Problem Solving in Orientation and Mobility:
Its Nature, Importance, and Pedagogy

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Abstract

Due to the dynamic and unpredictable nature of real-world environments in which people travel, individuals with visual impairments need excellent problem-solving skills to realize full independence. However, typical approaches to orientation and mobility training have failed to adequately address the critical need for problem-solving skills. Typical approaches have tended to overemphasize the instructor’s knowledge, relegating the student to a passive recipient of information; excessive instructor-generated feedback becomes an artificial feature of the environment, which supports the student’s performance during training, but stymies students’ development of independent information-gathering and problem-solving skills and does not accurately represent the real-world, post-training conditions under which students will eventually have to travel. Borrowing from relevant research in cognition and psychomotor learning (e.g., Bjork, 1994; Schmidt, 1991; Singer, 1977), some orientation and mobility specialists have formulated an alternative approach to instruction that emphasizes students’ active role in discovering knowledge for themselves through deliberately structured scenarios that require problem solving (e.g., Dodds, 1984; Mettler, 1995). In this paper, the author examines the nature of problem solving, cognitive and psychosocial factors germane to problem solving, and pedagogical approaches and methods that facilitate students’ acquisition of problem-solving skills. Though very little primary research related to problem solving in orientation and mobility exists, the author reviews research concerning assessment and psychosocial variables as they relate to problem solving.
Problem Solving in Orientation and Mobility: Its Nature, Importance, and Pedagogy

Due to the dynamic and unpredictable nature of real-world environments in which people travel, individuals with visual impairments need excellent problem-solving skills to realize full independence. Typical approaches to instruction in orientation and mobility (O&M) foster students’ development of a wide range of motor, perceptual, and cognitive skills but have failed to adequately address the critical need for problem-solving skills. A variety of factors contribute to this deficiency, such as overemphasis on the instructor’s knowledge at the cost of the student’s active participation in learning and lack of appreciation for the value of learning from mistakes. Psychosocial factors, such as students’ anxiety and lack of self-efficacy, may also impede training in problem-solving skills. Despite these obstacles, problem-solving skills are essential for true independence because they are necessary for dealing with the unexpected challenges that real-world situations often present (e.g., Mino, 2011; Perla & O'Donnell, 2004). For instance, how should the traveler respond when a memorized route is blocked by construction or when excessive noise prevents him or her from hearing traffic, making it unsafe to cross the street?

In this paper, the author examines the nature of problem solving in the context of O&M. The author reviews pedagogical strategies that facilitate the acquisition of problem-solving skills and examines key cognitive and psychosocial factors influencing success in problem-solving scenarios. Whereas O&M instructors have had recourse to a significant body of research related to the teaching of basic skills, such as cane grip and arc, guidelines for the teaching of problem solving have been less accessible. This
shortcoming may be due, in part, to the fact that problem solving does not consist of a set of discrete techniques that can be communicated explicitly by instructors to students (Mettler, 1994; Nyman, 2001). Adding to the difficulty of teaching problem-solving skills is that problem solving is contingent upon a variety of psychosocial factors as well as enabling knowledge and skills, such as environmental concepts and selective attention.

The Nature of Problem Solving

Problem solving is said to occur in situations where one has a goal but has not identified a means for achieving it; problem solving, then, is the process of reaching a goal, which involves applying strategies learned previously (Gagné, Yekovich, & Yekovich, 1993). The definition of social problem solving espoused by D’Zurilla and Maydeu-Olivares (1995) is especially pertinent to the types of problems likely to occur in the context of O&M: “…[problem solving is] the self-directed, cognitive-behavioral process by which a person attempts to identify or discover effective or adaptive ways of coping with situations encountered in everyday living” (p. 410).

Problems can be classified along a continuum of clarity and structure (Mino, 2011). At one end of the continuum, well-structured problems are those in which all information needed to solve the problem is given, the goal of the problem is clearly stated, there is one correct solution, and the solution can be obtained through use of an algorithm or other application of logic. At the other end of the continuum, ill-structured problems lack clear goals; the information necessary to solve an ill-structured problem may not be immediately available, and multiple approaches and solutions may be viable (Jonassen, 2007). Due to the complexities of the real world, the problems that a traveler who is visually-impaired encounters are likely to fall towards the ill-structured end of the
continuum. Ill-structured problems require heuristics and generalization from previous experiences, rather than algorithms, to be solved (Mino, 2011).

Problem solving has been conceptualized as consisting of distinct stages or phases. D’Zurilla and Maydeu-Olivares (1995) partitioned the process of problem solving into understanding the problem and implementing the solution. This distinction is particularly relevant to ill-structured problems for which the goal may not be clear; it emphasizes that many obstacles can be related to how one conceptualizes a problem rather than to the particular strategies one employs to solve it. Most theories of problem solving retain the distinction between understanding the problem and solving it but break down the latter process into sub-stages, such as forming hypotheses about how to solve the problem, choosing and implementing a hypothesis, and evaluating the outcome (e.g., Carlson & Bloom, 2005). Some theorists assert that recognizing that a problem even exists precedes understanding or conceptualizing the problem (e.g., Mettler, 1995).

