
Skill instruction in outdoor leadership: A comparison of a direct instruction model and a discovery-learning model.

Glyn Thomas

La Trobe University, Bendigo

Abstract

In this paper I discuss some of the strengths and weaknesses of two different approaches to teaching motor skills to students in outdoor education and outdoor recreation settings. Using acronyms to describe their stages: DEDICT is a six step, direct instructional model that some outdoor leaders may already be familiar with; and FERAL is my adaptation of a discovery learning approach that can be used to teach students and participants skills. It is my premise that both models are theoretically sound in terms of motor skill acquisition theory and the physical education literature on skill instruction. I discuss and critique both models with reference to the theories of motor learning, the stages of skill acquisition, the role of feedback, the characteristics of effective practice, the value of demonstrations, the role of verbal instructions, and experiential learning theory. Finally, I offer some recommendations on how to optimise the effectiveness of skill instruction in outdoor leadership using both models.

Teaching outdoor education, or leading outdoor recreation experiences, often involves teaching people how to perform certain skills. The quality of this instruction can become critical if the skill level of students has the potential to influence the students' level of safety and well-being, or their ability to focus on other learning objectives (see, Thomas, 2005). However, many outdoor leadership training pathways do not involve the formal study of motor skill acquisition. Also, physical education teacher training programs may not teach skill acquisition principles in ways that are specifically adapted to outdoor leadership settings. Skill performance in outdoor education may involve different timeframes, environmental circumstances may influence what counts as a skillful performance. In an outdoor leadership setting the definition of a skill might be highly practical or functional rather than normative. Suffice to say, it would seem that further consideration of skill acquisition principles may enhance the preparation of outdoor leaders. The terms outdoor leaders and outdoor leadership are deliberately used in this paper because they are inclusive of both outdoor education and outdoor recreation practice.

In one of the few papers focusing on motor skill acquisition in the outdoor education literature, Higgins and Morgan (1997) provided a good example of how a potentially flawed understanding of skill instruction led to a common, but poor, instructional practice in a kayaking instruction context. They described how some instructors were taking a shortcut and teaching the pawlata roll to beginner kayakers so they could experience success in re-righting a capsized kayak. However, the pawlata roll requires a change in the kayaker's grip on the paddle, places less emphasis on the important role of hip-flick, and encourages an

over-reliance on the paddle to re-right his or her kayak. Hence, the ultimate goal of developing a reliable and effective kayak roll that works well while paddling on the river is sacrificed in order to provide quick results.

Higgins and Morgan (1997) base their criticism of the aforementioned practice on the rationale that good skill instruction develops 'open' skills that can be applied in a variety of contexts and "while success is a very strong motivational force for our students (and for us as teachers) and its value must not be dismissed, we should address the issue of whether or not we are encouraging good (open) habits" (p. 4). Hence, if I teach motor skills in a way that encourages early success I could actually compromise, and even impair, the effectiveness of my students' skill acquisition in the long term. This is one example of why outdoor leaders may benefit from a better understanding, and application of, the principles of motor skill acquisition (MSA) and skill instruction. As explained by Hodges and Franks (2004), "we would not expect to visit a doctor and receive health prescriptions based on common sense, but we are happy to receive coaching from practitioners who are unaware of the principles underlying provision of instruction" (p. 145). The thesis of this paper is that outdoor leaders will teach skills to their students more effectively if they have a solid understanding of the theory that underpins the effective design and implementation of skill instruction sessions.

In this paper I will outline two models that can be used to teach motor skills in outdoor leadership. The titles of both models, DEDICT and FERAL, are acronyms of their various stages. DEDICT is a direct instructional model which many outdoor leaders will be familiar with because of its popularity in canoe

instructor training in the UK and Australia. FERAL is an acronym that I have developed to describe five stages of an adapted discovery-learning model. In the sections that follow, I will discuss and critique the two models with reference to theories of motor learning, the stages of skill acquisition, the role of feedback, the characteristics of effective practice, the value of demonstrations, the role of verbal instructions, and experiential learning theory. I will also provide recommendations for the effective use of both models based on MSA theory, literature on skill instruction, and my experience as a physical education and outdoor education teacher and teacher educator.

Models of skill instruction

Unfortunately, skill instruction has not featured strongly in outdoor education or outdoor recreation literature and the work of Higgins and Morgan (1997), cited in the introduction of this paper, is an exception. Of course the physical education literature has a strong focus on motor skill acquisition theory and practice, but many outdoor leaders are not exposed to this body of research and writing and it is not typically applied to outdoor leadership contexts. Before discussing and critiquing the DEDICT and FERAL models some background information on skill instruction models will be provided.

