Center on Innovations in Learning

Thank you for downloading

Converging Qualities of Personal Competencies
T. V. Joe Layng

from the Center on Innovations in Learning website
www.centeril.org

Converging Qualities of Personal Competencies

T. V. Joe Layng

What is to be taught? How is learning to occur? What makes for a truly successful learner? Educators are increasingly looking to the learning and psychological sciences for help in answering these questions. Covering content is no longer considered adequate, nor is a simple emphasis on the purely academic domain sufficient. Schools are being challenged with developing competencies that extend beyond what might be called the cognitive domain. In addition to cognitive competencies, three other competencies have been identified that some have suggested are essential for learners to master (see Redding, 2014a, 2014b): metacognitive, social/emotional, and motivational competencies. Although there is an emerging consensus that these are important, there is not widespread agreement on precisely how these competencies are defined and how they may be acquired. This chapter provides a behavioral description of each competency and describes how the competencies converge, that is, how each competency may contribute an important component to another.

Cognitive Competencies

Let's begin with what many consider a familiar competency category—cognitive competencies. For most teaching activities, some form of cognitive competency on the part of the learner is required. Cognitive competencies refer to those repertoires required to gain the knowledge and skills directly related to the subject matter taught. Redding (2014a) refers to a cognitive competency as "prior learning that facilitates new learning" (p. 4). Learning scientists and education researchers have for many years tried to provide various taxonomies of cognitive competencies. Bloom (1956) and his associates focused on content-neutral cognitive competencies that could be applied across content areas. Others have approached cognitive competencies through content learning; that is, they analyze instructional content in such a way that cognitive competencies can be defined based on the type of learning required for mastery of specific content (for insightful early treatments, see Mechner, 1962, 1965). One such model was first offered by Philip Tiemann and Susan Markle (1973). They provided what they called a "remodeled model," which

was based on David Merrill's (1971) revision of Robert Gagne's (1965, 1970) famous *Conditions of Learning*. Tiemann and Markle (1991) later went on to produce a comprehensive guide to applying their model to content analysis (also see Layng & Twyman, 2013). An updated version of their model was recently described by Layng (2014a). As described later in this chapter, the advantage of this approach is that precise cognitive competencies can be described and evaluated in the context of the specific subject matter that is to be mastered. I will return to Bloom in our discussion of metacognitive competencies.

To analyze cognitive competencies in the context of subject matter, Tiemann and Markle (1991) provide a matrix that describes "types of learning." The matrix provides a guide for ensuring that "prior learning that facilitates new learning" is acquired (Figure 1). The cell at the bottom left is labeled "Responses." To determine if learning in this category has taken place, we ask the question, "Can the learner actually perform the behavior requested?" An example of a response is grasping a pencil.

Figure 1. Types of Learning

Psychomotor	Simple Cognitive		Complex Cognitive
Kinesthetic Repertoires	Verbal Repertoires		Strategies
Chains	Sequences		Principles (Rule Applying)
	Serial Memory	Algorithms	
Responses	Paired Associates	Multiple Discriminations	Concepts
	Associations		

Note. Adapted from *Analyzing Instructional Content* (4th ed.), by P. W. Tiemann & S. M. Markle. Copyright 1991.

Just above the "Responses" cell, the "Chains" cell concerns how responses are linked to perform a sequence of behaviors in which one behavior must be successfully completed before another can occur if the entire "chain" of behaviors is to be completed successfully. Sharpening a pencil is an example of such a chain. Often these behaviors may appear simple and may be considered relatively unimportant, but, without them, more complex behaviors may be difficult to learn. These behaviors often make up what some authors have called "tool skills," the fundamental building blocks of more complex skills (Johnson & Layng, 1992). For example, clearly and quickly writing digits 0 to 9 may be essential to reach fluency in performing addition and subtraction math computations. The top cell in the psychomotor category, "Kinesthetic Repertoires," refers to linked, and often recombinant, motor patterns. They include such skills as competitive cycling, ice skating, and hockey. They are complex and require sophisticated methods of instruction (see, for example, Mechner, 1994, for a detailed description of the teaching and evaluating of complex psychomotor behavior).

The next column, labeled "Simple Cognitive," has at its basic level what psychologists have called paired–associate learning or stimulus–response relations, cognitive scientists

call condition–action pairs, and behavior analysts call occasion–behavior relations. That is, a response is provided to a stimulus, for example, seeing a picture of a truck (stimulus) and saying, "Truck" (response). Often, the task is made more complicated by placing several stimuli together and providing each stimulus with its own response, such as seeing a car and saying, "Car"; seeing a truck and saying, "Truck"; and seeing a bicycle and saying, "Bicycle" when the pictures of each are all presented together. Learning scientists call this simple cognitive activity a "Multiple Discrimination" (see bottom cell in middle under "Simple Cognitive"). The next cell up in the "Simple Cognitive" column, "Sequences," includes "Algorithms." Solving a long-division problem is an example of an algorithm. Although different long-division problems may be presented, the algorithm, or the steps that are followed, is the same for solving each one. "Serial Memory" requires learners to perform a sequence that is arbitrarily defined by the outcome. An example is playing a sequence of notes on a musical instrument that results in "Twinkle Twinkle, Little Star." At the top of the "Simple Cognitive" column, the "Verbal Repertoires" cell refers to being able to speak or write knowledgeably about a topic. When one uses knowledge, one has to provide an account of some type. Although essays are often thought to tap into a more complex cognitive domain than answering multiple-choice questions, this may not always be the case. Whereas an essay can simply be the phrasing of material read or heard, a well-designed multiple-choice question may include distinguishing examples from very similar nonexamples, thus requiring a deep understanding of the subject matter.

> Often principles are stated in terms of "if, then" relations: If there is an action, then there will be an equal and opposite reaction.

