Systematic Instruction for Students with Moderate and Severe Disabilities

by

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About the Author

Belva C. Collins, Ed.D., is Professor and Chair of the Department of Special Education and Rehabilitation Counseling at the University of Kentucky, where she serves on the program faculty in the Moderate and Severe Disabilities Program. Dr. Collins began her career as a teacher of students with intellectual disabilities in rural Southwestern Virginia before coming to the University of Kentucky to work as a research assistant on several federally funded grants to validate the use of response prompting strategies in special education. She has continued this line of research throughout her career in higher education and has been successful in guiding the applied research of her students in investigating variations of systematic instruction in classroom and community settings. This work provides the foundation for this text. In addition to disseminating her own scholarly writing, Dr. Collins serves as the executive editor of *Rural Special Education Quarterly*, the primary publication of the American Council on Rural Special Education.

CHAPTER 1

Using Effective Practices to Teach Students with Moderate and Severe Disabilities

CHAPTER OBJECTIVES

On completion of this chapter, the reader will be able to

- List and describe the components of an instructional trial
- Task analyze a chained task, and describe how it can be taught across three instructional formats: forward chaining, backward chaining, and total task presentation
- State principles for presenting a consequence following a correct response
- Provide examples of general and specific attentional cues and responses, and describe the rationale for delivering one over the other
- Provide examples of response prompts, and arrange them in a hierarchy that is appropriate for a given target skill and learner
- Distinguish between massed, spaced, and distributed trial presentation formats
- List the four phases of learning, and write a behavioral objective with observable and measurable behaviors to address each phase

TERMS USED IN THIS CHAPTER

applied behavior analysis (ABA)
instructional programs
instructional sessions
instructional trials
antecedent
behavior
consequence
stimulus
response
stimulus control
observable behavior
measurable behavior
discrete behavior
chained task
task analysis
forward chaining
backward chaining
total task presentation
differential reinforcement
attentional cue
attentional response
prompts
stimulus prompts
response prompts
errorless learning
prompt hierarchy
verbal prompts
gestural prompt
model prompt
physical prompt
controlling prompt
massed trial format
spaced trial format
distributed trial format
embedded instruction
acquisition
fluency
maintenance
generalization
behavioral objective
response cards
choral response
fixed ratio schedule of reinforcement

Before using procedures for conducting systematic instruction with students with moderate and severe disabilities, it is necessary to have a basic understanding of the principles of **applied behavior analysis** (**ABA**; Alberto & Troutman, 2009) and a working knowledge of the components of instruction. This chapter provides that foundation by defining, describing, and providing examples of instructional components and concludes with samples of lesson plans demonstrating those components.

BASIC COMPONENTS OF SYSTEMATIC INSTRUCTION

Instructional programs using direct instruction are composed of individual **instructional sessions,** and instructional sessions are composed of individual **instructional trials.** An instructional session may have as few as one instructional trial or as many as the instructor deems necessary for learners to have ample opportunities to perform a targeted behavior or skill. Instructional programs differ from lesson plans in that instruction continues across daily sessions until learners reach criterion on the performance of a behavior; lesson plans typically address a single day of instruction on a specific topic. Instruction on the behaviors targeted in instructional programs may be embedded across lesson plans. For example, an instructional program for a communication skill can be embedded across lessons in science, language arts, math, or social studies. In general, the more opportunities a learner has to perform a behavior, the more quickly learning will take place.

Instructional Trials

Every single trial of systematic instruction has three basic components. These include the **antecedent,** the **behavior,** and the **consequence.** It is easy to remember these components as the A-B-C of an instructional trial. The antecedent is the **stimulus** that precedes a behavior or a **response,** and the consequence follows the behavior. One way to do this is

to envision systematic instruction through a simple formula (Collins, 2007, p. 119): A → B → C (A = antecedent, B = behavior, C = consequence) or S → R → C (S = stimulus, R = response, C = consequence). Throughout this book, the terms *antecedent* and *stimulus* are used interchangeably, as are the terms *behavior* and *response*.