The importance of instructors basing their practice on a theoretical model has been well documented in the literature. Theoretical models provide: an overall plan and coherent approach to teaching and learning; a unified theoretical framework; clarity around the purpose and sequence of activities promoting increased student interest, co-operation, and managerial efficiency; verification of the relationship between instruction and learning; and more valid assessments of learning (Metzler, 2000; Mosston & Ashworth, 2002). Metzler identified seven different models of skill instruction and “each model is designed to promote certain types of student learning outcomes. No one model ‘does it all’” (p. 160). The models identified by Metzler included: 1) direct instruction, 2) co-operative learning, 3) inquiry teaching, 4) tactical games, 5) peer teaching, 6) sport education, and 7) personalized systems.

Historically, physical education in schools has demonstrated a clear preference for direct, formal, and teacher-centered instruction, but other instructional styles, with a stronger student-centered focus, are finding a place in the teaching repertoires of physical educators (Byra, 2006). Physical education teachers now acknowledge that students have a range of learning style preferences, cultural backgrounds, and movement experiences and Byra (2006) noted that there is an increased emphasis on inclusive pedagogies, which seek to “facilitate equal opportunities for success for all learners regardless of gender, socioeconomic

status, race, ethnic background, or physical or cognitive ability” (p. 451). In the next section of this paper I will discuss and critique the DEDICT direct instructional model.

DEDICT: A direct skill instructional model

History

Anecdotal observations suggest that the direct instructional model has been the dominant skill instructional approach in outdoor leadership. The dominance of this approach in outdoor leadership settings is probably linked to the popularity of this approach in both physical education (Byra, 2006) and the military (Len Smith, personal communication, January 29, 2007), although it is difficult to find empirical evidence to support these assertions. In Australia, the EDICT and DEDICT direct instructional approaches have been popularised by organisations such as Australian Canoeing Incorporated. In these models the skill instruction occurs in the following six steps: Demonstration (not included in the EDICT model), Explanation, Demonstration, Imitation, Coaching/Correction, and Trials.

Peter Vandepeer, from Australian Canoeing Incorporated, suggested they adopted the EDICT model from the British Canoe Union and the National Fitness Council, both of which were influenced by the military (Personal communication, January 29, 2007). John Handyside (Personal communication, February 9, 2007), the National Development Coach with the British Canoe Union, indicated that EDICT was the instructional model of choice in their coaching handbooks between 1969 and 1985. Since then, British Canoe Handbooks (for example, Rowe, 1990) have presented a model called IDEAS, which uses the steps of Introduction, Demonstration, Explanation, Activity, and Summary. In the next section of the paper a description of each stage of the DEDICT model and a rationale for each stage will be provided by referring to MSA theory and skill instruction literature.

Demonstration

It is commonly accepted that demonstrations provide the simplest and most effective means to convey information about motor skills, especially for complex, whole body movement skills. Not surprisingly, demonstrations were estimated to be the most commonly used mode of instruction in MSA (Hodges & Franks, 2004; Horn & Williams, 2004). The first demonstration of the DEDICT model requires the outdoor leaders to position themselves so that the group of students are close enough to see the detail of the skill. The outdoor leader should complete the whole skill at the appropriate speed and repeat several times, which helps students to start translating the observations into the movement commands required

to produce the actions (Magill, 2004). Demonstrating the skill in this manner also allows the students to see the skill in context, which O'Connor (2006) argued enhances learning because students can understand the relevance of the skill by noting its application. Metzler (2000) suggested that instructors can more effectively engage the cognitive domain with their students by encouraging them to consider the potential application of the skill.

The exact process by which demonstrations have a positive effect on MSA is poorly understood but Horn and Williams (2004) argued that the neural structures used for motor imagery and actual motor action have shared substrates and that observing a skill produces heightened electrical activity in the muscles which are likely to be involved in that same action. Magill (2004) cited research that indicated,

the visual system automatically detects in a movement pattern invariant information for determining how to produce the observed action. In some manner, which scientists do not fully understand and continue to debate, the person translates the perceived information into movement commands to produce the action. (p. 251)

Magill (2004) suggested there are two theories available to explain how demonstrations work to help skill learning. Cognitive mediation theory, developed by Bandura (1986, cited in Magill, 2004) proposed that when a student observes a model he or she translates the observed movement into a symbolic memory code. Whereas, Gibson's (1979, cited in Magill, 2004) dynamic view of modeling proposed that the visual system automatically processes an observed movement in a way that constrains the motor control system to act accordingly, meaning the person does not even need to engage the cognitive medium. There is no conclusive evidence as to which theory is correct (Magill, 2004).