In the third column, labeled "Complex Cognitive," the cell at the bottom, "Concepts," is not a mental construct but instead refers to stimuli that share a set of common (*must have*) features found in each example of the concept but that also may differ from one another by including varying (*can have*) features. The *must have* features provide the defining properties that make something a concept. "The *can have* features describe the many ways examples of a concept can be different" from one another (Layng, 2012, p. 2). Teaching a concept requires the learners to respond to all examples that include the *must have* features and not to respond to "nonexamples" missing one or more of the *must have* features. To test if a learner actually has learned a concept, new examples (not presented during instruction) containing the *must have* features must be correctly identified, and close-in nonexamples, items for which often only one of the *must have* features is missing, are rejected. Furthermore, the testing examples must be drawn from examples that include the full range of *can have* features.

"Principles" (center cell) describe the relation between concepts. For example, in the physical law "For every action there is an equal and opposite reaction," four concepts—equal, opposite, action, and reaction—are related to one another in a specific way. Often principles are stated in terms of "if, then" relations: If there is an action, then there will be an equal and opposite reaction. At the top of the "Complex Cognitive" column, the "Strategies" cell describes repertoires required for solving problems of various types.

One feature that distinguishes the "Simple Cognitive" from the "Complex Cognitive" column is how the cognitive repertoires are assessed. In the "Simple Cognitive" column, what is presented in instruction is what is tested. In the "Complex Cognitive" column, new examples and nonexamples not presented in instruction must be tested. This is the

case for all the cells in the "Complex Cognitive" column. For a detailed description of this topic, see Tiemann and Markle (1991).

Teaching Cognitive Competencies

Cognitive competency is built when content is described in terms of the relations found in each of these cells (see Figure 1) and those relations are taught and mastered, as evidenced by the evaluation criteria appropriate to each cell. One definition considers cognitive competency learning that assists new learning (Redding, 2014a, 2014b), but further analysis suggests something a bit more complex than that. Two aspects of cognitive competency must be considered: (a) the repertoires acquired (content), and (b) the methods used to establish and assess the various types of cognitive competency. Teachers tap the acquired repertoire of learners to teach further skills and strategies. An example of the first is provided by Markle (1982); learners may be asked to do the following: "With appropriate tools, construct a useful object out of wood." A cognitive competency that is likely required to achieve this is "measure accurately to 1/16th of an inch on any board from which a piece is to be cut." To do this likely requires learners to "read a tape measure, interpolating to 8th and 16th between the marked 4ths of an inch." Earlier cognitive competencies may also be described, such as, "Read numbers, including fractions" (Markle, 1982, p. 18). The methods (b, above) used to teach and test these competencies depend on the cognitive domain into which each numeracy competence falls. As noted earlier, algorithm following is taught and tested differently than is a concept or principle.

Metacognitive Competencies

Three discrete categories tend to define metacognitive competency. The first category is not specific to the metacognitive category, but without it, many metacognitive competencies cannot be truly acquired. This category concerns the skills learners need to be able to carry out independent work or to complete activities required by a problem or project. Archer and Gleason (2002) have identified many of these skills and strategies. They include—to name but a few of the many skills—gaining information and responding in class, completing assignments with directions, memorizing and studying information, taking notes, using a book's front and back matter, selecting the appropriate reference source, reading and interpreting graphs and tables, alphabetizing, locating and using the information in dictionary or encyclopedia entries, and effectively searching for and using online resources. None of these refers to the content to be learned; rather, they refer to how one may go about learning the content.

The second metacognitive category has to do with a range of skills that can best be characterized as making one's behavior more effective through organization, planning, and other strategies. This includes appropriate school behaviors and organizational skills such as arriving on time, having materials organized and at hand, participating meaningfully in class, preparing for and doing homework, and using strategies for studying for and taking tests (Archer & Gleason, 2002).

How does a student plan, evaluate what is required, and evaluate if he or she is on the right track if skills from these two metacognitive categories are absent? Some of these are taught directly, some are acquired by trial and error as one progresses through school, and some may never be acquired through typical school activities. For the purpose of teaching metacognitive skills, a focus on the metacognitive domain may be illusory; it is in the cognitive domain where our effort needs to be directed. To ensure full metacognitive

competency, all of these skills need to be specified and directly taught. What is notable here is that no special "metacognitive instruction" is required. Accordingly, to ensure metacognitive competency, the skills in these first two categories must be treated as being part of the "cognitive domain." It is only when they are used together, when they converge and when they are applied to new situations that this constellation of skills would be called a metacognitive competency. When they are a part of the learner's repertoire, they may be called upon by learners to achieve the independent learning goals that are so valued.

The third category of metacognition involves evaluating one's own behavior. Evaluation requires a comparison with a standard or set of criteria. The answer to the question, "Am I really doing what is required?" implies that one can discriminate between what is and what is not required. Next, one must match what one has done with respect to those requirements, noting where they are met and possibly where they may not be met. The steps also involve a repertoire of self-dialogue, reasoning, and a fluent repertoire of questioning. Furthermore, the key repertoires for meeting the criteria fall into the two categories described earlier. They may also serve to provide a basis of evaluation; the answer to, "Do I have enough sources?" will likely require a broad knowledge of what sources are available and how they are accessed. Ensuring metacognitive competency is not a simple matter, nor can it be achieved by simply providing projects and encouragement. It requires the convergence of all three categories of skills that comprise metacognitive competence after all have been taught so as to be part of a learner's cognitive competency.
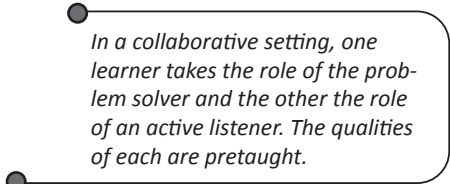
Teaching Metacognitive Competencies

Fortunately, there are relatively simple ways classroom teachers can ensure that these competencies are established. But directly teaching the skills described in each of the three categories is not enough; also required is a certain classroom culture—a culture that hopefully extends not only among classrooms within the same grade but across all grades. The learning of these competencies does not happen necessarily over a period of weeks or months but over a period of years. An easy-to-implement and comprehensive (and inexpensive) curriculum, *Skills for School Success* (Archer & Gleason, 2002), teaches most of the skills described in the first two categories and cumulatively builds these skills beginning in third grade. The bulk of the skills are learned in third through sixth grades, with more advanced skill instruction available to middle and high school learners. To be successful, these skills must be integrated into the fabric of classroom learning if they are to transfer from the cognitive to metacognitive domain. They need to be a part of how one learns, not simply something one learns but seldom uses.