If the correct response always follows an antecedent or stimulus, **stimulus control** has been established (Wolery & Gast, 1984). The goal of instruction is to establish stimulus control, especially under natural conditions.

Behavior

The target behavior is the one the instructor wants the learner to acquire and, therefore, is targeted for instruction. The behavior or response follows an antecedent or stimulus. When recording the responses of learners, it is important that behaviors be both **observable** and **measurable.** It is impossible to know what a learner feels, thinks, appreciates, or understands unless it is demonstrated in some tangible way that can be seen and measured by the instructor. For example, a learner who looks up and smiles in response to music may be demonstrating appreciation, and a learner who puts words together in a novel way to make a sentence may be demonstrating the understanding of the mechanics of writing a sentence. Appreciation cannot be measured, but the presence of a smile can; likewise, understanding cannot be measured, but the ability to put together nouns and verbs with punctuation to show meaning is measurable.

Discrete and Chained Behaviors

All behaviors that are taught to a learner can be classified as discrete or chained (Alberto & Troutman, 2009; Collins, 2007). A **discrete behavior** consists of a single step. When it is observed, it either occurs or does not occur. For example, a learner is performing a discrete behavior when reading a single word, writing a single letter, answering a question with a simple response, communicating "hello" in greeting someone, or raising a hand to gain the attention of the teacher.

A **chained task** consists of discrete behaviors that are linked together to perform a more complex behavior. When a chained task is observed, each step can be viewed individually to see whether it occurred or did not occur. For example, a learner is performing a chained task when linking several words together to read a sentence, writing a series of letters to form a word, answering a complex question by putting together a series of statements, communicating by emitting an utterance with several words to convey a thought, or performing a series of actions to prepare for class (e.g., open door, walk in room, sit at desk, get out book, open book to correct page).

A **task analysis** is a means of breaking down a chained task into small, discrete behaviors or steps (Alberto & Troutman, 2009). The number of steps depends on the ability of the learner. For example, writing a name could be considered a discrete task for a learner with a mild intellectual disability, it might be broken down into individual letters of the alphabet for a learner with a moderate intellectual disability, and it might be further broken down into the individual strokes necessary to form each letter of the alphabet for a learner with a severe intellectual disability. Although instructors may provide task directions to perform individual steps of a chained task during instruction, the goal is that, over time, the completion of one step of a chained task will serve as the natural stimulus for the learner to perform the next step of the chained task. For example, the natural stimulus for turning off the water tap is a full glass, not the instructor saying, "Turn off the water." In some

chained tasks, it is necessary for learners to perform the steps in a specific order (e.g., crossing a street). In other chained tasks, it is acceptable if learners perform the steps out of sequence (i.e., in a functional order) as long as the desired outcome is produced (e.g., put either peanut butter or jelly on the bread first to make a sandwich).

There are three formats for teaching chained tasks: 1) **forward chaining,** 2) **backward chaining,** and 3) **total task presentation** (Alberto & Troutman, 2009). Forward chaining occurs when one step of a task analysis is taught at a time. As a step is mastered, the instructor begins instruction on the next step in the sequence until all steps are learned. Although this is time consuming, it can be an effective way to teach learners with significant disabilities who may require a great deal of time to learn single steps. An example would be teaching a learner to write the first letter of his or her name to mastery before teaching the next letter. Backward chaining occurs when the instructor performs all of the steps for the learner except the last step of the sequence and then teaches that step to the learner. When the learner masters the final step of the sequence, the instructor teaches the final two steps. Instruction proceeds in this backward fashion until the learner has mastered all of the steps. This format also is time consuming but has the advantage of allowing the learner to receive reinforcement for accomplishing a task. An example would be when an instructor performs all of the steps of tying a shoe except for the final step, in which the learner pulls the laces tight to secure the bow and is praised for tying the shoe. Again, this procedure may be appropriate for learners with significant disabilities. Total task presentation is the most natural way to present a task. During every single instructional trial, the learner has the opportunity to perform every single step of the chain. This allows the learner to perform the steps already known and to receive instruction on the steps yet to be mastered. Instructor judgment determines which format should be used when teaching different tasks to different learners. If the total task presentation format is too overwhelming for a learner, the instructor always can decide to teach in a forward or backward chaining format.