Explanation

In this stage the outdoor leader explains the purpose and importance of the skill, which provides students with the motivation to learn. Having piqued the students' interest with the demonstration and rationale for the skill, the outdoor leader provides three to four key teaching points using concise phrases that direct students' attention to key elements of skill. Most students have difficulty paying attention to more than one or two instructions at a time, but concise and relevant verbal cues provided by the outdoor leader can assist learning (Hodges & Franks, 2004). To prevent information overload, outdoor leaders should use "short, concise phrases that direct a performer's attention to important environmental regulatory characteristics, or that prompt the person to perform

key movement pattern components of skills" (Magill, 2004, p. 265). This mental image can help students in the cognitive stage of Fitts and Possner's (1967) classic three-stage model of skill acquisition. In this first stage the student is typically focussed on thinking about how to use or modify existing movement patterns to solve the new motor skill challenge. Magill (2004) explained,

When confronted with learning a new skill, we often determine that it resembles a skill we already know how to perform. As a result, we typically begin practicing the new skill using movement characteristics similar to those of the skill we already know. (p. 215)

More recently, skill acquisition experts have also encouraged instructors to use teaching points that direct students' attention to the intended outcome rather than the students' body movements (Magill, 2004, Rose & Christina, 2006). Using the 'action-effect hypothesis,' Magill (2004) explained that, "actions are best planned and controlled by their intended effects.... The learning and performance of skills are optimized when the performer's attention is directed to the intended outcome of the action rather than on the movements themselves" (p. 259). Rose and Christina (2006) agreed that research has shown skill learning is optimised by directing the students' attention away from their own movements and towards the effects these movements will have on the environment.

Demonstration

The second demonstration allows for consolidation of the students' understanding of the skills context and the desired outcome it is used to create. The students' observation should be focused by reminding them to look carefully for the key teaching points and their desired effects. The same principles of good demonstrations described earlier apply and students should be allowed to watch, without excessive talking by the outdoor leader to avoid sensory overload and distraction. Although researchers do not fully understand how students use demonstrations to acquire new skills removing these distractions will allow students to focus more fully on this second demonstration.

Imitation

The purpose of this stage is to provide opportunities for students to practice the skill. As students initially experiment with different movement patterns they often produce frequent, and large, errors. Studies using electromyography, which measures the electrical activity in muscles, have shown that in this early stage of skill acquisition students typically use more muscles than are needed and the timing

of activation is often also incorrect (Magill, 2004). However, as movement patterns are refined with appropriate practice and coaching, fewer muscles are recruited, and timing improves. Thus, through experimentation good movement strategies are retained and inappropriate ones discarded producing large and dramatic performance gains as the student moves into the next stage of Fitts and Possner's (1967) skill acquisition model, known as the associative stage (Magill, 2004).

The principles of good practice cited in the skill acquisition literature argue that practice needs to incorporate specificity, validity, and variability (Magill, 2004; Rose & Christina, 2006; Schmidt & Lee, 2005). However, these hallmarks of good practice should be seen as end points rather than starting points. In this stage of the DEDICT model, practice routines should be simple and excessive practice variability should be avoided until students understand the dynamics of the skill to be learned. Too much variability can detract from the consolidation of learning and Rose and Christina (2006) recommend that

Generally, learners who experience more success in learning and performing motor skills tend to feel more adequate, confident, and self-enhanced. Learners who experience frequent failure tend to feel anxious, less adequate, less confident, and less able to set realistic goals for themselves. Essentially, success tends to enhance learning and, to an even greater extent, failure tends to impair it. (p. 227)

Practice routines should also be as specific as possible, but in the cognitive stage of skill acquisition the environment in which new skills are practiced may need to be more controlled. For example, outdoor leaders teaching belaying skills to novices can do so by laying ropes horizontally on a flat grassy surface to create a more controlled environment with less distractions and no serious consequences for errors. The challenge for the outdoor leader is to know when to make the practice environment more specific, or like the real world environment where the skill will eventually be applied. The final stage of the DEDICT model typically provides such opportunities.

Outdoor leaders should provide clear instructions about the way they want their students to practice the skill being learned. Depending on the age and maturity of the students, care should be taken to unambiguously define the practice area, explain exactly what should be practiced. This should include details of number of repetitions, safety procedures that need to be observed, and what the students should do when they have completed the designated practice routines.