The skills related to the third metacognitive category must also be thoroughly integrated into the classroom practices if they are to be taught successfully, and they can be difficult to teach. This category involves not only behaving but also seeing that one is behaving and evaluating that behavior in accord with the requirements of the situation. It is not enough to provide opportunities in the way of problems or projects but requires that specific learner repertoires be established. In the 1950s, Benjamin Bloom became interested in what separated some of the more successful students at the University of Chicago from some of the less successful. He was particularly interested in what the successful students actually did while mastering a subject. He began observing students as they

studied. What surprised him was that many of the successful students shared a similar pattern of studying, one that was different from those who were less successful (Bloom, 1950). The successful students would today be regarded as demonstrating substantial metacognitive competency.

Later, an investigator at Purdue University, Arthur Whimbey, decided to follow up on Bloom's initial observations. He began to observe highly successful individuals across a range of disciplines and professions. Whimbey was surprised to find that these individuals not only resembled the students Bloom observed in how they solved problems, but they also resembled each other. He was able to distill the critical behaviors into a small set anyone could learn. This formed the basis for the book, *Problem Solving and Comprehension* (1985), that Whimbey coauthored with Jack Lochhead. In that book, they described both effective and ineffective strategies for solving problems. In a more than 20-year quest to improve the metacognitive problem solving of chemical engineering students, McMaster University found the only successful method was to directly teach the methods described by Whimbey and Lochhead. A similar discovery was made by educators at Xavier University in New Orleans (Carmichael et al., 1980; McMillan, 1987). Xavier was able to use the methods to greatly increase the number of African American students accepted to medical school (Carmichael, Bauer, Hunter, & Sevenair, 1988). What is most interesting is that the reasoning strategies described in the most recent edition of the book (Whimbey, Lochhead, & Narode, 2013) are relatively easy for learners to master.

After working with college students, Robbins (1996, 2011, 2015) began investigating how the Whimbey et al. (2013) strategies could be further broken down and taught to learners beginning in third grade. After years of development and testing, she produced a program that any teacher can use to teach this set of complex metacognitive skills to young learners. She defined, with simplified terminology, the critical qualities of the third metacognitive category: behaving, observing one's own behavior, and responding to it. Robbins's (2015) program is designed to develop five qualities that comprise successful problem solving and five qualities comprising successful active listening as a partner in problem solving. Each quality is learned separately in the context of a continual self-dialogue that involves breaking problems into parts and determining the requirements—that are often only implicitly specified. In a collaborative setting, one learner takes the role of the problem solver and the other the role of an active listener.

> In a collaborative setting, one learner takes the role of the problem solver and the other the role of an active listener. The qualities of each are pretaught.

The qualities of each are pretaught. After learners are well practiced in each role across a range of academic and nonacademic problems, the students can combine the problem-solving and self-observational repertoires to guide future independent work. They achieve a high level of metacognitive competency. Applying this repertoire in combination with the skills described earlier, learners can be true independent learners. They can evaluate the requirements, assess what is required, determine a plan of attack by breaking down the problem into parts, keep up continual evaluation as to whether what they are doing is reaching the goal, reflect on the soundness of their work, and continually check for accuracy of their work. Furthermore, each step is observable and measurable. Teachers can actually see the metacognitive process occurring (e.g., see the video file by Robbins,

2014). By separately teaching and then bringing together these metacognitive skills, a metacognitive repertoire can be produced that is applicable across a range of challenges (for a similar approach, see Mechner, Fredrick, & Jenkins, 2013).

All three categories of metacognitive competency are critical for what Joseph Schwab (1960) called "stable enquiry." In stable enquiry, the learners guide themselves (metacognitive competency) through the application of various heuristics, algorithms, and resources (cognitive competency) required to produce a project or solve a problem. This type of enquiry comprises the bulk of activities learners encounter in school. It can be complex and challenging. Another repertoire that Schwab identified is "fluid enquiry." In fluid enquiry, learners must step outside the bounds of the prescribed problem, asking themselves questions such as, "Is there another approach not yet tried?" "Is the question framed correctly?" and "What if a different question were asked?" The learner is asking, "What if I looked at this in a different way?" and then begins to examine all the assumptions of the problem. This is a very sophisticated repertoire. It not only requires cognitive competencies in the topic being investigated, but it also requires an advanced metacognitive repertoire that includes another element: asking meaningful questions that result in discovering new problems or challenges not before described. Although questioning is a valued skill and there are programs targeted at getting learners to ask questions, the primary point of questioning is often overlooked, that is, to create a meaningful discrepancy that will take real effort to resolve. This level of questioning goes beyond content queries and requires the full metacognitive repertoire described earlier to achieve. The question and its relation to the discrepancy created must be examined, requiring considerable reflection. A program for college students was created in the mid-1990s that was geared to this outcome and was successful with factory workers, drugstore managers, and other professionals (Robbins & Layng, 2010; Robbins, Layng, & Jackson, 1994). Recently, efforts have been directed toward adapting this program for use with children in school settings in the context of both stable and fluid enquiry (Robbins & Layng, 2015).

All the elements of metacognitive competency described here can be made explicit, readily taught, and evaluated within the context of a typical school day. Learning metacognitive competency can readily become metacognitive learning. That is, the procedures required to learn in the cognitive domain can be used to teach the critical skills required to produce a functioning metacognitive repertoire, which is the result of the convergence of the three metacognitive categories (Robbins, 2015; Robbins et al., 1994). These categories are themselves products of skills learned by using methods derived to establish cognitive competencies. Accordingly, taxonomies such as those provided by Tiemann and Markle (1991) or Bloom (1956) can be useful in teaching the components of a metacognitive repertoire. When evaluating a project, for example, the student tells whether or not a given product meets specified criteria or compares two products for some purpose, often providing reasons as he or she responds. Students can be taught a vocabulary that specifically supports such reasoning. For example, the vocabulary most likely to be used when a student says, "How do I…" "assess," "decide," "rank," "test," "measure," "convince," and so on, all speak to the evaluation level in the Bloom taxonomy. Once a course of action is identified, multiple discrimination, concept and principle applying, and perhaps strategies from Tiemann and Markle's taxonomy will likely be required. In short, linking vocabulary appropriate to metacognitive requirements posed by a problem to the type of learning required is a primary goal of teaching metacognitive competency.