The complexity or difficulty of a given problem is influenced by several factors. In the preliminary stages of recognizing that a problem exists and understanding it, complexity is increased to the extent that the goals of problem solving must be inferred instead of being obvious or given. As one forms hypotheses about how to solve the problem, complexity is increased when there is a diversity of potential strategies to consider rather than one dominant strategy. A problem is more complex to the extent that it requires more steps or operations to be solved and to the extent that it occurs in a novel environment or context such that more originality is required (Oosterhof, Rohani, Sanfilippo, Stillwell, & Hawkins, 2008).
In each stage of problem solving, particular arrays of perceptual, motor, and cognitive skills as well as psychosocial factors become salient. For example, recognizing that a problem exists might require that selective attention is directed toward pertinent auditory stimuli and that skilled manipulation of the long cane is used to obtain informative tactile and kinesthetic feedback from the environment. Conceptualizing or understanding the problem might rely on the accuracy of the traveler’s mental model of the environment, previous experiences with similar problems, and the ability to generalize those experiences to the current situation. Testing a potential solution to the problem may require specific mobility or assistive technology skills and that the traveler reacts with poise rather than a sense of resignation or helplessness.

D’Zurrila and Nezu’s (1999) theory of social problem solving (i.e., problem solving in the real world) emphasized the interplay of problem-solving skills and orienting responses. Problem-solving skills are the competencies needed to move from one stage of problem solving to the next—formulating the problem, generating possible and alternative solutions, implementing a solution, et cetera (Mino, 2011). Orienting responses refer to how one tends to react when faced with a problem, which is associated with psychosocial variables such as anxiety and self-efficacy. The following sections expound upon these skills and intrapersonal responses to problems. Particular emphasis is placed on the role of a pedagogical approach known as structured discovery learning (SDL) in facilitating the acquisition of problem-solving skills and addressing the psychosocial issues facing students with visual impairments.

**Pedagogical Approaches to Orientation and Mobility**
Typical training in O&M emphasizes the instructor’s knowledge and how that knowledge is conveyed to students, who act as relatively passive recipients of information. Although this approach is effective for teaching certain kinds of skills, it is ineffective for teaching problem-solving skills for numerous reasons, one being that many aspects of problem solving are tacit—unable to be articulated by instructors (Altman & Cutter, 2004; Mettler, 1994). What is needed by O&M instructors, then, is not a manual of tangible problem-solving techniques, but a teaching philosophy conducive to students’ acquisition of problem-solving skills. Borrowing from relevant research in cognition and psychomotor learning (e.g., Bjork, 1994; Schmidt, 1991; Singer, 1977), some O&M specialists have formulated and advocated for such an approach to teaching independent travel that emphasizes students’ active role in discovering knowledge for themselves through deliberately structured scenarios that require problem solving. This approach, known as structured discovery learning (e.g., Dodds, 1984; Mettler, 1994, 1995, 1997, 2008; Mino, 2011; Nyman, 2001), emphasizes practice under conditions representative of traveling in the real world and the student’s self-correction of errors as fundamental to the learning process (Altman & Cutter, 2004).

Guided Instruction

SDL must be understood in contrast to the more typical approach to O&M training, often referred to as guided instruction. Guided instruction places the locus of control with the instructor, whose role is to present explicit information and behaviors necessary to perform a task—extrinsic feedback—to the student; the primary role of the student is to receive and process this extrinsic feedback (Mettler, 1995, 1997). In that the instructor presents behaviors to be emulated by the student, the guided instructional
approach employs behavioral learning methods, such as shaping and chaining. The instructor uses these methods to condition and refine the desired student response (Altman & Cutter, 2004). Welsh (2010b) stated that heavily guided instruction is most appropriate for novice learners who need to build motivation and develop basic skills and knowledge before they will be ready to assume greater responsibility for their own learning; when an unguided approach is initiated prematurely, students may lack the perceptual skills, environmental concepts, or other enabling abilities they need to identify the salient elements of a problem scenario. Nyman and Mettler (1993) also asserted that extrinsic feedback is useful for introducing the fundamentals of a skill and that it can have a motivating and reinforcing effect on students.

Critiquing the guided instruction approach, Mettler (1994) contended that it overemphasizes the importance of the instructor's knowledge, and correspondingly, minimizes the importance of students developing their cognitive skills. Similarly, Nyman and Mettler (1993) argued that emphasis on extrinsic feedback can lead to a student's dependency on it and difficulties when extrinsic feedback is withdrawn. Mettler (1994, 1995, 1997) and other proponents of SDL conceded that guided instruction is the optimal approach to teaching motor skills that are repetitive, require little adjustment to changing conditions, and eventually become automatic (Altman & Cutter, 2004; Nyman, 2001). For example, Mettler (1994) advocated for a guided instructional approach to teaching cane travel subskills, such as use of the pencil grip for traveling in confined areas. For repetitive motor skills, there is little benefit to be realized through students’ trial and error because these skills and any errors associated with them are rapidly
integrated into procedural memory and are resistant to later modification (Altman & Cutter, 2004).