Coaching/Correction

The coaching stage of the DEDICT model is implemented concurrently with the imitation stage and outdoor leaders need to supervise the students carefully while observing how well they are performing the skills, particularly in terms of the key teaching points that have been provided for the skill. This is essential in order to provide useful feedback to the students and there are several different forms of feedback that may be used. Task intrinsic feedback is "sensory feedback that is naturally available while performing a skill" (Magill, 2004, p. 269), such as visual and audio information, and proprioceptive feedback on the movement of the student's body. In contrast, augmented feedback is "information about performing a skill that is added to sensory feedback and comes from a source external to the person performing the skill; it is sometimes referred to as extrinsic or external feedback" (Magill, 2004, p. 269). Augmented feedback either adds to, or enhances, task intrinsic feedback.

Most augmented feedback can be defined as either knowledge of results (KR) or knowledge of performance (KP). Knowledge of results is defined by Wulf and Shea (2004) as

terminal feedback provided to the performer after the completion of a response about the environment outcome in terms of an environmental goal... [which provides] a basis for error correction on subsequent trials, presumably guiding the performer to the correct response. (p. 121).

Knowledge of results has a positive impact on skill learning because it allows students to confirm their own task-intrinsic feedback, it clarifies any confusion with task-intrinsic feedback, and it motivates them to keep practicing (Magill, 2004). Schmidt and Lee (2005) concurred that KR has "optimal informational value when the learner is uncertain about the reliability of his or her own inherent sources of information" (p. 397).

The advantage of KP is that it provides the student with information about the movement which otherwise they may only be vaguely aware, such as the behaviour of a particular limb in a complex movement, although it can also provide information about processes in the body of which the subject cannot be aware, such as blood pressure or other forms of biofeedback (Schmidt & Lee, 2005). Magill (2004) suggested that KP works best when skills must be performed with correct technique or when specific movement components requiring complex co-ordination must be improved or corrected.

Some disagreement in the literature exists over the optimal frequency to provide augmented feedback and Wulf and Shea (2004) reported that

some KR is clearly required for learning to occur, especially in those situations where intrinsic error information is not readily available. However, 100 per cent KR conditions do not consistently lead to better acquisition performance than reduced frequencies of KR conditions in constant practice. (p. 139)

They explained that the provision of KR after every trial is thought to create an unhelpful dependence and Magill (2004) agreed that less frequent feedback encourages students to engage in more beneficial learning strategies. Schmidt and Lee (2005) argued that too much augmented feedback may block the processing of inherent sources of feedback, which can prevent the student from developing their own error-detection capabilities.

It can be difficult for outdoor leaders to decide the most appropriate focus for their feedback. Wulf and Shea (2004) argued that augmented feedback is more effective if it focuses on the movement effect rather than the movement itself. They explained “when participants are asked to focus their movements, they tend to actively intervene in the motor control processes ... [and] performers seem to inadvertently disrupt relatively automatic processes that normally control the movement” (p. 134). Magill (2004) and Schmidt and Lee (2005) both agreed that augmented feedback is more effective when it focused on the provision of information about what was wrong with the previous trials than when it focused on the reward of correct movements. However, Magill (2004) noted that information about correct performance may be more effective in motivating the student to keep practicing.

Finally, and perhaps the most important principle of effective coaching is that “motor learning is indifferent with regard to correctness. People can learn incorrect movements as well as they can learn correct ones, which is one reason why practice does not always lead to improvement in performance” (Rose & Christina, 2006, p. 190). Hence, outdoor leaders should not allow students to continue to practice with poor technique, otherwise the incorrect technique will become fixed as the learned motor program.

Trials

The final stage of the DEDICT model provides students with opportunities to engage in practice routines that are specific and variable. Practice is specific when it occurs in conditions that replicate

the conditions where the skill will ultimately be used. Increased variability means that practice routines prepare students for the variations that occur in the environment where the skill will eventually be applied. For example, instead of practicing the moving water paddling skill of eddyding-out on flat-water behind a buoy, the students practice catching an eddy behind a rock on a moving water river. Hodges and Franks (2004) explained that practice variability “aids long-term retention and transfer of new skills as a result of an increased repertoire of action situations and knowledge of general principles underlying skilled behaviour” (p. 168). Specific and variable practice routines help students to move into and through the associative stage of Fitts and Possner’s (1967) skill acquisition model as they settle on the most appropriate movement pattern to meet the goal. As the students recognise how to modify or adapt their movement patterns to new situations, performance variability decreases (Magill, 2004; Rose & Christina, 2006). Although, the time taken to reach the autonomous stage of Fitts and Possner’s (1967) skill acquisition model varies, most students require numerous practice sessions before reaching the place where the skill becomes almost automatic, conscious thought is not required, and they are able to detect their own errors and make adjustments as required (Rose & Christina, 2006).

