting explicit knowledge acquisition and fostering implicit learning one can prevent skill breakdown under pressure. One such method is analogy learning (see Liao & Masters, 2001). Learners are given a familiar verbal representation (i.e., an analogy) which they are then instructed to focus on, minimizing the use of working memory on underlying rules or information pertaining to the skill. The role of the analogy is to assimilate the information and rule structure of the new skill in an uncomplicated biomechanical metaphor that can be reproduced by learners (Liao & Masters, 2001). For example, learners may be asked to “butter the bread” rather than focus on complex verbal instruction when applying mortar to the underside of a tile.

**Modeling.** Bandura (1986) argues that the majority of human behavior is learned by observation through a process he terms modeling. Catina (2000) argues for the superiority of this approach when compared to verbal instruction, stating that visual demonstration produces cognitive representations or “mental blueprints” which guide future action. In Bandura’s (1986) view, modeling occurs largely by four subprocesses: (a) attention, (b) retention, (c) production, and (d) motivation. The attention subprocess requires learners to have interest in the modeled behavior, to absorb the characteristics of the event and its relevance. The learner must then retain the behavior in an abstract representational form in memory, either visually or verbally. During the production subprocess, the learner performs the skill and measures it against the representation acquired during the retention subprocess. This allows the learner to adjust the response in accordance to the representational standard. Last, the learner must be motivated through external, vicarious, and/or self-incentives to perform the behavior; simply observing the skill and having the physical and cognitive ability to perform it are inadequate to ensure learning.

**Discussion**

The perspectives and models discussed reveal a multitude of disciplinary approaches used to facilitate adult motor learning. There are, however, common themes that run throughout. For example, motor programs, variability of practice, analogy learning, and modeling are representational models, i.e., they rely on systems of representation and classification that are largely internal and unobservable (Ingvaldsen & Whiting, 1997). The experiential perspective utilizes representational activities such as reflection, which Fenwick (2000) argues is largely situated within the constructivist perspective, a representational theory of learning concerned with the construction of knowledge and meaning derived from experience. This shared framework may prove useful in their integration. How can representational models be utilized to construct knowledge and meaning? How well do they align with constructivist views on experience and knowledge construction?

The findings also reveal other potential unifying themes. Although paradoxical at first, Bandura’s (1986) social cognitive theory, a foundation for the modeling approach, and Kolb’s (1984) experiential learning theory, appear to share common ideals. Bandura’s (1986) attention phase overlaps considerably with Kolb’s (1984) concrete experience phase, both stressing the need for the learner to have interest in and heightened feelings toward the subject or activity. The former’s retention phase corresponds with the latter’s reflective observation and abstract conceptualization phases, emphasizing watching the subject or activity and thinking about its relevance and impact on one’s life. Last, Bandura’s (1986) production phase naturally aligns
with Kolb’s (1984) active experiment phase, both emphasizing action or doing. These commonalities reveal the potential to integrate modeling activities in experiential settings in order to better facilitate motor learning.

A third connection is seen between the experiential perspective and the following models: motor programs, variability of practice, analogy learning, and chaining. Each model inherently places the learner in an active role and, therefore, integrates well into experiential settings. These models should no longer be viewed tangentially to the experiential perspective but rather as integral tools for teaching and learning motor skills through doing and action. Future researchers may wish to quantify reflection’s affect on adult performance in the aforementioned models.

It is also important to consider how motor learning models can be incorporated within the situated perspective. Considering its emphasis on natural contexts and activities, there appears little room for rapprochement. The very introduction of practices based on these models would invariably alter the natural environment and thereby render it contrived. Lave and Wegner (1991) express resistance to pedagogical practices in situative settings, stating, “Gaining legitimacy is … a problem when masters prevent learning by acting in effect as pedagogical authoritarians, viewing apprentices as novices who ‘should be instructed’ rather than as peripheral participants in a community engaged in its own reproduction” (p. 76). However, when the authors describe the apprenticeship practices of Vai and Gola tailors – citing them as models of true legitimate peripheral participation – it appears as if backwards chaining is already in use. In addition, situative settings appear to be highly conducive to modeling approaches. In fact, educators utilizing a didactic or experiential approach may benefit by mirroring their modeling practices after those in situative environments. This potential area of inquiry may provide researchers a better understanding of how situated and contrived learning differs, as well as how pedagogical intervention can be utilized unobtrusively in natural environments.

A final unifying theme emerges from the close relationship between didactic learning and modeling. Several questions remain, however. The didactic perspective’s reliance on lecture or demonstration – with no opportunity for practice – often means learners delay performance for significant periods of time. Learners, therefore, receive no feedback and are faced with a vast number of contextual variables. The failure to account for delayed performance, absence of feedback, and contextual variables raises significant questions regarding the effectiveness of modeling in didactic settings. Further research is needed to investigate these variables’ impact.

Conclusion

Brookfield (2004) has argued that adult educators build their practices on strong theoretical underpinnings based on predictive understandings of how learners will respond. Accordingly, a primary goal of this investigation was to offer adult educators a theoretical foundation from which to base pedagogical motor learning activities. It is the hope that the proposed research initiatives influence future practice; however, current practitioners may find some of the findings immediately useful. For example, experiential practitioners may discover that chaining, motor programs, variability of practice, and analogy learning models align well with their current approach. In addition, they may find that the use of these models, in conjunction with current practice, results in more effective adult motor learning. Situated practitioners may find that activities based on these models are easily embedded within natural contexts. As a result, they may wish to examine how these practices affect motor learning and performance when compared to their usual methods. Last, didactic practitioners may wish to
incorporate active models in their practice in response to the concerns raised in this paper. The author’s aim in conducting this investigation is to demonstrate the need for a more unified understanding of how adults best learn motor skills. It is the hope of the author that the research opportunities presented here spark an interest in others to further investigate the interdisciplinary possibilities inherent in the study of adult motor learning.

References


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