Running head: COMPETENCE

Competence, Persistence, and Success: The Positive Psychology of Behavioral Skill Instruction

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Abstract

Early school failure is a critical factor in the development of peer rejection and antisocial behavior in children. This paper describes three sets of instructional strategies that have been shown to promote high levels of academic competence by arranging frequent opportunities for correct skill practice: (a) teaching children at their instructional level and monitoring progress, (b) teaching children differently as their skills improve, and (c) rewarding success and setting goals. Research is reviewed showing that practicing skills to high levels of fluency leads to retention and endurance, the emergence of new forms of a skill, and creative problem solving. Motivating children to complete schoolwork through the strategic use of reinforcement and the implications of these strategies for encouraging children to be persistent, self-motivated, life-long learners are discussed.

Competence, Persistence, and Success: The Positive Psychology of Behavioral Skill Instruction

What is the purpose of the American school? Most educators might say that the purpose is to educate. A recent survey of parents, however, indicated that they want "children who are happy and like school" (American Association of School Administrators annual conference, AASA: Public Expects More Than Test Results from Schools, August 2001). Although the goal *to educate* is not incompatible with the outcome of working to develop *children who are happy and like school,* these goals are quite different. Many children leave school educated and have high test scores, but they are “turned off” on school. Hence, it is possible to stuff facts into the heads of children who can recite them back with great accuracy, but to do so in a way that detracts from the larger goal of encouraging happy life-long learners who are adept at finding and learning what they need to know in a changing society.

The antithesis of what parents and many others are hoping for is a child who is negative, lazy, unmotivated, lacks self-confidence, and perhaps engages in either undesirable excesses such as criminal acts or deficits such as lying in front of the TV munching potato chips at age 20. The essential crux of the situation is aptly summarized by the story of a man who decided to take a plunge in the frigid Seine near the Louvre during a cold February day and was asked why. His response was that every creature, at each moment, must face the decision of what to do next. And the American school child, moment by moment, faces decision after decision (Martens, 1992). A typical moment might present a child with the decision to complete a worksheet or talk back to the teacher. Which option will the child take?

It has been argued that a natural selection process is at work guiding our choices about what to do next (Skinner, 1987, 1990). As a result of the consequences children receive for what they say and do at home and at school, their environment teaches them what behaviors are important and should be repeated (R.G. Wahler, personal communication, June 25, 2002). The sheer diversity of human behavior attests to the fact that this is an infinitely practical and dynamic system. A word of caution is in order, however. A child's environment, even the school, is essentially "blind" in selecting and training behaviors to high levels of proficiency – it merely selects those behaviors that are most efficient at getting a child what he or she wants (e.g., teacher or peer attention, escape from demands). Thus, although a teacher may *intend* for children to work quietly completing math problems, the fact that the problems are too difficult and that the teacher only attends to disruptive behavior teaches the children to do otherwise. So, if we assume that different behaviors compete for time at school based on the reinforcement they receive, then effective instructional and managerial practices are needed to direct the process. Effective teaching can be a great equalizer. In its absence, children are assigned responsibility for their learning, a situation which places them at the mercy of individual differences in family background, innate ability, and community SES (National Research Council, 1998). This situation is particularly problematic for low-achieving or at-risk students who may not receive the help they need to be successful learners. Faced with chronic school failure and in many cases peer rejection, these students choose other ways to access social and material reinforcers in school and later in life. If we don't help direct the learning process as

educators, then people with less honorable agendas but more effective teaching tools probably will.

So the high road to self-esteem and happiness and the low road to jail or the parent's sofa at age 20 are littered with little moments. The longitudinal data Gerald Patterson has collected shows a definitive linkage between the minute-by-minute experiences of 5 and 6-year old children and the development of criminality, conduct disorder, and other outcomes. Patterson has shown that early school failure can result in peer rejection (by the "good" children), teacher rejection, and even parent rejection. These experiences often initiate or exacerbate the coercive behavior cycle that Patterson has found to be instrumental in the development of antisocial behavior.