Cautions and suggestions to optimise the use of DEDICT

Direct instructional approaches, like DEDICT, are characterised by teacher-centered decisions and teacher directed engagement patterns for students. Students make few decisions and they follow the directions of an instructor who seeks to provide efficient use of class time and resources to promote high rates of engagement in practice tasks (Metzler, 2000). The outdoor leader observes these practice sessions and provides high rates of positive and corrective feedback. This approach assumes the outdoor leader has the primary responsibility for learning and is best equipped to make decisions regarding skill instruction and has good group management skills (Metzler, 2000). The primary strength of DEDICT, when implemented effectively, is the high level of student engagement. The Irish Canoe Union demonstrated their commitment to active engagement by using small letters in their ‘edICT’ acronym to “get the message to coaches who like to talk and demonstrate for too long while the participants sit passively and watch/listen” (Steven Hannon, personal communication, February 1, 2007). Strangwick and Zwondiak-Myers (2004) were critical of instructors who talk too much because it denies students valuable activity time. In their opinion, explanations and instructions should be succinct and “talk must not dominate in practical sessions where your objective is to get the class moving” (p. 61).

Research on the effectiveness of direct instructional models has identified deficiencies that commonly occur in their implementation including: excessive teacher talk, students spending more time receiving information and waiting than practicing motor skills, and the failure to provide appropriate levels of performance feedback to students (Metzler, 2000; Mosston & Ashworth, 2002). Another problem with models like DEDICT is that even when high levels of student engagement are created cognitive engagement may remain low (Metzler, 2000). DEDICT also assumes that all students progress at similar rates and because this is typically not the case, keeping students on-task may require multiple options within the imitation and trials stages. Byra (2006) noted that more experienced teachers were more able to meet the individual skill development needs of the students than less experienced teachers by providing more appropriate use of task progressions. Direct instruction approaches can also create a competitive learning environment with little positive interaction between students.

The emphasis on demonstrations in DEDICT is contentious and Magill (2004) argued that research on the efficacy of demonstrations is inconclusive. Magill encouraged instructors to only use demonstrations "after determining that the instructional situation indeed warrants the use of demonstration, rather than some other form of providing information about skill performance" (p. 249). Other authors challenged the assumption that the demonstrator must perform the skill correctly and that a student's performance is linked to the quality of the demonstration they observe. Some research has found that encouraging novices to observe demonstrations from other novices can also be beneficial. For example, Magill (2004) noted that novices who observe other beginners practicing a skill sometimes performed the skill at a higher level than the beginners they observed. Rose and Christina (2006) explained this might be because,

the observer who watches an unskilled model is thought to be more actively involved in the problem-solving activities of the model as the model tries to discover how to perform the skill more effectively. It is further argued that the use of skilled models may undermine the problem-solving process because skilled models offer observers very little error information they can use to develop their own error-detection mechanisms. (p. 237)

Finally, another disadvantage of direct instruction approaches noted by Byra (2006) is that they are one-dimensional because they imply that the most important educational goal is motor skill development. Like physical education, outdoor leadership programs typically focus on psychomotor, cognitive, and affective

domains, which may necessitate the use of a different instructional model. Discovery-learning approaches to skill acquisition attempt to resolve some of these concerns, and I will now provide a description and critique of such approaches using the FERAL model as an example.

FERAL: A discovery-learning approach to skill instruction

In the field of physical education in the 1960s a group who called themselves movement educators advocated the development of intellectual ability, problem solving, and generic movement skills (Metzler, 2000). Such approaches now go by many names including problem solving, inquiry teaching, exploration teaching, child-centered teaching, discovery teaching, and indirect teaching. The basic tenet is,

rather than the teacher showing and telling students how to move, the teacher uses a series of questions to prompt student engagement in both the cognitive and psychomotor domains. Essentially the teacher asks a question that leads to some type of student thinking, which in turn leads to a 'movement answer' displayed by students. (Metzler, 2000, p. 310)