Social/Emotional Competencies

After a basic metacognitive repertoire is acquired and there has been practice in acquiring both problem-solving and active-listening repertoires, a firm foundation for important social/emotional learning (SEL) is in place. SEL is increasingly being considered an important component of school curricula. The Austin Independent School District (AISD, 2015) in Texas lists behavioral skills, based on recommendations by the Collaborative for Academic, Social, and Emotional Learning (CASEL, 2015), as central to its SEL curriculum. The skills listed are representative of other districts' SEL guidelines:

- Students will develop and demonstrate self-management skills, regulate emotions, and monitor and achieve behaviors related to school and life success.
- Students will develop self-awareness skills, have knowledge of their emotions, develop an accurate and positive self-concept, and recognize individual strengths and external support systems.
- Students will develop social-awareness skills needed to establish and maintain positive relationships, including recognizing feelings and the perspectives of others, appreciating individual and group differences, and contributing to the well-being of one's school and community.
- Students will demonstrate interpersonal skills needed to establish and maintain positive relationships, including using social skills and communication skills to interact effectively with others while developing healthy relationships and demonstrating an ability to prevent, manage, and resolve interpersonal conflicts.
- Students will demonstrate decision-making skills, problem-solving skills, and responsible behaviors in school, personal, and community contexts.

On its website, AISD presents a specific breakdown of the goals and more specific objectives for each guideline by category. For example, one of the four objectives in the self-awareness category is that a student demonstrates an awareness of his or her own emotions. This outcome is to be achieved by acquiring a set of cumulatively learned skills beginning in kindergarten and continuing through Grade 12. For kindergarten through Grade 2, the skills are recognizing and accurately naming feelings, identifying and communicating an emotion, and identifying emotions related to situations or events (triggers). For Grades 11 through 12, they are differentiating between the factual and emotional content of what a person says, expressing empathy toward others, and comparing multiple perspectives on an issue. There are three or four objectives for each of the five categories, with more specific enabling objectives for each grade level under each category.

Obviously, a robust SEL program based on those of CASEL or similar recommendations is a major, time-consuming project. Furthermore, even though the objectives appear to be clear, plenty of ambiguity exits. Exactly how does a teacher help a learner recognize and accurately name feelings? This is not the same teaching task as recognizing and accurately naming letters of the alphabet. At best, naming feelings is an inference based on observing the context, the behavior in the context, and the likely consequences of the behavior in the context. An often-overlooked limitation is teachers' lack of direct access to what the child is feeling. A teacher may often rely on how he or she might feel in a similar situation, but does that guarantee that is what the learner feels, and more specifically, what a 6- or 7-year-old learner feels?

The teaching task is further complicated by considering how one knows that the emotion one thinks one feels is actually the emotion one is feeling. How does one distinguish between true emotions and emotional behavior? In other words, is the emotional behavior occurring as the result of consequences being produced, which have little to do with the circumstances with which the emotion is typically associated, or is it reflective of conditions under which the emotion is likely to occur? If a learner acts aggressively in a classroom, is it to drive away someone with whom one is angry, or is it to gain the attention of classmates? Accordingly, the objectives targeting social-emotional competency require a different approach than that which teachers may use when teaching and evaluating academic subjects.

Teaching Social/Emotional Competencies

For an individual to be socially and emotionally competent, that student needs to not only understand why he or she may be feeling a certain way under certain circumstances, but also be able to harness those emotions to help deal with those circumstances. When emotions are felt, often readily observable and assessable behavior also occurs. An observer can see how situations are handled, the interpersonal dialogue that occurs, and the consequences of those actions. If emotions reflect circumstances, then they may be harnessed to help understand those circumstances. The concept of a "triggering event" included in the AISD objectives may not be adequate to understanding emotions in context. A common stimulus–response description goes something like this: An event (triggering) occurs, feelings occur, and the feelings result in some behavior. However, another description might be that an event occurs, behavior and feelings occur, and the behaviors have consequences. The feelings serve to describe the relation among the event, the behavior, and the consequences. Emotion is not separated from the entire context, nor is it treated as causal; rather, emotion is a natural and understandable part of the context, a type of byproduct (Goldiamond, 1975; Layng, 2006). For example, fear may describe situations when putting distance between an individual and a harmful event is desirable. We want to run away. We are not running because we are afraid, nor are we running and therefore feeling afraid. Rather, we are running *and* feeling afraid because something harmful is nearby. It does not really matter that our feeling of fear matches anyone else's; it only matters that we

> *Empathy is contacting the context and consequences that others may face and having that influence how one behaves toward others.*

understand that the emotion reflects (but does not cause) the need to take effective action to create distance from a harmful situation. When a learner says, "You don't understand how I feel; you never had anyone say that to you," one can say, "I do know what it's like to really want to get away from something. What can be done when you feel you really want to get away?" We can use our feelings of fear to ask, "What do I think is harmful?" "Why do I think that?" and "What do I need to do so as not to be harmed?" Each situation involves consequences important to someone. The procedures typically described as being in the cognitive competency domain can be used to teach the critical discriminations and actions required.