Antecedent

The antecedent is the stimulus preceding a behavior that the instructor wants a student to perform (Alberto & Troutman, 2009; Collins, 2007). The list of examples from our daily world is endless. The doorbell ringing is the stimulus to answer the door. Darkness approaching with nightfall is the stimulus to turn on the lights. The smell of burning food is the stimulus to check what was left cooking on the stove. The beep that accompanies an incoming message on a computer is the stimulus to check e-mail. The goal for learners is that they will, in time, perform the behaviors they have acquired in response to natural stimuli. While teaching, however, the instructor must ensure that learners have antecedents that will result in the desired behaviors. Most often, this is done by giving a task direction, such as, "Read the words on this page," or "Work these math problems." This tells learners what the instructor wants them to do, and it is paired with the natural antecedent—in these examples, the page of written words or the worksheet containing math problems. By pairing the task direction with the natural stimulus, it is likely that learners, over time, will begin to complete the task at hand in the absence of a task direction. For a more functional life skill, the natural stimulus for crossing a street is a white *Walk* sign. When first teaching this skill, however, the instructor would give the task direction "Cross the street" and then teach learners to wait for the white *Walk* sign as well as the absence of oncoming traffic instead of expecting them to respond correctly to an untrained stimulus.

Consequence

If correct responses are to increase, it is important that every behavior or response be followed by a consequence (Alberto & Troutman, 2009; Collins, 2007). The consequence consists of feedback to let a learner know if a response was correct or incorrect. A consequence, such as praise or a good grade, informs the learner that a response was correct; if this is reinforcing to the learner, it increases the likelihood that the learner will make the same response in the future. Error correction allows the learner to see where a response was incorrect and how it should have been performed. Asking the learner to correct the error allows the learner to practice a correct response, thus increasing the likelihood that the learner will recall how to perform the response in the future.

There are few rules that should be followed in delivering reinforcement following a correct response (Alberto & Troutman, 2009). First, it is important to provide consequences that are reinforcing to learners and not to assume that every learner is reinforced by the same consequence. For example, a learner who is tactilely defensive may not be reinforced by a pat on the shoulder. Second, it is important to vary reinforcers because they can lose their power when they are used repeatedly. For example, praise statements might include, "Good job," "Awesome," "Wonderful work," and "Great performance!" Third, it can be helpful to provide learners, at least initially, with descriptive praise statements because these provide feedback on what the learners did correctly. These can be statements such as, "I like the way you wrote your first and last names on the line with a space between," or, "You did a great job washing your hands; they are really clean!" Fourth, it is important to provide reinforcement during all instructional trials until learners reach criterion. Once criterion is reached, reinforcement can be faded, as described in Chapter 7. Fifth, reinforcement should be age appropriate. To illustrate, young children or learners with significant intellectual disabilities may not grasp the concept of earning points, whereas edibles or smiley face stickers may not be appropriate for older learners. Finally, artificial reinforcers, such as edibles, should be used sparingly and only when necessary. In every case, the artificial reinforcer should be paired with a natural reinforcer, such as social praise, so that it can be faded as the natural reinforcer becomes more valued.

A good principle to remember is that a consequence is not positive reinforcement unless the behavior increases. Sometimes instructors will find it necessary to change or strengthen reinforcers to motivate students to respond. Also, if a learner becomes dependent on teacher assistance, it can be helpful to use **differential reinforcement** (Alberto & Troutman, 2009), in which reinforcement is delivered for independent responses only and is withheld when students receive assistance.