Discovery approaches are based on different assumptions about the teaching and learning process. Rose and Christina (2006) described the instructor's role as one of constructing the learning environment in such a way that "the learner is encouraged to employ a variety of different strategies, some more appropriate than others, until he or she finally discovers the best co-ordination pattern" (p. 245). Metzler (2000) explained that in discovery-learning: the teacher's main function is to stimulate thinking, which leads to development in the psychomotor domain; questions become the most prominent discourse; the teacher is seen as the facilitator of student learning who prompts students with carefully thought-out questions to promote student exploration and creativity. Discovery approaches also assume that learning occurs best when the activity has personal meaning to students, that students bring multiple sources of prior knowledge and skills which can be used to construct new knowledge and skills, and that learning in the cognitive domain precedes learning in the psychomotor domain (Metzler, 2000).

In the outdoor leadership unit that I teach at La Trobe University I developed the FERAL acronym to describe a discovery learning approach to skill instruction. The suitability of the title is not lost on those who are familiar with outdoor education students at La Trobe University in Bendigo. Our students are encouraged to challenge the consumerist and exploitive attitudes common to Western worldviews, and when

combined with student poverty many students adopt alternative lifestyles. The stages described in the FERAL model are not exactly the same as, but are consistent with, the stages identified in other discovery-learning models (Metzler, 2000; Mosston & Ashworth, 2002).

Frame the problem

This first step allows the student to understand the nature of the problem to be solved, which is consistent with the recommendations of Hodges and Franks (2004) who argued that it is critical that the student understands the goal of the task. Appropriate framing engages students with the challenge of learning a new skill and provides the motivation required to learn a new skill. For example, the outdoor leader could provide the following frame up to his or her paddling students, "This morning, I have noticed that some of the canoes don't seem to want to go where you want them to go. So there seems to be a bit of a steering problem. In a moment, I would like you to move into a space of your own within our designated area and work with your partner to experiment with some different ways that you can steer your canoe. Find out the best way to go straight, or turn, when you want to. After a few minutes, I will call you all back together so you can share your solutions with the rest of the group and we will see what you came up with."

Explore for solutions

In this stage the facilitator creates a suitable environment in which the students can experiment with solutions that will solve the movement challenge presented. This requires the facilitator to implement appropriate safety-management practices that mitigate any unnecessary risks associated with exploration. While the students experiment with solutions the facilitator should move amongst the students, observe their behaviour, and provide the encouragement and feedback required to keep students focused on finding solutions to the challenge that has been provided.

This significance of this stage is that it provides students with an experience that engages them on a different level. Nicol (2003) explained the significance of experiential knowing when he used the epistemology developed by Heron (1996) and Reason (1998) to craft an alternative philosophical framework for environmental education. From Nicol's perspective, student learning will be stronger and more significant when the experience is compelling and relevant to them.

The direct experimentation involved in finding solutions to skill challenges in this stage of the FERAL model is well suited to a new perspective on how skills are acquired. Although, there has been considerable writing and research on the topic of how skills are acquired over the last 100 years, closed-loop theory

(Adams, 1971) and schema theory (Schmidt, 1975) have only provided incomplete explanations of how motor skills are acquired. Consequently, the ecological theory of perception and action has recently emerged to give an alternative perspective on how motor skills are learned. Rose and Christina (2006) explained, "Whereas closed-loop and schema theories of motor learning emphasize the development of memory-based representations of action, the ecological theory of perception and action emphasises the changing relationship between the performer and the movement environment" (p. 191). Thus according to this theory, students discover relationships between their perceptions and the action environment in which they operate through experimentation and they develop the ability to spontaneously compensate for changes in the environment. The active search for movement patterns that resolve the challenge presented by the outdoor leader in this stage of the FERAL model would appear to strengthen this new theory on how skills are acquired.

Report back with solutions

In this stage of the FERAL model the students regroup after their experimentation to share their findings with their peers and the outdoor leader. Through the skillful use of questioning the outdoor leader refines the solutions identified by students and highlights the plausible solutions. Unlike guided discovery approaches described in sections of the skill instruction literature (Griffey & Housner, 2007; Mosston & Ashworth, 2002), the FERAL discovery learning model does not encourage outdoor leaders to shepherd students towards a single solution to the movement challenge. FERAL is a divergent model because it concedes that there may be many ways to solve the problem and students are given the opportunity to share solutions with each other (Rink, 1998).