Empathy as an Example of a Complex Social Competence

Empathy is contacting the context and consequences that others may face and having that influence how one behaves toward others. In essence, learners must apply many of

the metacognitive repertoires described earlier to determine what context and consequences are responsible for how they or others are feeling and what those feelings suggest about what needs to be done. Of particular importance is the application of problem solving and active listening. Here the issue involves navigating the world of others, what Sternberg (2006) calls "practical intelligence." It is not the problem-solving behaviors that differentiate SEL from other types of learning; rather, it is the subject matter to which those behaviors are applied. Accordingly, it is important to define precisely the contextual conditions and to build simulated scenarios around them, possibly using role-playing and encouraging the application of steps outlined by Robbins (2011) and Robbins and Layng (2015) in real time. By linking feelings to context, learners can be led to discover the relation of feelings to context and consequences and to build a sophisticated repertoire throughout their schooling. Learners can begin to describe other learners' contexts and infer what emotions others may be feeling or might likely feel. Furthermore, they can be taught to assess the consequences of their actions for themselves and for others. Learners can apply these skills to all social relations. Using their emotions as guides, learners can be taught to take the steps to arrange the conditions that produce the social outcomes they seek while not creating undesired outcomes for others. It is important that learners begin to recognize that there are no "bad" feelings. Even their painful feelings are telling them something about the world and helping them find what they value and the goals they want to achieve.

Teacher assessment of SEL competencies involves determining if learners apply the metacognitive competencies described earlier to the solution of problems of social and emotional importance. Correctly answering a series of multiple-choice questions about various scenarios may help, but only the real-time sampling of the application of problem solving and active listening to real-world social and emotional behavior can provide a true indication that such SEL competency actually exists. This reflects yet another convergence: metacognitive competency and a set of social-emotional cognitive skills that, combined, will produce a reliable social-emotional competency.

Insider–Outsider Considerations

So far, the discussion concerning SEL has focused on what the learner is doing. Teachers also need to be sensitive to the fact that some aspects of their students' social and emotional status may be very difficult for the "insider" to see and may require an "outsider" to understand and help. Specifically, isolation or exclusion is felt (by the learner) more often than it is seen (by the teacher). An apparently successful learner goes home feeling left out, even isolated. What the teacher or other classmates may see is a learner's success and perhaps even smiles. This apparent success masks the felt isolation. One first needs to understand what makes someone feel left out. Happiness often depends on the number of alternative ways of obtaining important consequences in comparison with the number of alternatives available to a peer group (Goldiamond, 1974, 1976a, 1976b; Layng, 2014b; Layng & Robbins, 2012; Rayo & Becker, 2007; Robbins, 1995).

Figure 2. Available Alternatives and Their Elements

Opportunity	Means		Benefits
School Dance	Dance Skills	⟶	Invited to Dance
Debate Club	Debate Skills	⟶	Invited to Debate
Lunch	Talking Skills	⟶	Invited to Sit

Consider Figure 2. To the extent that all elements—the opportunities, means, and benefits—are present and all alternatives are as available as they are to others, one feels relatively included. But what if one has no dance skills? Even if there is a school dance and the learner is present, the learner cannot participate. Or, in the school cafeteria, what if the learner is not invited to sit even though there are open seats at lunch and the learner can converse? It is not only the opportunities that matter but whether or not one has the means of taking advantage of them or whether the benefits everyone else seems to enjoy are available. If one has all three alternatives available, one can choose any of them to get valuable social interaction. One has more degrees of freedom and feels it (after Goldiamond, 1976b). No dance skills, not invited to sit—one is coerced into debate club only. The learner does not feel that a real choice is available. Feelings of exclusion describe alternatives relative to those available to peers; a learner may feel left out or lonely even if he or she is a successful debater. These relations are responsible for the feelings and any actions taken by the learner as a result. Stated differently, the feeling of isolation is not the cause of the actions; rather, the actions and the feelings are a function of the restricted alternatives in reference to the alternatives available to others. If one who is experiencing restricted degrees of freedom relative to his or her peers is now subject to even minor insults or teasing, the result can make distancing (from school and those responsible for allowing the restriction and the bullying) a potent reinforcer. When escape is not possible, the emotion that describes this situation is often anger. The SEL competence of teachers must include the ability to detect and intervene to increase the social alternatives available to learners as well as attend to insults or teasing and its direct effects. This requires very special training and is not currently a part of most SEL programs. For example, teachers must not simply assume a remark or a joke at a learner's expense is inconsequential. Nor should they regard as harmless recognizing the birthday of one student one day and overlooking the birthday of another student on another day. Schoolwide programs that encourage inclusion may also be required and may need to include school personnel beyond a classroom teacher. Inclusion is, however, a key to avoiding many of the serious conditions that may lead to school violence.

Motivational Competencies

Motivation is commonly considered some type of internal drive that may keep one at something over long periods of time or when keeping at something may create hardship. A lack of motivation is often posited when such perseverance or "grit" is not observed. One learner works diligently at something for hours; another may give up right away. This raises the question as to how motivation can be instilled in learners.

Strategies for building motivation can draw upon a strong literature that has both experimental and real-world roots. Laboratory work has shown that human persistence can be shaped (e.g., Wylie, 1986a, 1986b; Wylie & Dubanoski, 1988) with a considerable amount of work but with very little payoff. Procedures can be applied that help

us forgo near-term small rewards for much more delayed larger ones (Rachlin, 2004). Learners can be helped to specify goals, assess current strengths, and proceed in small enough steps when clear movement toward the goal will motivate behavior (Goldiamond, 1974). What is really important to someone can be determined, and help can be provided to build the person's life around it through problem solving (Goldiamond, 1984; Layng, 2009; Liden, 2015) and building resilience and "grit" (e.g., Smith, 2010) in challenging conditions. This vast literature can be valuable, but for teachers, understanding motivation may not be an easy task.

The term *motivation* may be used to describe behavior under a range of circumstances that may be quite distinct (after Goldiamond, Dyrud, & Miller, 1965). Food can be a good motivator if we wait to leave some time since one has last eaten: We define by those things we may do to make a consequence effective. A high frequency of someone doing something may cause us to say he or she is really motivated to do it: We define by behavior frequency. We may conclude that someone is motivated to get something if we see that person obtaining something over and over: We define by consequence. We may attribute motivation to a certain condition or setting if we see someone repeatedly do something in these settings: We define by occasion. We see someone continue to work even though there is a distracting siren blaring and lights flashing outside a window: We define by level of distractibility. We notice one consistently choosing one activity over another: We define by preference among alternatives. We see someone continue with an activity in the face of obstacles or infrequent reward: We define by persistence. Accordingly, motivated behavior may be a product of very different variables. No single motivational state accounts for all of them. Additionally, a variety of methods are available for helping to make particular behavioral outcomes important to a person (Goldiamond, 1974; Langthorne & McGill, 2009). Furthermore, some students may show plenty of motivation but not for doing the things that they might benefit from in school.