**Structured Discovery Learning**

The role of errors in learning represents a major distinction between guided instruction and SDL. Proponents of guided instruction argue that “it is easier to learn a skill correctly the first time, that no benefits are realized from learning through errors, and that learned errors are difficult to extinguish” (Mettler, 1994, para. 8). In contrast, proponents of discovery learning view errors as valuable learning opportunities. Learning how to self-correct errors and solve problems that errors may engender is critical to the student’s independence because travelers are bound, with varying degrees of frequency, to make errors in judgment and encounter problems in the post-training environment (Mettler, 1994). Indeed, Maurer (2011) observed that even highly-skilled cane travelers made a large variety of errors, such as wrong turns, veering, and misinterpreting tactile and auditory clues. Proponents of SDL argue that preventing students from making errors gives them a false sense of optimism about their competence and is likely to defer errors to the post-training setting. From this perspective, it is actually the absence of errors that should be worrisome, because lack of any challenge or difficulty indicates that the student is not being exposed to the conditions that facilitate learning (Bjork, 1994).

Structured discovery learning is so named because it emphasizes the student’s active construction of his or her own knowledge in the context of deliberately structured problem situations in which a satisfactory solution must be discovered (Maurer, 2011; Nyman, 2001). SDL holds that knowledge the student discovers is more likely to be
incorporated into existing schemas and subsequently used than knowledge presented by the instructor for memorization (Altman & Cutter, 2004); the source of learning, therefore, is not extrinsic feedback presented by the instructor, but rather it is perceptual and cognitive feedback generated and received intrinsically by the student (Nyman, 2001). The instructor’s primary role is to deliberately structure lessons to provide students with opportunities to practice generating and utilizing intrinsic feedback, which leads to the development of self-monitoring, the refinement of environmental information-gathering skills, and the discovery of errors in reasoning that lead to independent problem-solving skills. Thus, the planned, systematic SDL approach is in stark contrast to the common practice of addressing problem-solving skills opportunistically and desultorily, an approach that Perla and O’Donnell (2004) called “wait and see” (i.e., wait and see if a problem arises).

In the SDL approach, the student is given increased responsibility to rely on his or her own ability to make sense of the environment and make decisions based on reasoning and common sense. Thus, from the SDL perspective, students with visual impairments are viewed positively and holistically; they are recognized as having an innate capacity to learn from meaningful experience as well as a desire to travel independently and maintain control over their own lives (Altman & Cutter, 2004).

In the following vignette, Bell (2012) illustrates the SDL approach to teaching a child residential travel skills:

…if a child learns how to walk down a sidewalk with a cane by investigating it himself …, he’s not only learning just the mechanics of how to follow the pathway of the sidewalk, but he is learning how to problem-solve as he maneuvers around
obstacles in the middle of the sidewalk, solidifying concepts he may have been taught before such as what parallel and perpendicular mean...[He] is learning how to recognize landmarks to orient where he is..., learning how to recognize different textures or sounds with his cane to get different feedback, and so much more (para. 1).

This vignette highlights the importance of intrinsic feedback (e.g., detecting obstacles; recognizing landmarks and different textures with the cane; reflecting on prior knowledge of environmental concepts) to the child’s development of independent travel skills. Indeed, Nyman (2001) asserted that skilled creation and utilization of intrinsic feedback is the best guarantee of full independence for travelers with visual impairments.

Realistic Environments

To achieve expertise in a given skill, the learner must practice extensively under conditions that resemble those in which the skill will be performed (Ericsson & Charness, 1994). For this reason, SDL maintains that lessons should occur in environments that are representative of real-world travel experiences, which introduce the types of problems and challenges that students will encounter post-training (Altman & Cutter, 2004). Practicing in realistic environments enables the student to acquire knowledge of the environmental features and perceptual stimuli that play an essential role in non-visual travel (Altman & Cutter, 2004). Moreover, facing problems in realistic environments enhances learning because these scenarios offer a purpose for learning; when the student recognizes the practical value of the training for dealing with
challenges he or she will face in the real world, learning becomes more meaningful (e.g., Ge, 2001; Mino, 2011).

In addition to practicing in realistic environments, practicing under diverse conditions is desirable because it improves the likelihood that students will be capable of generalizing skills to a variety of situations (Ericsson & Charness, 1994). Indeed, for this reason, SDL discourages route travel, which provides little variation in environmental conditions. Altman and Cutter (2004) warned that students overly exposed to route travel may develop O&M skills that are relevant to a specific task or route and that these skills may not transfer well to different conditions. Bell (2012) advised that instructors not only avoid route travel, but seek out lesson sites with which they themselves are not familiar. By modeling non-visual travel for students in these novel environments, the instructor demonstrates how an experienced blind traveler can synthesize non-visual information to create a mental representation of the environment.

**Cognition and Structured Discovery Learning**

Conscious thought processes are essential to non-visual mobility (e.g., Dodds, 1984; Mettler, 1995). The primary cognitive skills emphasized by SDL that support problem solving are related to environmental information-gathering and the construction of a mental model of the environment (Mino, 2011). Perceptual skills underlie these critical processes.

Foulke and Hatlen (1992) characterized perception as actively seeking “the stimulus energy that is likely to yield the information we need in order to realize our purposes” (p. 43) and note that a person relies on past experience to choose the stimuli to which he or she attends. Foulke and Hatlen’s view emphasized the cognitive
dimension of perception whereby the traveler consciously directs attention to the stimuli that are most informative. Mettler (1994) called this process selective attention, which amounts to "knowing from experience where, how, and when to direct perceptual mechanisms in preparation for extracting the right information for the occasion" (para. 25). For example, in determining whether it is safe to cross a street, a skilled non-visual traveler might attend to a variety of relevant tactile, auditory, and kinesthetic stimuli, such as the texture of the ground beneath the feet, vibrations transmitted via the cane, the contours of the sidewalk and curbs, the sounds of traffic, and the location of the sun (Mettler, 1994). The traveler’s awareness of, selective attention to, and synthesis of these different types of stimuli into a model of the environment represents the cognitive dimension of perception. These perceptual processes are acquired and refined through experience and practice (Foulke & Hatlen, 1992; Mettler, 1994).