Regrettably, a longitudinal study analogous to Patterson's does not exist which shows the precursors for encouraging the growth of happy, well-adjusted children. From Patterson and others, however, we know that it is important to prevent early academic failure in school and therefore the social consequences that follow. In other words, we need to help children be successful learners from the first moment of school, and we need to engineer an environment where peers, teachers, and parents provide an abundance of assistance and positive feedback for this success. We need to continue to nurture and shape the child so that the early scaffolds and structures we erect to assist learning are removed gradually over time and replaced with the child's own rule-governed, generative, portable self-system of making good choices (about what to do next!) and conducting self-analyses (i.e., self-evaluation, self-reinforcement).

Some might say that in most American schools it would be virtually impossible to start *all* children off successfully and to keep them successful while providing a constant

but declining amount of instruction, feedback, and support. It is easy to call up images of very negative teachers who rigidly step through the curriculum without checking to see if children are learning, who criticize a hundred times more than they praise, and who could easily provide just the opposite type of experiences we would want to children who can't keep up academically. It is equally easy, however, to call to mind an image of perhaps one of our own teachers who was kind and nurturing and who always offered a helping hand of encouragement. Is it possible for schools to routinely provide an experience which insures that children are successful learners, are happy about learning, and go on to be self-initiating, life-long learners?

We believe it *is* possible, and strategies exist, supported by extensive research, that have been shown to promote competent, successful, and happy learners. Unfortunately, these research-based teaching tools have not been widely adopted by educators because they run counter to the prevailing philosophy of American education, namely that learning is a discovery-based process directed by the child rather than the teacher (Martens & Daly, 1999). As noted by Carnine (1992), dogma rather than science has often dictated educational reform over the years, enabling fads to cycle through the schools with no demonstrable improvements in instruction (e.g., whole language, spiral math). Given the crucial role played by early school failure in peer rejection and the development of antisocial behavior, teachers, educational administrators, psychologists and others need to be much more vocal in arguing for the adoption of effective teaching strategies. Our goal in the remainder of this article is to describe three sets of strategies that have been shown to promote high levels of academic competence in children. By high levels of academic competence, we mean

that children's skills and behaviors are proficient enough to be used in novel ways or combined to solve complex problems later on (Johnson & Layng, 1992). In many respects, these strategies represent the fundamentals of effective instruction. As such, they are conceptually very simple but strategically demanding because they require teachers to act more like personal trainers or coaches rather than pedagogues. A guiding principle underlying these strategies is the notion that children learn by doing. Zimmer (1969) perhaps put it best when he said that, "Knowledge is the reward of action, for it is by doing things that one becomes transformed" (p. 544).

Three Steps for Creating Competent, Happy, and Motivated Learners

Teach Children at Their Instructional Level and Monitor Progress

The starting point for happy, successful students is to find where they are functioning with respect to the subject matter you wish to teach, and to then begin instructional efforts at that level. The happy student is a successful student. Operationally, success means that the student is making a high percentage (i.e., 90-95%) of correct responses. The "happiness" of children working at different levels of difficulty can easily be demonstrated. Take 10 children of various ability levels and find their mastery and frustrational levels in math using standard curriculum-based measurement procedures (cf. Shinn, 1989). Then, allow them 15 minutes each to complete two worksheets of math problems, one at the frustrational level and one at the mastery level. You will notice large differences in the behavior of the children when working the different types of problems. When working at their mastery level, they will be on task and "motivated". When working at their frustrational level, many students will be off-task, they may seem bored, some will talk to other children, and some may

actually become at least mildly disruptive. *Same children, different tasks*. If you were to interview them after each type of task, comments might be mildly to very positive from the children about the mastery-level task and most would uniformly say they “hated” the frustrational-level assignment.

There is a substantial body of literature which stops short of saying that students who are working on their level are “happy”, but it does show conclusively that students who are working on difficult tasks are not happy and will cause problems in the classroom. This research has focused on different aspects of curricular tasks. Weeks and Gaylord-Ross (1981), for example, showed that children exhibited more behavior problems when presented with difficult tasks they could not accomplish than with tasks they could accomplish. Interestingly, when the “difficult” tasks were gradually introduced using errorless learning procedures, behavior problems were reduced. Errorless learning is conducted by very gradually moving a child, one small step at a time, from something they can easily do to a more difficult task. If instruction is designed correctly, the child makes no errors because each step is so small.