Initial assumptions about the motivations of those who finish a task and those who do not may also be inaccurate. In developing academic support programs for community college learners (see Johnson & Layng, 1992), a research team of which I was a part, working at Malcolm X College in Chicago, was curious as to what separated the B+ and A students from the C+ and B students in a health science program. The placement test data for these students showed little difference. However, we found that the better students took more and better notes. They also tended to turn in assignments on time, particularly when the assignments required taking notes and using them to answer a question. Was there a difference in student motivation? Were the better students simply willing to work a little harder? We examined the note taking and discovered that the poorer students took notes at about 5 to 10 words per minute and that the better students could take notes at a rate of between 25 and 30 words per minute, at least triple the rate of the poorer students. Library assignments often involve extensive note taking. The better students took about an hour to complete a typical assignment; for the very same assignment, the poorer students would take nearly three hours to complete, if they completed it at all. If the poorer learners are equally as motivated as the better learners—that is, they can work continuously for an hour—they will fail to complete the assignment. The poorer learners must be about three times as motivated—to do the same thing. Was it possible that what appeared to be a motivational problem separating good from poor students might instead simply be a function of writing speed? We decided to find out by providing a special

type of practice on "tool skills" (see Johnson & Layng, 1992)—hear word/write word, and see word/write word—until the writing rate of the poorer learners reliably equaled the rate of the better learners. After the practice, the difference in students' performance outcome virtually disappeared. Instead of increasing motivation, the tool skills brought the performance of the task at hand in line with the requirements one could reasonably meet. The solution to what appeared to be a lack of motivational competence was teaching a psychomotor skill, yet it was a question of motivational competence that led us to the solution.

There are other times that a lack of performance may be mistakenly attributed to a lack of internal motivation. Take an example of a youth who plays video games instead of doing homework. The student does not have the motivation to do the work; competing activities appear to be far more motivating. But perhaps the situation is not one of simply working on his motivation for schoolwork directly. If the outcome of doing homework versus the outcome of playing the video game is compared, it may be discovered that this student prefers hanging with friends, playing a little basketball, texting with others, caring for a car, and a range of other activities to playing video games. The question might then be asked, "What has happened to this learner when homework was submitted in the past?"

Figure 3. Motivational Matrix: Possible Costs and Benefits of Two Alternatives

Occasion	Behavior		Cost	Benefit
Video Game	Play Game	⟶	Reprimand for no work, poor grade	Kill a few Orcs, get to next level; poor academic abilities not on display
Homework Problems	Do Problems	⟶	Get many wrong, embarrassment; poor academic ability on display, poor grade	Chance for improvement, teacher feedback

The learner may very much want to be good at academics, and the fact that there is reluctance to show bad works suggests that looking "smart" may be important. Is this a lack of motivation or an indicator of a different type of motivation, that is, a motivation to cover up one's shortcomings? What might our learner be feeling? Conflicted emotions are likely; comments to himself might be, "I know I should do the work; I am falling further behind." It is tempting to suggest that playing video games is a way to escape these thoughts and feelings. Some may advocate saying positive things to oneself or simply accepting that one feels this way and attempting to move on. But to understand the motivation, one needs to understand the feelings in context. Conflicted feelings may reflect conflicting circumstances and consequences. It is not only the benefits of homework and the costs of failing to complete it that need to be compared. Providing our learner with an immediate academic success and slowly requiring more behavior that results in even more success may change what was historically an unmotivated student into a focused, committed learner (see, e.g., Johnson & Layng, 1992).

Teaching Motivational Competency

There is no singular motivational competency that can be taught. Instead, arranging environments that increase the likelihood of certain behaviors across a range of conditions is required. This applies to both learners and teachers. For the learner, using

emotions to help uncover important consequences, needed additional skills, the right circumstances, a program of gradually increasing behavioral requirements (teaching grit), and so on requires a convergence of competencies. This convergence includes an SEL repertoire, a metacognitive repertoire, and a range of cognitive competencies. For teachers, it is important to ask, "What am I really saying when I say there is a motivational problem?" "Have I examined all the reasons for why the behavior I would like to occur is not occurring?" Different circumstances will require different programs.

Summary

In conclusion, the essential repertoires described as cognitive competencies, metacognitive competencies, social and emotional competencies, and motivational competencies consist of critical building block competencies that converge in such a way that a clear demarcation between each may not be possible. What separates them are the conditions under which often-well-defined competencies occur and are taught. As metacognitive competencies are acquired, they can be harnessed to teach SEL and motivational competencies. Accordingly, the critical repertoires in all of these competencies can be directly taught and hence measured using criteria established for teaching complex cognitive skills (after Tiemann & Markle, 1991) and can produce actions that result in meaningful differences for all learners.

Action Principles for States, Districts, and Schools

Action Principles for States

    a. Do not order cognitive, metacognitive, social-emotional, and motivational competencies in some hierarchy of importance. All are equally important. Treat them as converging repertoires.

    b. When setting objectives and priorities, include metacognitive, SEL, and motivational learning.

    c. Provide adequate funding for professional development for all competencies.

    d. Draw from a range of disciplines—including cognitive science, behavior analysis, learning science, neuroscience, and education—when developing strategies and goals.

    e. Avoid vague objectives that could lead to multiple interpretations. Carefully specify the behaviors learners would be observed to perform or each accomplishment achieved for each competence.