The SDL approach holds that any information about the environment provided by the instructor during a lesson inhibits the student’s practice of perceptual skills. So as not to deprive students of the opportunity to develop these skills, the instructor rarely verbalizes anything other than a leading question or occasional prompt during the lesson (Altman & Cutter, 2004). Moreover, when the environment is viewed holistically as comprising the instructor’s feedback as well as the actual physical surroundings, it is apparent that excessive extrinsic feedback may actually become an artificial feature of the practice environment. Extrinsic feedback tends to improve performance during practice, but when this feedback becomes absent in the post-training environment, performance may suffer (Mettler, 1994).
Extrinsic feedback may interfere not only with perception, but with the student’s information processing more generally (Mettler, 1997). As attention is a limited resource and the instructor’s comments tend to be compelling, excessive extrinsic feedback impedes the student’s ability to attend to and process intrinsic feedback (Mettler, 1994), the very ability most essential for independent travel (Nyman, 2001). This is not to say that all extrinsic feedback must be avoided; if this were the case, the instructor would have no role after teaching a student basic motor skills. For extrinsic feedback to be beneficial, it must be used judiciously with the intent of cultivating the student’s sensitivity to intrinsic feedback (Mettler, 1994; Nyman & Mettler, 1993).

The role of the instructor. In SDL, the primary role of the instructor is to structure lessons that cultivate students’ sensitivity to intrinsic feedback. Even during initial lessons in which guided instruction predominates, the instructor may begin working toward this aim. For example, Welsh (2010a) suggests that when students are learning human guide techniques, the instructor may ask the student to use environmental clues to maintain orientation or develop hypotheses about where he or she is in space; in this way, the student is actively engaged in processing intrinsic feedback even though the instructor is helping the student avoid obstacles and providing explicit instruction. Giving the student some responsibility for his or her own orientation during training of human guide techniques is essential, as Mettler (1995) warns that early emphasis on human guide may create the expectation that a passive social role is appropriate for people with visual impairments.

Throughout a student’s training program, the instructor deliberately structures lessons that compel the student to confront various types of problems. For example, the
instructor might ask the student to travel through an area that includes hazards, barriers, unexpected streets or street crossings, sidewalks with dead-ends, et cetera (Welsh, 2010b). According to a student’s current skill level, the instructor should discuss with the student key concepts, strategies, techniques, and prior knowledge that may be useful in approaching problems that may be encountered. More guidance will be necessary in the beginning stages of learning to ensure that the student fixates on salient elements of the problems he or she will face during each lesson. The amount of advice the instructor provides will gradually diminish as the student becomes more capable (Welsh, 2010b). The advice that is given will mostly be in the form of material intended for students’ reflection to help them solve problems independently (Nyman & Mettler, 1993).

As a student travels, the instructor can promote sensitivity to intrinsic feedback by maintaining a conversational distance and asking the student to comment on aspects of his or her performance (e.g., Altman & Cutter, 2004; Mettler, 1994, 1997; Mino, 2011). Occasionally questioning the student regarding his or her perceptions and thought processes encourages reflection and self-monitoring (Altman & Cutter, 2004). However, the instructor usually refrains from giving the student information regarding the environment or the student’s performance that the student can acquire independently (Mettler, 1994; Nyman & Mettler, 1993).

When a student requests extrinsic feedback, the instructor’s best response may be a quiet “What do you think?” or to prompt the student to reassess the present situation and focus on the goal (Altman & Cutter, 2004). If the student is in need of more substantial instructional scaffolding, the instructor might hint at ways the student can
acquire the environmental information to solve a problem at hand or point out that the student has all of the necessary information but needs to reconsider or reassemble it (Dodds, 1984; Mettler, 1994). Perla and O'Donnell (2004) offer similar advice. They describe a case study in which the instructor uses a metaphor based on puzzles to describe the process of problem solving to the student: problems are like puzzles to be solved while sensory cues and prior knowledge are the individual pieces. Because the student may not know what the finished puzzle (i.e., the solution) should look like, he or she may need to reexamine or rearrange the puzzle pieces during the problem-solving process.

Perhaps the best tool that instructors may use to promote students’ sensitivity to intrinsic feedback is Socratic questioning. For example, if a student were to become disoriented during travel, the instructor might pose questions such as “Where is the heaviest traffic?,” “Where was the sun when you began walking up the street?,” “What cues might tell you whether this is a parking lot or a driveway?” (Mino, 2011). Research (e.g., Chen & Bradshaw, 2007; Ge, 2001) has consistently demonstrated that Socratic questioning facilitates problem-solving processes through focusing attention, activating relevant conceptual knowledge, and promoting self-monitoring of thought processes (Mino, 2011). The Socratic Method obliges students to analyze problems based on their own perceptual awareness and interpretation of a situation, which facilitates their ability to become cognizant of inconsistencies in thinking and self-correct them (Mino, 2011). Indeed, Socratic questioning helps students develop the metacognitive skills implicated in problem solving (e.g., D'Zurilla & Nezu, 1999; Mettler, 2008) in that elaborating on the
questions asked helps students develop awareness of their own thought processes (Mino, 2011).