Attentional Cues and Responses

Before every instructional trial, it is necessary to secure the attention of learners. Learners need to be attending to the stimulus and task direction to know how they are to respond and for learning to occur. There are two ways to secure a learner's attention: 1) general **attentional cue** and 2) specific attentional cue (Collins, 2007). Likewise, there also are two ways for learners to respond: 1) general **attentional response** and 2) specific attentional response. These responses let the instructor know that the student is attending and ready to learn. The addition of an attentional cue would change the previous formula to the following: AC $\rightarrow$ S $\rightarrow$ R $\rightarrow$ C (AC = attentional cue; Collins, 2007, p. 123).

Most learners will respond to a general attentional cue by giving a general response that indicates readiness to learn. There are many types of general attentional cues. The

instructor may call out the learner's name; the instructor may say something to indicate that it is time for instruction to begin, such as, "Ready?" or "Look!" or "Eyes on me"; or, the instructor may perform an action that gains the learner's response, such as turning the lights on and off, raising or lowering voice volume, or touching the learner on the shoulder. In turn, the learner should respond to indicate attending in some way, such as giving the instructor eye contact, giving an affirmative verbal response (e.g., "Yes"), or sitting quietly and listening for further directions. Once attention is secured, the instructor is free to deliver the specific stimulus for the learner to respond. For example, the following exchange could begin an instructional trial:

General attentional cue: "Kaia, are you ready to work?"

General attentional response: "Yes."

Task direction: "Good, then answer this question. Who is the president of the United States?"

For some learners, a general attentional cue is not sufficient to secure attention. Some learners may be easily distracted or have sensory impairments that prevent them from picking up on natural general cues (e.g., cannot see or hear instructor). In these cases, the instructor will want to use a specific attentional cue in which the learner is required to perform a specific response to show attending. Specific attentional cues may require the learner to perform an action or to give a verbal response that may or may not be related to the task to be presented. A specific attentional cue that is not related to the task is illustrated in the following exchange:

Specific unrelated attentional cue: "Kaia, show me that you are ready to work by showing me your good sitting behavior."

Specific unrelated attentional response: Kaia stops talking, places her hands in her lap, and makes eye contact with the instructor.

Task direction: "Good, now answer this question. Who is the president of the United States?"

An example of an attentional cue that is related to the task is illustrated in the following interaction:

Specific related attentional cue: "Kaia, put your finger on the picture of the man in this picture."

Specific related attentional response: Kaia puts her finger on the picture of the president of the United States.

Task direction: "Good, now answer this question. Who is the president of the United States that is shown in this picture?"

There are a number of ways in which specific attentional cues can be presented to require the learner to attend to a relevant feature of the task to be completed. These can include naming the letters of a word before being asked to read it, tracing the letters of a word with a finger before being asked to write it, or naming the numerals in a math problem before being asked to work the problem.

Prompts

There are two categories of **prompts** that set up learners for success: 1) **stimulus prompts** and 2) **response prompts.** Using these types of prompts decreases the number of incor-

rect responses learners make during instruction, resulting in nearly **errorless learning** (Collins, 2007; Spooner, Browder, & Mims, 2011; Wolery, Ault, & Doyle, 1992; Wolery & Gast, 1984; Wolery & Schuster, 1997). Errorless learning typically is defined as an error rate of 20% or less in an instructional session. Errorless learning is advantageous because it decreases the opportunity for learners to make errors, decreases learner frustration when the correct response is unknown, and increases access to reinforcement for performing a correct response. The logic is that if a learner does not know how to perform a behavior, then the instructor should prompt the learner to perform it correctly rather than allow the learner to become frustrated, practice incorrect responses, or make guesses. Once the learner acquires the response by being prompted, prompts can be faded.

Stimulus Prompts

Stimulus prompts—prompts that are in place prior to instruction and that increase the likelihood that the learner will perform a correct response—can be conceptualized as follows: S/P → R → C (S = stimulus, P = prompt, R = response, and C = consequence; Collins, 2007, p. 124). As an example, instructional materials may be formatted to prompt learners to make a correct response to the targeted stimulus, as would be the case when the word *red* is printed in the color red. Over time, the red color can be faded as the learner begins to focus on the letters of the word as the relevant stimulus rather than the color of the letters. Commercial materials with stimulus prompts are available for purchase, or instructors who are skilled in technology use may develop their own on the computer.