Outdoor leaders in this stage are required to draw on different skill-sets to those used in direct instructional approaches. Good facilitation skills will allow the outdoor leader to help the students to share their responses in a way that doesn't lead to chaos. The outdoor leader's role in this stage is to make it easier for the group to share their solutions and this will involve helping the group to listen to each other, increasing participation, making sure that all solutions get heard, managing the available time, probing solutions and teasing out issues, keeping the students on task, and providing feedback and acknowledgement (Hunter, 2007). Once these skills have been used to identify the range of solutions the students will be ready to progress to the next stage of the FERAL model.

Adjust our thinking and motor plans.

This stage is consistent with the abstract conceptualization stage of Kolb's (1984) experiential learning cycle because the solutions recognised by the students are critiqued, refined, and improved before moving to the final stage. The outdoor leader will again need to facilitate the group discussion to identify agreement and disagreement, and distill the wisdom in the solutions shared to create a synthesis of ideas that can be tested in the next stage (Hunter, 2007). All of the principles of good demonstrations and effective teaching points discussed in the DEDICT model earlier also apply to this stage. The goal is to create a number of refined solutions that the students can experiment with to see which one they may find most useful or effective to solve the movement challenge.

Learn by testing the new solutions.

The final stage of the FERAL model is consistent with the final step of most experiential learning cycles (see, Kolb, 1984), which encourage participants to apply their learnings to a new context or situation. The range of solutions identified in the previous step are tested or tried out by the participants. It would seem entirely appropriate to get some of the students to demonstrate to the group the solutions identified and the outdoor leader will need to reinforce the appropriate safety-management practices when students test new solutions. The outdoor leader will also be required to apply the principles of effective practice and feedback provision, identified in the earlier discussion of the DEDICT model, when designing the practice routines and giving feedback to students on their performance of the skills.

Cautions and suggestions to optimise the use of FERAL

Discovery-learning approaches are highly inclusive because everyone gets a chance to think and move, and there is usually value in nearly every answer provided by students, which can be positively reinforced by the outdoor leader (Metzler, 2000). Although less teacher-centered, discovery approaches will place significant demands on outdoor leaders. They will need accurate perceptions of the students' cognitive and psychomotor abilities and an awareness of cognitive learning theory (Metzler, 2000). Discovery-learning also requires outdoor leaders to engage in a different kind of planning which is more focused on how problems will be framed and although

inquiry lessons cannot be scripted before class begins, the most effective ones are those in which the teacher has correctly

anticipated a good number of the students' verbal and movement answers and is ready to use those answers as 'teaching moments.' (Metzler, 2000, p. 324)

Discovery-learning approaches require firm but flexible group management and outdoor leaders will need the ability to design challenges that simultaneously challenge a range of students intellectually and physically. It is not uncommon for outdoor leaders to encounter resistance from students as they adjust to taking more responsibility for their own thinking and learning within this student-centered instructional style (Byra, 2006). Some outdoor leaders may also experience some internal conflict as they adjust to a different role of facilitating the learning process as opposed to being the instructional expert with the all of the answers.

Conclusions and recommendations

The apparent popularity of direct instructional approaches such as EDICT/DEDICT in outdoor leadership settings in Australia is understandable. These models provide a memorable sequence for novices to structure outdoor leadership skill sessions, and if implemented effectively they allow high rates of engagement in practice tasks which Metzler (2000) suggested enhances skill acquisition. However, overuse of EDICT/DEDICT models may impinge on the students' enthusiasm and interest in participation.

I would like to encourage outdoor leaders with some instructional experience to try using the more student-centered, discovery-learning approaches to teach skills. The literature certainly suggests that learning is enhanced when participants are more engaged across a wider range of domains (Byra, 2006; Metzler, 2000). However, I suspect some outdoor leaders avoid experiential activities to achieve skill acquisition objectives because they consider them to be an inefficient use of the available time. However, it may be worth critiquing the effectiveness of direct instruction sessions, which can become repetitious, predictable, and demotivating. My personal goal when teaching skills in outdoor leadership contexts is to operate as close to the student-centered end of the instructional model continuum as I can. It is quite possible that discovery-learning approaches are riskier in terms of achieving skill instruction objectives and I have run my share of 'flops,' and I have frustrated students who just wanted to be told 'how to do it.' However, after watching many DEDICT sessions I am less convinced that such approaches can claim to be more effective at achieving skill instruction objectives. My guiding questions when facilitating a skills session are simple: If I was a student in my class what would I want to be doing now? How can I get my students

more engaged, more quickly? What are the minimum safety guidelines that students need to know? Is it any fun?