Action Principles for Districts

    a. Do not order cognitive, metacognitive, social-emotional, and motivational competencies in some hierarchy of importance. All are equally important. Treat them as converging repertoires.

    b. Clarify the components of each competence and what form of teaching from the cognitive domain is required. A taxonomy such as provided by Tiemann and Markle (1991) or Bloom (1956) is helpful (see, e.g., the comprehensive identification of the minimum competencies required of applied learning scientists or instructional designers provided by Layng, 2014a).

    c. Build a culture in which reflection, analysis, and problem solving are supported throughout the curriculum and throughout the day for academic and nonacademic

challenges. Learners should be encouraged to continually apply their problem-solving and active-listening repertoires.

d. Understand that interpersonal competence comes from the applications of skills that can be learned (cognitive domain) and carefully used (metacognitive domain) and continually evaluated on their effect on us and others (social and emotional domain).

e. When setting objectives and priorities, include metacognitive, SEL, and motivational learning.

f. Provide adequate funding for professional development for all competencies.

g. Draw from a range of disciplines—including cognitive science, behavior analysis, learning science, neuroscience, and education—when developing strategies and goals.

Action Principles for Schools

a. Do not order cognitive, metacognitive, social-emotional, and motivational competencies in some hierarchy of importance. All are equally important. Treat them as converging repertoires.

b. Clarify the components of each competence and what form of teaching from the cognitive domain is required. A taxonomy such as provided by Tiemann and Markle (1991) or Bloom (1956) is helpful (see, e.g., the comprehensive identification of the minimum competencies required of applied learning scientists or instructional designers provided by Layng, 2014a).

c. Use available programs and resources that have been developed by educators to help teachers teach the components necessary for metacognitive competence (highly recommended are *Skills for School Success* by Archer and Gleason, 2002, and *Learn to Reason with TAPS: A Talk Aloud Problem Solving Approach* by Robbins, 2015).

d. Build a culture in which reflection, analysis, and problem solving are supported throughout the curriculum and throughout the day for academic and nonacademic challenges. Learners should be encouraged to continually apply their problem-solving and active-listening repertoires.

e. Help learners to understand that emotions are often the sensible outcome of the situation one is in and reflect that situation.

f. Help learners to use emotions as indicators of the conditions they are facing and to plan and execute strategies for dealing with that situation.

g. Understand that interpersonal competence comes from the applications of skills that can be learned (cognitive domain) and carefully used (metacognitive domain) and continually evaluated on their effect on us and others (social and emotional domain).

h. When choosing motivational strategies, first determine the possible reasons the learner may appear unmotivated or motivated to do something not in his or her best interest. Ask what the consequences are, both costs and benefits, of each alternative available to the learner. Ask what would make someone behave that way.

i. When setting objectives and priorities, include metacognitive, SEL, and motivational learning.

References

Archer, A., & Gleason, M. (2002). *Skills for school success*. North Billerica, MA: Curriculum Associates.

Austin Independent School District. (2015). Department of social and emotional learning: Tools for learning, tools for life [Website]. Retrieved from https://www.austinisd.org/sites/default/files/dept/sel/images/A.I.S.D._SEL_Standards_-_Elementary_and_Secondary_9-11-12_0.pdf

Bloom, B. S. (1950). Problem-solving processes of college students: An exploratory investigation. *Supplementary Educational Monographs, The School Review and The Elementary School Journal, 73*, 1–109.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives. Handbook l: Cognitive domain*. New York, NY: David McKay.

Carmichael, J. W., Bauer, J. D., Hunter, J. R., & Sevenair, J. P. (1988). An assessment of a premedical program in terms of its ability to serve Black Americans. *Journal of the National Medical Association, 80*(10), 1094–1104.

Carmichael, J. W., Hassel, J., Hunter, J., Jones, L., Ryan, M. S., & Vincent, H. (1980). Project SOAR (stress on analytical reasoning). *The American Biology Teacher, 42*(3), 169–173.

Collaborative for Academic, Social, and Emotional Learning. (2015). Social and emotional learning core competencies [Website]. Chicago, IL: Author. Retrieved from http://www.casel.org/social-and-emotional-learning/core-competencies

Gagne, R. M. (1965). *The conditions of learning*. New York, NY: Holt-Rinehart Winston.

Gagne, R. M. (1970). *The conditions of learning* (2nd ed.). New York, NY: Holt-Rinehart Winston.

Goldiamond, I. (1974). Toward a constructional approach to social problems: Ethical and constitutional issues raised by applied behavior analysis. *Behaviorism, 2*(1), 1–84.

Goldiamond, I. (1975). A constructional approach to self-control. In A. Schwartz & I. Goldiamond (Eds.), *Social casework: A behavioral approach* (pp. 67–130). New York, NY: Columbia University.

Goldiamond, I. (1976a). Coping and adaptive behaviors of the disabled. In G. L. Albrecht (Ed.), *The sociology of physical disability and rehabilitation* (pp. 97–138). Pittsburgh, PA: University of Pittsburgh.

Goldiamond, I. (1976b). Protection of human subjects and patients: A social contingency analysis of distinctions between research and practice, and its implications. *Behaviorism, 4*(1), 1– 41.

Goldiamond, I. (1984). Training parents and ethicists in nonlinear behavior analysis. In R. F. Dangel & R. A. Polster (Eds.), *Parent training: Foundations of research and practice* (pp. 504–546). New York, NY: Guilford.

Goldiamond, I., Dyrud, J., & Miller, M. (1965). Practice as research in professional psychology. *Canadian Psychologist, 6a*(1), 110–128.

Johnson, K. R., & Layng, T. V. J. (1992). Breaking the structuralist barrier: Literacy and numeracy with fluency. *American Psychologist, 47*(11), 1475–1490.

Langthorne, P., & McGill, P. (2009). A tutorial on the concept of the motivating operation and its importance to application. *Behavior Analysis in Practice, 2*(2), 22–31.

Layng, R. R., & Robbins, J. K. (2012, November). *Toward a new consequentialism: Nonlinear contingency analysis and the understanding of moral behavior*. Poster presented at the Theory and Philosophy Conference, Association for Behavior Analysis International, Santa Fe, NM.

Layng, T. V. J. (2006). Emotions and emotional behavior: A constructional approach to understanding some social benefits of aggression. *Brazilian Journal of Behavior Analysis, 2*(2), 155–170.