Dodds (1984) and Nyman and Mettler (1993) gave three broad guidelines that govern the role of the instructor in SDL. First, instructors should not overload students with extrinsic feedback, especially feedback that is not directly related to the current problem scenario. Second, instructors must ensure that students are actively participating. Third, instructors must gauge when to prompt the student versus withhold such prompts and allow the student to solve the problem independently.

**Psychosocial Factors in Problem Solving**

The ability to resolve mobility problems and travel independently comprises more than motor, perceptual, and cognitive skills; it involves mastery of psychological and social aspects of travel as well (Welsh, 2010b). In many settings, however, O&M training is heavily focused on discrete skills and techniques while the psychological status of the student is overlooked (Baskett, 2005). This neglect is unfortunate because psychological variables have been shown to account for more variance in O&M performance among people with visual impairments than even degree of residual vision (e.g., Beggs, 1991; Brown, Brabyn, Welch, Haegerstrom-Portney, & Colenbrander, 1986; Haymes & Guest, 1996). Moreover, psychological factors, such as fear and anxiety, have been identified as primary causes for refusing O&M training (Seybold, 2005; White, Carroll, & Martin, 1990), and students’ emotional and motivational styles have strong implications for how they approach situations requiring problem solving (e.g., D’Zurrila & Nezu, 1999; Emam, 2013; Mino, 2011; Perla & O’Donnell, 2004; Welsh, 2010a, 2010b). Addressing students’ psychosocial needs and their needs for
practical skills concurrently will tend to produce the best results for students, enabling them to acquire independent travel skills in addition to a sense of empowerment and increased self-esteem (Seybold, 2005).

**Instructor-Student Rapport**

Based on a survey administered to experienced mobility specialists, Beggs (1987; see also, Beggs, 1986) found that the consensus among respondents was that a student’s motivation and self-reliance were as crucial to success as degree of visual functioning and mastery of basic travel techniques. To enhance motivation, improve students’ self-concepts, and reduce feelings of helplessness, Beggs and other researchers highlighted the importance of instructors developing a collegial, egalitarian relationship with students (e.g., Alan & Cutter, 2004; Perla & O’Donnell, 2004; Seybold, 2005). Beggs advised that this relationship is facilitated when the instructor shifts perspective from “client-as-patient” to “client-as-friend.” In the former perspective, the instructor is seen as having all responsibility for student learning, which is likely to lead to dependency or learned helplessness for the student. In the latter perspective, the instructor communicates to the student that they share responsibility for the outcomes of training. Nyman (2001) admonished that the instructor should communicate to the student that he or she must begin to take control of learning process from the start, which sets the tone for every aspect of the training that follows.

Perla and O’Donnell (2004) gave several specific recommendations for enhancing instructor-student rapport and encouraging problem solving: (a) discussing with students the value of making mistakes, (b) praising students for willingness to try regardless of a successful outcome, (c) encouraging students to take risks, (d) praising
students for considering various options rather than acting on first impulse, and (e) sequencing problem-solving experiences so that tasks are challenging yet attainable. When the instructor has developed rapport with the student and is familiar with the student’s interests, the instructor can structure problem-solving opportunities around motivating tasks or environments. For example, the instructor might ask a student to locate a music store and find a favorite album (Ambrose-Zaken, Calhoon, & Keim, 2010).

**Self-efficacy**

Self-efficacy refers to “a person’s belief in what he can do and how strongly he believes it” (Welsh, 2010b, p. 188). Self-efficacy has a profound effect on motivation and behavior; it influences the challenges that a person will be willing to undertake, the amount of effort he or she gives, and how long he or she will persist in the face of obstacles. Supporting students’ perceived self-efficacy is especially relevant to O&M training; when self-efficacy is lacking, students are unlikely to believe in their ability to succeed and to work diligently throughout their programs (Welsh, 2010b).

Nothing is more likely to boost self-efficacy than direct, personal experience with successfully performing a task (e.g., Welsh, 2010a, 2010b), and moreover, success tends to reinforce the behaviors and skills students are learning more than praise or external reinforcements (Nyman, 2001). Devising lessons that result in success experiences is therefore one of the most important ways that instructors can support students’ development of self-efficacy. By controlling the degree of challenge each lesson or task presents and breaking down distant goals (e.g., walking in step with the long cane; traveling independently in unfamiliar settings) into smaller, more attainable
sub-goals, instructors can reduce students’ anxieties and increase their self-confidence. For example, Bell (2012) suggests that an instructor can increase a student’s confidence by giving him or her the opportunity to master the sub-goal of walking in a straight line before learning to make street crossings. Attaining sub-goals provides students with clear markers of progress (Mettler, 1997; Perla & O’Donnell, 2004; Welsh, 2010a, 2010b).