Similarly, Gickling & Armstrong (1978) defined task difficulty as simply the ratio of knowns to unknowns in a task and showed that on-task behavior was more frequent as the number of “knowns” in the task increased, up to a point. When the knowns increased beyond 85%, on-task behavior started to decrease, perhaps because the material was not challenging enough for the children. The ideal instructional range for good behavior and achievement was in the range of 70-85% knowns. Below that or above that and the children were not as well behaved and into the task.

Other studies have shown that including some “easy” tasks within the “real” more difficult tasks (Horner, Day, Sprague, O’Brian & Heathfield, 1991) improves behavior markedly. Also, modifying the task to reduce errors (Carr & Durand, 1985) can improve student behavior markedly.

We all like to be successful in what we do. For most children, doing well in school matters. It is their main ”job”. It is a source of parent, peer, and teacher positive attention. Hence getting children situated in their instructional level is important.

If all a teacher had to do was give children some relatively easy work they could do each day to keep them happy, then teaching would be an easy job. Several factors cause the situation to be more complicated for the teacher. First, many would say it is “nice” for children to be happy, but the really important thing is that they learn and achieve. So the teacher must find just the right level where the child is being successful but which contains enough unknowns or new material so that the child can increase their knowledge.

The second complicating factor is that as children learn, material which is of appropriate difficulty today may be too easy tomorrow. That is, as the child learns, the difficulty of the material should ideally increase. So the child’s instructional level is constantly changing.

A third complicating factor is that we are coming out of an era in American education in which no one, ranging from textbook publishers to teacher preparation programs, were cooperating to assist the teacher in this process. Instead, teachers were told that students needed materials that would force the learner to construct their own knowledge. Hence stories in a basal reading text were “interesting” but paid little

attention to skill sequencing or passage difficulty. One story in a 2nd grade basal reading book may be at the first grade level and the next would be at a 5th grade level. The drastic decline in achievement and the movement toward accountability have caused an increase in materials which conform to basic principles of instructional design and facilitate the gradual introduction over time of new skills (ref Oregon scaffolding).

Even though the process can be challenging for a teacher, the good news is that the procedures have all been worked out. The procedures are referred to a formative evaluation or continuous progress monitoring (refs), and call the for the teacher to find out what the child knows and help them a little further today. Tomorrow, begin where you left off today and repeat.

The payoff for using formative evaluation is great with effect sizes of .70 (Fuchs and Fuchs, 1986). This means that children who receive formative evaluation are .70 standard deviation units ahead of their peers who do not receive it. If you add a little reinforcement contingency to this, teachers can increase the effect size to 1.0 or greater!

The thing that we must keep in focus about good teaching is that it represents and interaction between the teacher and the learner. Unfortunately, many American educators do not have this simple idea clearly in mind. Instead, they seem to view teaching as the presentation of information which the learner will sop up like a sponge. They don't check for understanding. They don't asses learning so they don't teach until the child understands. And they don't find out what the child knows and take them a little further everyday. The stereotype of the teacher who is told to be on page 51 of the

math book by September 30th is all too true. Can one be called a teacher if no one in class is learning?

Teach Children Differently as Their Skills Improve

The vast majority of school districts across the country adopt a published curriculum series for teaching subjects like reading, math, or spelling. In addition to providing teachers with instructional materials, test items, and suggested activities, these curricula also detail the sequence in which various skills are to be instructed from year to year (Erchul & Martens, 2002). Although these scope and sequence charts serve as a road map of sorts to help teachers decide *what* skills they want children to perform and when, very little attention is paid to *how well* children must perform a given skill before moving on. One criticism of the American educational system is that a large number of skills are introduced, but few of these are ever practiced to high levels of mastery (Binder, 1996). The result for many students is failure and frustration as they attempt to solve complex problems using incipient skills for which they were given only a handful of opportunities to practice. And this situation has worsened in recent years with state mandates for higher learning standards that force teachers to cover more of the curriculum (usually in a cursory fashion) in less time often with fewer resources (Martens & Daly, 1999).

Whether children are learning a sport, a musical instrument, or how to read, research has shown that mastery is attained through a sequence of stages referred to as the instructional hierarchy (IH) (Daly, Lentz, & Boyer, 1996; Haring, Lovitt, Eaton, & Hansen, 1978). The IH describes behaviors to be learned, not by their form (e.g., single-digit addition, sums to 18), but by the level of proficiency with which they are performed

(e.g., accurately without assistance, rapidly in situations different from training). A guitar teacher uses the IH when she places students' fingers in position to play different chords, has them practice the chords in isolation, and then has them combine the chords into short songs. A soccer coach uses the IH when she shows players how to make a good pass, has them pass back and forth in pairs, and then adds a defender to simulate a game situation.