Layng, T. V. J. (2009). The search for an effective clinical behavior analysis: The nonlinear thinking of Israel Goldiamond. *The Behavior Analyst, 32*(1), 163–184.

Layng, T. V. J. (2012). *Understanding concepts: Implications for science teaching*. Boston, MA: Mimio. Retrieved from http://www.mimio.com/~/media/Files/Downloads/Partner-Resources/Whitepapers/whitepaper_science_teaching.ashx

Layng, T. V. J. (2014a). Learning science design and development requirements: An update of Hendrix and Tiemann's "designs for designers." *Mexican Journal of Behavior Analysis, 40*(2), 39–57.

Layng, T. V. J. (2014b, November). *Social policy and terrorism: Contingencies of exclusion*. Invited address presented at the 11th International Congress on Behavioral Studies, Milan, Italy.

Layng, T. V. J., & Twyman, J. S. (2013). Education + technology + innovation = learning? In M. Murphy, S. Redding, & J. Twyman (Eds.), *Handbook on innovations in learning* (pp. 133–148). Philadelphia, PA: Center on Innovations in Learning. Retrieved from http://www.centeril.org

Liden, T. A. (2015). *Parent partnership: Towards a constructional approach to improving the life of parents with children with autism* (Unpublished master's thesis). University of North Texas, Denton, TX.

Markle, S. M. (1982). *Formulating clear objectives*. Unpublished self-instructional program.

McMillan, J. H. (1987). Enhancing college students' critical thinking: A review of studies. *Research in Higher Education, 26*(1), 3–29.

Mechner, F. (1962). *Behavioral analysis for programmers*. New York, NY: Basic Systems.

Mechner, F. (1965). Science education and behavior technology. In R. Glasser (Ed.), *Teaching machines and programmed learning, II: Data and directions* (pp. 461–484). Washington, DC: National Education Association.

Mechner, F. (1994). *Learning and practicing skilled performance*. New York, NY: The Mechner Foundation.

Mechner, F., Fredrick, T., & Jenkins, T. (2013). How can one specify and teach thinking skills? *European Journal of Behavior Analysis, 14*(2), 285–293.

Merrill, M. D. (1971). Necessary psychological conditions for defining instructional outcomes. In M. D. Merrill (Ed.), *Instructional design: Readings* (pp. 173–184). Englewood Cliffs, NJ: Prentice-Hall.

Rachlin, H. (2004). *The science of self-control*. Cambridge, MA: Harvard University Press.

Rayo, L., & Becker, G. S. (2007). Evolutionary efficiency and happiness. *Journal of Political Economy, 115*(2), 302–337.

Redding, S. (2014a). *Personal competencies in personalized learning*. Retrieved from http://www.centeril.org/publications/Personalized_Learning.pdf

Redding, S. (2014b). *Personal competency: A framework for building students' capacity to learn*. Retrieved from http://www.centeril.org/publications/Personal_Compentency_Framework.pdf

Robbins, J. K. (1995, May). *Contingencies of exclusion: Why we need diversity training*. Paper presented at the 21st Annual Convention of the Association for Behavior Analysis, Chicago, IL.

Robbins, J. K. (1996). *TAPS for teachers*. Seattle, WA: Robbins/Layng & Associates.

Robbins, J. K. (2011). Problem solving, reasoning, and analytical thinking in a classroom environment. *The Behavior Analyst Today, 12*, 42–50.

Robbins, J. K. (2014). Learn to reason with TAPS: A talk aloud problem-solving approach [video file]. Seattle, WA: P.E.E.R. International. Retrieved from http://peerinternational.org/taps.html

Robbins, J. K. (2015). *Learn to reason with TAPS: A talk aloud problem solving approach*. Seattle, WA: P.E.E.R. International.

Robbins, J. K., & Layng, T. V. J. (2010). *Fluent thinking skills: A generative approach* (2nd ed.). Seattle, WA: P.E.E.R. International.

Robbins, J. K., & Layng, T. V. J. (2015, August). *Teaching children to ask meaningful questions*. Invited workshop presented at the National Autism Conference, Pennsylvania State University, University Park, PA.

Robbins, J. K., Layng, T. V. J., & Jackson, P. (1994). *Fluent thinking skills*. Seattle, WA: Robbins/Layng & Associates.

Schwab, J. J. (1960). The teaching of science as enquiry. In J. J. Schwab & P. F. Brandwein (Eds.), *The teaching of science* (Burton Lecture; pp. 3–103). Cambridge, MA: Harvard University Press.

Smith, J. (2010). *When "it" happens in college: Lead yourself through any change*. Morgantown, WV: ChangeMatters, LLC.

Sternberg, R. J. (2006). The scientific basis for the theory of successful intelligence. In R. Subotnik & H. Walberg (Eds.), *The scientific basis of educational productivity* (pp. 161–184). Charlotte, NC: Information Age Publishing.

Tiemann, P. W., & Markle, S. M. (1973). Remodeling a model: An elaborated hierarchy of types of learning. *Educational Psychologist, 10*(3), 147–158.

Tiemann, P. W., & Markle, S. M. (1991). *Analyzing instructional content.* Seattle, WA: Morningside Press.

Whimbey, A., & Lochhead, J. (1985). *Problem solving and comprehension.* Hillsdale, NJ: Lawrence Erlbaum.

Whimbey, A., Lochhead, J., & Narode, R. (2013). *Problem solving and comprehension* (7th ed.). Hillsdale, NJ: Lawrence Erlbaum.

Wylie, A. M. (1986a). The establishment of high rate schedule control through the use of clinical transfer procedures: Historical, instructional, and imitative transfer. *Experimental Analysis of Human Behavior Bulletin, 4*(2), 26.

Wylie, A. M. (1986b). Implicit programming strategies in the development of high rate schedule control. *Experimental Analysis of Human Behavior Bulletin, 4*(2), 27.

Wylie, A. M., & Dubanoski, R. (1988). Program determinants of fixed-ratio performance by humans. *Experimental Analysis of Human Behavior Bulletin, 6*(2), 21–22.