In this paper I wanted to encourage outdoor leaders to be more intentional about how they help their students to learn skills. My analysis of the DEDICT and FERAL models using MSA theory and the skill instruction literature has demonstrated that good skill instruction is grounded in sound, theoretical principles. I have only focused on two of the many approaches to teaching skills and I would encourage outdoor leaders to experiment with some of the other teaching styles described in the literature (see, Metzler, 2000; Mosston & Ashworth, 2002; Rink, 1998), find the approach that best suits their individual contexts, and to share their conclusions with other practitioners.

References

- Adams, J. A. (1971). A closed-loop theory of motor learning. *Journal of Motor Behaviour*, 3, 111-150.
- Byra, M. (2006). Teaching styles and inclusive pedagogies. In D. Kirk, D. Macdonald & M. O'Sullivan (Eds.), *The handbook of physical education* (pp. 449-466). London: Sage.
- Fitts, P. M., & Possner, M. I. (1967). *Human performance*. Belmont, CA: Brooks/Cole.
- Griffey, D. C., & Housner, L. D. (2007). *Designing effective instructional tasks for physical education and sports*. Champaign, IL: Human Kinetics.
- Heron, J. (1996). *Co-operative inquiry: Research into the human condition*. London: Sage.
- Higgins, P., & Morgan, A. (1997). Skimming the surface: Teaching kayak support strokes and rolls. *Journal of Adventure Education and Outdoor Leadership*, 14(1), 3-6.
- Hodges, N. J., & Franks, I. M. (2004). Instructions, demonstrations and the learning process. In A. M. Williams & N. J. Hodges (Eds.), *Skill acquisition in sport: Research, theory and practice* (pp. 145-174). London: Routledge.
- Horn, R. R., & Williams, A. M. (2004). Observational learning: Is it time we took another look? In A. M. Williams & N. J. Hodges (Eds.), *Skill acquisition in sport: Research, theory and practice* (pp. 175-206). London: Routledge.
- Hunter, D. (2007). *The art of facilitation: The essentials for leading great meetings and creating group synergy*. Auckland: Random House.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.
- Magill, R. A. (2004). *Motor learning and control: Concepts and applications* (7th ed.). Boston: McGraw Hill.
- Metzler, M. W. (2000). *Instructional models for physical education*. Boston: Allyn and Bacon.
- Mosston, M., & Ashworth, S. (2002). *Teaching physical education* (5th ed.). San Francisco: Benjamin Cummings.
- Nicol, R. (2003). Outdoor education: Research topic or universal value? Part three. *Journal of Adventure Education and Outdoor Learning*, 3(1), 11-28.
- O'Connor, J. (2006). Making sense of teaching skills, games and sports. In R. Tinning, L. McCuaig & L. Hunter (Eds.), *Teaching health and physical education in Australian schools* (pp. 192-208). Sydney: Pearson Education Australia.
- Reason, P. (1998). A participatory world. *Resurgence*, 186, 42-44.
- Rink, J. E. (1998). *Teaching physical education for learning*. Boston, MA: WCB/McGraw-Hill.
- Rose, D. J., & Christina, R. W. (2006). *A multilevel approach to the study of motor control and learning* (2nd ed.). San Francisco: Pearson Education.
- Rowe, R. (Ed.). (1990). *Canoeing handbook*. Nottingham: British Canoe Union.
- Schmidt, R. A. (1975). A schema theory of discrete motor skill learning. *Psychological Review*, 82, 225-260.
- Schmidt, R. A., & Lee, T. D. (2005). *Motor control and learning: A behavioural emphasis*. Champaign, IL: Human Kinetics.
- Strangwick, R., & Zwondiak-Myers, P. (2004). Communicating in PE. In S. Capel (Ed.), *Learning to teach physical education in the secondary school: A companion to school experience* (pp. 61-78). London: RoutledgeFalmer.
- Thomas, G. J. (2005). Traditional adventure activities in outdoor environmental education. *Australian Journal of Outdoor Education*, 9(1), 31-39.
- Wulf, G., & Shea, C. H. (2004). Understanding the role of augmented feedback. In A. M. Williams & N. J. Hodges (Eds.), *Skill acquisition in sport: Research, theory and practice* (pp. 121-144). London: Routledge.

About the Author.

Glyn Thomas EdD is currently a senior lecturer in the School of Outdoor Education and Environment at La Trobe University in Bendigo. However, he began his working life as a physical education teacher in the mid 1980s in Queensland. His current research and teaching interests focus on facilitation, facilitator education, and experiential education. Email: g.thomas@latrobe.edu.au