The IH is an important teaching tool for several reasons. First, it offers a practical description of how performance improves over time that can be applied to a wide range of behaviors and skills. Second, because learning at each stage of the IH is promoted in different ways, knowing how well a child performs a skill enables one to select the most effective teaching strategy for that level (Daly et al., 1996). Third, frequent performance monitoring allows one to change teaching procedures as needed to maximize practice opportunities, minimize errors, maintain high levels of motivation, and avoid boredom. In this respect, effective teaching as viewed through the IH is similar to driving a manual-shift car; one starts in first and shifts up through the gears as speed increases. Good drivers do not use one gear for all conditions, just as "one size does not fit all" when it comes to meeting the instructional needs of diverse students. For example, driving at high speeds for a long period of time in first gear will likely burn out a car's engine. Similarly, keeping a child at acquisition-level training long after they have met criteria for accuracy will likely "burn them out" on learning. Starting out from a red light in third gear is a sure way to stall a car. Teaching a new skill using difficult, generalization-level activities is a sure way to "stall" a child in terms of learning as evidenced by few correct responses, high numbers of errors, and little or no improvement over time (Wolery,

Bailey, & Sugai, 1988). Conversely, teachers who are active and responsive in changing their instructional activities as children's skills improve make learning fun, provide an appropriate level of challenge, and arrange opportunities for student success.

Acquisition. Each stage of the IH can be described by a different performance goal, performance measure, and teaching strategy as summarized in Table 1. Once the goal is reached based on frequent measures of student performance, opportunities for learning are maximized by then "shifting" instruction to the next level. The goal of training at the first stage, acquisition, is for children to perform a new skill or behavior accurately on repeated occasions without assistance. Performance measures during acquisition typically include number or percent correct attempts and number or percent errors. Because acquisition-level training involves the introduction of new skills and behaviors, it requires teachers to guide students through a number of practice opportunities with assistance or what are called *learning trials* (Wolery et al., 1988). Each learning trial involves showing children how to perform a skill (modeling), giving them enough help to do it themselves (prompting), and either correcting errors or reinforcing correct responses. Once the child can perform a skill accurately with a certain amount of assistance, the assistance is withdrawn or gradually faded since it is no longer needed. The careful use and gradual withdrawal of prompts during acquisition enables accuracy goals to be reached with few or no errors, promotes positive interactions between teachers and students and high rates of reinforcement, reduces problem behavior motivated by escape or avoidance, and decreases the chances that children will practice errors (Wolery et al., 1988).

Fluency. During fluency building, the goal is to perform an acquired skill rapidly at a rate similar to competent peers (Shinn, 1989) or adults (Binder, 1996). Although accuracy is a commonly used measure of academic performance, fluency goals are monitored using rate or number of skills performed in a given amount of time (e.g., words read correctly per minute, states named in 10 sec). Fluency is best promoted by providing frequent and brief opportunities to practice a skill and rewarding students for improvement (e.g., Daly, Martens, Hamler, Dool, & Eckert, 1999). Given the current emphasis in education on acquiring new skills, it is unfortunate that practice is often seen as the student's responsibility and accomplished by assigning more homework and at lower grade levels. Contrary to the prescription above, students today are often expected to complete 2-3 hours of homework a night in the absence of a structured reinforcement program. After reviewing the available research, Skinner, Fletcher, and Henington (1996) concluded that gains in fluency are closely associated with the frequency or rate of practice opportunities and that it is possible to engineer such opportunities into the school day. Strategies that have been shown to promote fluency by increasing student practice rates include choral responding during teacher-led instruction, explicit timing during independent seatwork, and goal setting during homework completion (Miller & Kelley, 1994; Rhymer, Henington, Skinner, & Looby, 1999; Skinner et al., 1996).