While success experiences are crucial, their power to affect self-efficacy is contingent upon two key factors. Unless students perceive a performance objective as reasonably challenging, it is unlikely that achieving that objective will positively impact their self-efficacy. Likewise, students must understand and appreciate that success was due to their own efforts (Welsh, 2010a, 2010b). Marsh (2009) stated that ensuring a student’s success by removing challenges may actually negatively impact his or her self-confidence because students learn that they only succeed when the instructor is present. The importance of students feeling responsible for their own successes is another reason that instructors should limit extrinsic feedback during lessons. When students are allowed to make and recover from errors independently, their personal sense of self-efficacy is strengthened. On the other hand, to the degree that the instructor helps solve a problem for the student, the instructor undermines the student’s confidence in his or her own abilities (Alan & Cutter, 2004). It may be difficult for instructors to refrain from assisting students during lessons, especially when students appear frustrated, but instructors must bear in mind that “dealing with frustrations and learning that one can work through them…is a life-affirming, powerful experience” (Marsh, 2009, para. 5).
Vicarious experiences—observing others successfully performing a task—may have a smaller but similarly positive effect on self-efficacy as direct, personal experiences. The impact of vicarious experiences is amplified when the observer perceives the actor and him- or herself as being alike; thus allowing students to observe other students who possess slightly more advanced skills perform tasks successfully can be a useful instructional strategy (Welsh, 2010b). To capitalize on the power of vicarious experiences, Bell (2012) and Maurer (2011) recommended leading by example; by donning sleep shades and modeling various skills successfully, the instructor may dramatically influence a student’s attitude toward learning the modeled skills.

When used appropriately, verbal encouragement may also positively impact self-efficacy. Verbal encouragement alone is unlikely to make a long-term difference, but it may help students muster the courage to undertake a challenge or sustain their efforts in the short term (Welsh, 2010b), which could then lead to direct experiences of success. A strong rapport between instructor and student increases the likelihood that verbal encouragement will be effective. Instructors should avoid giving unrealistic feedback or encouragement because it may backfire. Unrealistic feedback invites failure, which undermines instructor-student rapport and students’ perceived self-efficacy.

Anxiety

Anxiety may negatively influence students’ willingness to accept challenges related to problem solving and may interfere with learning, especially for complex tasks.
Helping students manage anxiety is therefore an important aspect of mobility instruction.

To determine the aspects of independent travel that provoked the most anxiety for travelers with visual impairments, Johnson and Petrie (1998) conducted in-depth interviews with 24 participants who traveled either with a cane or guide dog. Fifteen participants were male and nine were female, and the mean age of participants was 40.4 years. Interviews consisted of both closed- and open-ended questions. When asked to define or mention components of safe, independent travel, 75% of participants mentioned “avoiding obstacles” whereas less than 40% of participants mentioned “orientation,” “personal safety,” “crossing roads,” or “not getting lost.” When asked about the aspects of travel that provoked the most worry or anxiety in unfamiliar environments, participants’ most frequently cited concern was “unexpected obstacles.” Fewer than 20% of participants cited issues with public transportation or interactions with the general public. When asked the same question in regards to familiar environments, 38% of participants cited “getting lost,” and between 17 and 21% of participants cited “asking sighted people for information,” “public transport,” or “personal safety.” Though it cannot be assumed that Johnson and Petrie’s sample is representative of the broader population of travelers with visual impairments or that the results of their study would generalize, Johnson and Petrie’s research does highlight the fact that people with visual impairments confront a large variety of potentially anxiety-provoking situations while traveling.

Researchers have differentiated between trait and state anxiety. Trait anxiety is considered a relatively stable disposition based on an individual’s tendency to

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1 Johnson and Petrie (1998) do not report how this sample was obtained.
experience anxiety more frequently and intensely across a variety of situations. In contrast, state anxiety refers to transitory experiences of anxiety that most people experience from time to time (Welsh, 2010b). Many sources may contribute to trait and state anxiety. Seybold (2005) noted that these sources include risk of physical injury, not knowing what to expect will happen next, judgments made by others that threaten the student's self-esteem, and interpersonal anxieties related to interactions with others. These varied sources of anxiety highlight the fact that not all problems students face are directly related to the physical environment. Other problems, such as how the student should respond when his or her cane inadvertently contacts another person, how to appropriately solicit assistance, and how to react to other pedestrians who may be either helpful or insensitive, are more social in nature (Conversely, social skills may be called upon in some situations as a problem-solving strategy, for instance, to solicit help crossing an intersection).

Students high in trait anxiety may express this emotion at the advent of an O&M training program. In particular, students may experience heightened “ambiguous anxiety” because they do not know what training will entail and what will happen next. Instructors should consider providing detailed information about the training process to help mitigate ambiguous anxiety (Welsh, 2010b). Moreover, Baskett (2005) advised that instructors ask students what independent travel would mean to them specifically. Questions such as “How would safe and independent travel change your lifestyle?,” “Would you be able to do things that you can’t do now?,” and “Would it make life easier for your family and loved ones?” (p. 470) may encourage students to reflect on the benefits of training and help them overcome initial feelings of anxiety. Another way that
instructors may help assuage anxiety is to share their own prior experiences in which they felt anxious, such as when they first began traveling under blindfold (Bell, 2012). It is expected that students will experience some degree of stress and state anxiety during lessons; if they do not, then it is likely that lessons are not appropriately challenging. Low and moderate amounts of stress may even benefit performance by increasing alertness and motivation (Perla & O’Donnell, 2004). Conversely, severe anxiety can reduce perceived self-efficacy (Welsh, 2010b) and cause the student to fixate on negative self-judgments or cues irrelevant to the task at hand (Perla & O’Donnell, 2004).