Maintenance. Although maintenance is generally considered to be the third stage of the IH (Alberto & Troutman, 1999), it is really an extension of fluency building. Fluency researchers have found that when children practice skills to high levels of proficiency, their performance takes on several new and important characteristics. Two

of these characteristics are related to maintenance and are known as retention and endurance (Binder, 1996). Retention refers to the performance of a skill at high levels of fluency following a period of no practice. The old adage “it’s like riding a bike, you never forget” refers to the retention of a highly fluent behavior during childhood even years later without intervening practice opportunities. As another example, tennis players who take winters off may find that they are better at hitting forehands rather than backhands when they first resume play in the spring. The reduction in fluency for backhands is evidence that this stroke was not practiced to retention standards last season and therefore should be practiced more intensely this season. A similar situation occurs each year for low-achieving and at-risk students whose reading and math skills decline over summer vacation, thereby contributing to student absenteeism and drop-out (Ballinger, 1993; Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996).

Endurance refers to the ability to maintain fluent performance over longer work intervals and is a measure of persistence (Johnson & Layng, 1992). Again, children are likely to work longer and engage in less off-task and disruptive behavior when using skills that they can perform fluently. Even simple strategies like interspersing easy problems that can be completed quickly among more difficult problems on math computation worksheets have been shown to increase on-task behavior or persistence during seatwork (McCurdy, Skinner, Granthan, Watson, & Hindman, 2001). Endurance is a particular concern for students with Attention Deficit Hyperactivity Disorder (ADHD) who may be more susceptible to distractions and who typically show lower levels of task engagement. Although medication is the most frequently used treatment for students with ADHD (Barkley, 1998), instructional materials and methods that increase rates of

active academic responding (e.g., ensuring an instructional match, using peer tutoring) have been shown to significantly improve on-task behavior (DuPaul & Henningson, 1993; McDowell & Keenan, 2001).

Generalization. The goal of generalization training is accurate and rapid performance of behavior in the natural environment or in situations that differ from training. Just as sparring practice is reserved for more advanced students in the martial arts, training for the generalization of academic skills is undertaken after children can perform fluently in the basal curriculum or other teacher-controlled activities. Generalization is best promoted by arranging opportunities to practice and apply skills with diverse materials, persons, or settings (Alperto & Troutman, 1999). In the schools, generalization training may take many forms and include such activities as building and flying model rockets, designing and budgeting for an indoor sports arena, or desk-top publishing of one's own story. It is important to remember, however, that children are likely to enjoy and benefit from these activities only if they are sufficiently fluent in the component skills to complete them with minimal assistance. Many a weekend has been spent by parents "helping" their children with school projects for which they were unprepared and did not have the skills to complete on their own.

Generalization of skills is a key goal of reading instruction which was dominated in the late 1980s and early 1990s by the whole language movement. According to Stahl and Kuhn (1995), whole language is a philosophical rather than empirical approach to instruction based on the principles that children learn best if: (a) language is used for authentic purposes such as communication, enjoyment, and information gathering rather than practiced as component skills, (b) learning is directed by the child at his or

her own rate rather than by the teacher, and (c) teachers provide opportunities for children to read using diverse, natural language devices such as trade books or children's literature. Clearly, the whole language movement is a generalization-level approach to reading instruction. Although it may be appropriate for children who are already accurate and fluent readers in teacher-controlled texts, it proved largely ineffective for poor or emergent readers and therefore was replaced in many school districts across the country with more direct, phonetically-based programs.

Adaptation. The final stage of the IH is known as adaptation and represents complete mastery of a skill. The goal at this stage is for skills to become so automatic that new variations and combinations emerge, seemingly spontaneously, in response to environmental demands (i.e., response adduction) (Binder, 1996). Thus, although the IH emphasizes the practice of important academic skills to high levels of fluency, this in itself is not the goal of instruction. Rather, the goal of instruction is to generate new forms of a skill through practice that can be selected and strengthened through reinforcement thereby enabling children to adapt successfully to their environment (Johnson & Layng, 1992). As the reader might have noticed, adduction is virtually synonymous with creativity, which is also defined as the generation of novel solutions to problems by combining information and skills in new ways. Although few would argue that mastery, creativity, and enjoyment are important goals for the life-long learner, we often forget that such high levels of achievement are attained only after significant periods of effortful practice. For example, Yamaoka Tesshu, considered to be one of the greatest martial arts masters in the history of Japan, attained enlightenment at age 43 after nearly a lifetime of arduous training (Stevens, 1984). Research on creativity has

shown that even “creative geniuses” often spend decades practicing the component skills of their trade before achieving world recognition (Simonton, 2000).

Reward Success and Set Goals

Thus far in the article we have discussed two sets of strategies that have been shown to promote academic competence in children by arranging opportunities for correct and frequent practice: (a) using curriculum materials that are matched to students’ ability levels and monitoring progress, and (b) changing teaching methods according to the IH as children become more proficient at a skill. Once we have so painstakingly designed an academic task using the strategies above, do we simply assume that children will sit quietly, complete the assigned work, and then ask for more? Common sense and more than 30 years of behavioral research in educational settings suggest that this is unlikely and that academic responding must be reinforced if it is to occur frequently enough for fluency to develop (Martens, Witt, Daly, & Vollmer, 1999).

A myth, which has become popularized in the media, is that rewarding children for completing tasks they already engage in actually decreases their motivation and performance (Kohn, 1993). Eisenberger and Cameron (1996) reviewed the literature in this area including a meta-analysis of over 60 studies that examined the effects of reward on task engagement and enjoyment. Contrary to popular belief, rewards (both verbal and tangible) were shown to *increase* task interest and enjoyment. Similar findings were reported with respect to the effects of reward on task engagement, with one exception. The only detrimental effect of reward on time spent engaging in a task was found for a specific type of reward; reward given independent of performance or

what is referred to as *noncontingent reinforcement* (e.g., Vollmer, Ringdahl, Roane, & Marcus, 1997). That is, receiving rewards for “free” or without earning them appeared to reduce a child’s motivation to work for those same rewards. Along these lines, Martens, Hilt, Needham, Sutterer, Panahon, and Lannie (in press) found that students with learning disabilities chose to complete easier math problems and worked more carelessly after receiving points for “free” that could later be exchanged for back-up reinforcers. Thus, there is considerable research evidence to suggest that contingent reinforcement increases children’s task engagement, accuracy, and enjoyment (e.g., McGinnis, Friman, & Carlyon, 1999), and only when rewards are given for free or not earned is there a potential for negative effects.

Teachers often describe children with learning problems as being lazy or unmotivated. From a behavioral perspective, being lazy means that students may be accustomed to reaching goals with little or no effort. Learning has become quick and easy in the information age, and life outside of school may foster the expectation in children that schoolwork too should require little effort. All things being equal, many of us will choose tasks that require less effort, or what has been termed the least effort principle (Sutherland, 1989). When children are faced with learning goals that require more effort or persistence then they are used to, they are likely to quit, whine, act out, or change goals in favor of something easier (e.g., “An average grade is good enough for me”). In order to overcome the least effort principle, teachers, parents, and others must find ways to keep children motivated as they complete schoolwork.

Motivation can be defined simply as the amount of reinforcement associated with reaching a goal. Today, children of all ages are exposed to a wider range of reinforcers

that can be obtained more quickly and with less effort that even a decade ago (e.g., internet access, instant messaging, computer games). Research has shown that children will choose tasks associated with reinforcers that are more highly preferred, more immediate, of higher quality, or given more frequently (Berkowitz & Martens, 2001; Neef & Lutz, 2001; Neef, Shade, & Miller, 1994; Northup, George, Jones, Broussard, & Vollmer, 1996). Applied to instruction, students may seem unmotivated with they choose the highly preferred and immediate reinforcers of everyday life over the less preferred and often delayed reinforcers of learning. As parents, we have learned four surefire ways to make this situation worse; give children whatever they want for free, tell them that they did great no matter what, fix children's mistakes for them, and give-in when children whine.

Helping children learn that learning takes effort and can be fun and rewarding requires the strategic use of reinforcement. As Skinner (1983) remarked when describing how to be content in old age, "Reinforcers need not occur too frequently if we are fortunate enough to have been reinforced on a good schedule" (p. 243). For Skinner, a good schedule means that the interval between reinforcer deliveries is gradually increased, thereby teaching one to work for longer periods of time and to delay gratification. These are important lessons for children to learn as they too get older, and we can help them in the way we structure incentive programs. One way to promote the practice of a skill following acquisition is to reinforce correct responding on an intermittent schedule (e.g., Baer, Blount, Detrich, & Stokes, 1987).