As students are confronted with difficult aspects of training, instructors need to be sensitive to the observable indications of acute state anxiety, which may include sweating, rapid breath, increased muscle tension, visible tremors, slower walking pace, or idiosyncratic mannerisms (Welsh, 2010b). When these signs become present during a lesson, the instructor should use careful judgment before deciding to intervene. The tendency of many instructors’ is to “rescue” students experiencing anxiety. For example, Dodds (2008) reported that one of his students once remarked, “[instructors] don’t think you can bail yourself out. They can’t stand there…whilst you’re crying or if you get absolutely enraged. They step in real quick to bail you out. They are uncomfortable. They don’t want to let you work it out on your own” (para. 11). Minimalist interventions, such as providing simple verbal encouragement or minor advice or physical assistance, should be tried before more intensive responses, such as terminating the lesson—if the instructor intervenes too quickly and eagerly, he or she deprives the student of the opportunity to work through the difficult experience more or less independently, which
would lead to higher self-efficacy and reduced anxiety in the future. Through quality rapport with the student, the instructor will learn to gauge how much anxiety he or she can tolerate and how to maintain focus on success experiences (Welsh, 2010a).

**Problem Solving Orientation**

Tantamount to D’Zurrila and Nezu’s (1999) concept of *orienting responses*, some mobility specialists and researchers emphasize the psychosocial construct of *problem-solving orientation* (PSO). This construct comprises an individual’s cognitive, emotional, and behavioral reactions to being faced with a problem (e.g., Emam, 2013; Mino, 2011; Perla & O’Donnell, 2004). The cognitive component of PSO involves evaluating a problem and judging one’s ability to cope with it (Perla & O’Donnell, 2004). The emotional component of PSO may include negative reactions, such as frustration, helplessness or depression, but also positive reactions, such as excitement and eagerness to address problems. The behavioral component involves the tendency to avoid problems, react passively and depend on others for help, or to react actively and assertively, viewing problems as interesting challenges (Altman & Cutter, 2004; Perla & O’Donnell, 2004). Among a population of highly-skilled cane travelers, Maurer (2011) observed that, individuals’ emotional and behavioral responses to problems were highly consistent: “Correction of errors was…done with little or no apparent emotional response. From what was observed, it seemed apparent that errors were a natural, expected part of travel. They were just one more problem to be solved” (para. 33).

Emam (2013) explained that cognitive characteristics, such as self-efficacy and attributional style, in conjunction with negative life events (e.g., loss of vision), contribute to depressive symptoms and may reduce an individual’s ability to cope with stressful
situations (e.g., problems). Emam (2013) studied the relationships among PSO, attributional style, and depression in a population of Egyptian adolescents with visual impairments. His purposeful sample drawn from a residential school for students with visual impairments resulted in 56 male and 35 female participants ranging from 12 to 17 years of age. Emam’s participants completed a battery of scales and inventories measuring social problem solving, attributional style, and depressive symptoms. Using hierarchical regression analysis, Emam examined the degree to which PSO and attributional style predicted depressive symptoms over and above that predicted by gender (Emam found a significant main effect of gender such that females experienced overall more depressive symptoms than males). Emam’s analysis demonstrated that an attributional style in which negative events are attributed to stable and global causes while positive events are attributed to unstable and specific causes is a strong risk factor for depression in the population under study. Moreover, Emam found that a negative PSO was significantly related to depressive symptoms even after accounting for gender and attributional style. Emam noted that it would be of interest to examine how self-efficacy expectations related to problem solving might mediate the link between PSO and depressive symptoms, but noted that not including a measure of self-efficacy represented a limitation of his study. Emam suggested that interventions involving training in attributional style and problem solving may reduce risk of depressive symptoms in similar populations.

**Assessing Problem Solving Skills**

In assessing problem solving skills, the mobility specialist can focus on the outcome of a problem-solving scenario (i.e., whether or not a satisfactory solution was
achieved) or the processes that led to the outcome (D'Zurilla & Maydeu-Olivares, 1995). Focusing on the outcome may be appropriate for a student who consistently is faced with a specific type of problem for which a limited number of problem-solving strategies might apply. However, in most instances, more valuable assessment data can be gleaned when the instructor focuses on the processes that the student used, which facilitates the identification of strengths to reinforce and weaknesses to address in future lessons. For example, given identical scenarios, one student might fail due to incorrectly conceptualizing the problem and therefore testing suboptimal strategies, whereas another student might correctly recognize and understand the problem but lack the cane skills or the self-efficacy to implement a proposed solution. Instructors should consider using the stages of problem solving as a framework for discussing the student’s performance, which helps the student explore his thinking and identify where errors were made.

Depending on the student’s developmental level, a “think-aloud” protocol may be a valuable assessment tool; while attempting to solve a problem, the student verbalizes his thoughts, either continuously or intermittently when prompted by the instructor. The think-aloud protocol provides the instructor with insight into how the student is thinking in regards to each stage of the problem-solving process. Observing the student during a drop-off exercise and questioning him either during it or afterward can provide useful assessment data that can be used to individualize future instruction (Perla & O’Donnell, 2004).