In an early study, Lovitt and Esveldt (1970) used intermittent schedules of reinforcement to increase the number of math problems completed by a 12-year old boy

with behavior disorders. Conditions in which 1 min of free time could be earned for correctly completing 20 problems (i.e., a fixed-ratio [FR] 20 schedule) were alternated with conditions in which the child could earn progressively more free time for problems completed as his completion rate increased (a multiple-ratio schedule). Results showed higher problem completion rates under the multiple-ratio schedule, and this effect was more pronounced when the student was given easy problems. More recently, McGinnis et al. (1999) found that reinforcing problem completion on an FR3 schedule increased the time that students devoted to math work above baseline levels. These gains were maintained when reinforcement was thinned to FR4 and FR5 schedules and even when reinforcement was withdrawn altogether.

One creative way of arranging intermittent reinforcement for work completion is to implement a lottery system. In a typical lottery system, participants are given tokens for desired behavior that are subsequently entered into a drawing for the opportunity to obtain back-up reinforcers (Johnson & Fawcett, 1994). Witt and Elliott (1982) used a reinforcement lottery in conjunction with a response-cost procedure to increase the task engagement of three fourth-grade students. At the beginning of each seatwork period, students were given four slips of paper and told that one slip would be removed for each violation of classroom rules (i.e., response cost). At the end of the period, the remaining slips were entered into a lottery for a drawing to be held at the end of each week. Students were also told that good behavior each day would enable them to retain more slips and therefore increase their chances of winning. All three students showed increased levels of appropriate classroom behavior during the lottery conditions. Martens, Ardoin, Hilt, Lannie, Panahon, and Wolfe (in press) found that children's

behavior is sensitive to different probabilities of reward, and that chances of “winning” the opportunity to exchange for back-up reinforcers as low as 50:50 may still maintain high levels of work completion.

A second creative way to arrange intermittent reinforcement involves the interspersal of easy problems among more difficult problems (McCurdy et al., 2001). According to Skinner (in press), the reinforcing properties of interspersed easy problems comes from two sources. First, when children are repeatedly rewarded for completing work that contains many problems, the completion of each problem acquires conditioned reinforcing properties. That is, the completion of each problem becomes rewarding in and of itself because it signals that the child is closer to completing the entire task (i.e., they are closer to the goal). Thus, not only does practicing a skill over time build fluency, it may also result in practice itself becoming rewarding. Second, consistent with the notion that it is more enjoyable to do something you’re good at, problems that can be completed quickly and easily can be used to reinforce the completion of more effortful or difficult problems.

Reward can be effectively combined with setting ambitious yet realistic goals for student success. At a simple level, this can be translated into contingencies when the child “beats their score for yesterday”. Hence, if the child read 34 words correct per minute yesterday, then the goal would be 35 or more today. Carefully used, however, goal setting can help teachers achieve one of the ultimate outcomes of education. That is, for the child to become a “self-motivated” life long learner. Behaviorally, a large part of so-called self-motivation is setting and accomplishing the goals we set for ourselves. Initially many educational goals for children are set by adults such as teachers and

parents. Gradually we come to establish our own goals and we “feel good” when they are accomplished. Teachers can facilitate the process of becoming self-motivated by first setting goals for children and rewarding them when they meet the goal. When they meet the goal it is important for the teacher to emphasize not only the reward but the accomplishment, “Wow you met the goal!” As the child succeeds at this, the next step is to solicit the child’s input on goals. As time goes on, the reward is faded out and there is a transfer from teacher-imposed goals to more reliance on children to set their own goals. When children are setting their own goals and feel “satisfied” when they accomplish a goal, the teacher can also be “satisfied” in knowing that a major educational goal for the child has been accomplished.

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Table 1

Performance Goals, Measures, and Teaching Strategies for Each Stage of the IH

Stage	**Performance Goal**	**Performance Measure**	**Teaching Strategy**
Acquisition	Accuracy	Number or percent correct and errors	Modeling, prompting, and error correction
Fluency	Proficiency	Rate	Practice and reinforcement
Maintenance	Retention	Rate in the absence of practice	Practice beyond an accuracy criterion (overlearning)
	Endurance	Rate on longer tasks	
Generalization	Application	Rate in new situations	Practice with diverse materials, persons, or settings
Adaptation	Adduction	Rate of emergent skills	Practice to retention and endurance standards