Maurer (2011) employed these assessment strategies as well as audio recordings, running records, and miscue analyses to examine the thought processes
that highly-skilled cane travelers used while traveling familiar and unfamiliar routes. Maurer contacted leaders in the National Federation of the Blind to solicit nominations of cane travelers who were blind or partially sighted traveled quickly, walked with a normal stride, made relatively few errors when traveling, and who were highly independent and self-determined. Through this purposive sampling, Maurer obtained seven participants aged between 20 and 55, several of whom were currently O&M instructors. Maurer asked each participant to travel one short and one longer route in two environments: one familiar environment of the participant’s choosing and one unfamiliar environment. Maurer then observed each participant traveling the routes; he made audio recordings and kept running records (i.e., continuously recorded notes regarding observable behaviors, such as walking speed, what the traveler’s cane contacted, and interpersonal interactions) to guide his discussions with the participants afterward. During the longer routes, Maurer stopped participants at regular 5-minute intervals to engage in the think-aloud protocol.

Maurer (2011) transcribed and coded the audio recordings of each observation. Based on his personal observations and the coded recordings, Maurer identified a number of patterns that characterized the behavior of these highly-skilled cane travelers. He noted that all participants exhibited highly automatic cane techniques. For example, participants automatically narrowed their cane arcs in response to oncoming foot traffic and automatically changed cane grips in crowded areas. Moreover, they exhibited “low touch” cane behavior—not contacting objects or following a shoreline of which they were already aware, which would be unnecessary. In unfamiliar settings, participants asked questions of the general public very early in each route and exhibited
much more exploratory behavior in terms of listening and using the cane to probe the environment.

Maurer (2011) was particularly interested in examining the degree of conscious versus subconscious thought processes his participants used while traveling and thoroughly explored this topic with them through discussion. Maurer assumed that highly skilled cane travelers would practice many travel skills to automaticity, at which point performance of those skills would become subconscious, much like a sighted motorist might drive a long route and have little recollection of the experience. However, most participants reported a higher level of conscious awareness than Maurer expected, especially given their fluency with which they responded to unexpected aspects of the environment. Maurer concluded that participants used an intentional interplay of conscious and subconscious thought processes; they switched to conscious processing at critical junctures during travel and seamlessly switched back to more subconscious modes for routine travel.

Based on the discussions with his participants, Maurer (2011) recommended that the think-aloud assessment technique should be used intermittently rather than continuously to minimize disruptions. Moreover, he noted that focusing on errors via miscue analysis, especially early in discussions, was problematic for some travelers, who became defensive or distracted from analyzing their thinking. Instead, Maurer found that open-ended questions (e.g., “What was that like?”; “What were you thinking about as you walked?”) elicited a greater variety of responses and better revealed the traveler’s thought processes. Maurer reserved questions related to errors for the end of discussions and noted that some behaviors he perceived as errors during the
observations were actually intentional decisions related to safety or other reasons that were not apparent to him.

The SDL approach emphasizes self-assessment by the student as being fundamental to the learning process. Mettler (1994) recommended that, upon completion of each lesson, the instructor and student should share a frank discussion of the student's performance. The instructor should prompt the student to reflect on his or her performance, which helps develop self-monitoring skills. For instance, instructor might inquire about whether the student perceived environmental stimuli and how he or incorporated it into his or her travel strategy (Mettler, 1990). Though extrinsic feedback is kept to a minimum during the lesson, it may play a more prominent role when discussing the student's performance afterward. Altman and Cutter (2004) suggested that extrinsic feedback is especially important in addressing aspects of the student's performance that were not correctly self-assessed. This feedback may consist of direct commentary, but, as during the lesson, Socratic questioning may be used to encourage students to analyze their own thought processes.

**Implications for Professionals**

It has been said that a wise instructional perspective is to begin with the ending in mind (e.g., Maurer, 2011); when the long-term goal for a person with a visual impairment is the ability to travel independently in the real world, O&M training should reflect this aim at the outset. Because individuals will assuredly make errors and encounter unexpected obstacles in the real world, learning how to recognize problems, conceptualize them, consider various solutions, and implement solutions must be a focus of O&M training. Training must also provide students with experiences in which
they feel appropriately challenged and responsible for their own successes to develop
the self-efficacy needed to confront problems independently in post-training settings.

Beginning with the end in mind, O&M instructors must come to see student errors
and problem-scenarios as valuable learning tools. Proponents of the SDL approach
have advocated for the deliberate structuring of lessons such that students are provided
with sufficient experience dealing with mistakes and problems under conditions that
accurately reflect the post-training environment. This approach emphasizes that
students actively learn how to generate and process intrinsic feedback—their own
perceptions, mental representations of the environment, prior knowledge, and self-
awareness—rather than feedback given by the instructor. Though guided instruction is
appropriate in the initial stages of training when the student is developing basic skills,
instructors must gradually shift responsibility for learning to the student over time.
Developing a quality rapport and communicating to the student that he or she shares
responsibility with the instructor for learning from the beginning eases the transition from
heavily guided instruction to discovery learning.

For people with visual impairments, well-developed O&M skills are fundamental
to overall quality of life (Cobb, 2013); the ability to choose where, when, and how to
travel undergirds social connection and self-determination (Maurer, 2011). Given the
significance of O&M skills to an individual’s well-being, it is paramount that instructional
approaches are aligned with the long-term goal of independent travel in everyday
settings. For this to occur, institutional and individual (i.e., instructors, students, family
members, etc.) attitudes towards the role of errors and problems in learning must
change (Mettler, 1994).
References


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