Response Prompts

Response prompts and the systematic procedures for using them are the focus of the instruction described in this book. Response prompts are inserted in instructional trials to elicit the correct responses from learners, making the procedure nearly errorless, and can be conceptualized as follows: S(P) → R → C (S = stimulus, P = prompt, R = response, and C = consequence; Collins, 2007, p. 125).

There are several levels of assistance in a **prompt hierarchy**. Depending on the learner and the task, the prompts can be listed from least to most intrusive (Collins, 2007: Wolery et al., 1992) as follows: independence (no assistance or prompt needed), **verbal prompt, gestural prompt, model prompt,** and **physical prompt**. Verbal prompts can be further broken down into 1) direct verbal prompts (e.g., "The word is *dog*") or 2) indirect verbal prompts (e.g., "The word starts with a *duh* sound"; "The word is the name of an animal that barks"). Physical prompts can be further broken down into 1) full physical prompts (e.g., hand-over-hand guidance to write *dog*) or 2) partial physical prompts (e.g., a nudge to get the hand started to write *dog* or guidance from the wrist or forearm instead of the hand).

In most response-prompting procedures, the general rule is to use the least intrusive prompt possible that is still likely to result in a correct response. A prompt that facilitates a correct response is called a **controlling prompt** (Collins, 2007; Wolery et al., 1992). In some cases, it may be desirable to pair prompts. For example, an instructor might pair a verbal prompt with a physical prompt for a learner who needs physical guidance; the instructor can then fade the physical prompt when the learner begins to respond to verbal directions. Regardless of the type of prompt that is used, all prompts should be faded over time as learners acquire the ability to perform behaviors independently.

Trial Format

As previously noted, each instructional trial consists of an antecedent or stimulus, a behavior or response, and a consequence. An instructional session can consist of a single trial or a multitude of trials. For example, a learner may have one opportunity to hang up a coat when arriving at school, but he or she will have a vast number of opportunities to practice social greetings with peers throughout a school day. There are three basic trial formats in which instruction can take place: 1) **massed trial format,** 2) **spaced trial format,** and 3) **distributed trial format** (Collins, 2007; Wolery et al., 1992). Each of these formats has advantages and disadvantages. It is best to use all three when it makes sense to use them. For example, a learner who is acquiring a new skill may require one-to-one massed trial practice with the instructor during initial instruction on a skill, then may need to practice the skill again in a group setting while also receiving distributed trials as opportunities for using the skill arise naturally throughout the day.

Massed Trial Format

Massed trials occur when one instructional trial after another takes place in quick succession with no other activity in between. Massed trials can be conceptualized as follows: XXXXX, where X = instructional trial on a targeted skill (Collins, 2007, p. 122). The instructor may give a task direction repeatedly, one after the other, such as asking a learner to read a series of sight words; set out utensils, plates, and cups for the entire class before snack time; or fill a page with one trial after another of writing his or her name and address. Massed trials can be beneficial when learners are first learning a new behavior because such trials provide many opportunities to practice the targeted response.

Spaced Trial Format

Spaced trials occur when a learner has an opportunity to respond and then some time to contemplate the response or listen to others respond before receiving another trial on the same skill. The learner does not engage in any other activities between turns. Spaced trials can be conceptualized as follows: X X X X X, where X = instructional trial on a targeted skill (Collins, 2007, p. 122). Spaced trials occur naturally in group settings in which all learners are working on the same behavior. For example, learners may take turns being called on to answer questions in a science class, they may take turns reading sentences or paragraphs from a story, or they may take turns counting out money to each other as they simulate making purchases. Spaced trials can prepare learners for the real world by teaching them to take turns; such trials also can provide learners the opportunity to acquire skills from each other through observation between turns.

Distributed Trial Format

Distributed trials occur across activities at natural times throughout the day. The learner may participate in an instructional trial and then take part in another activity before having the opportunity to participate in another instructional trial. Distributed trials can be conceptualized as follows: XYXYXYXY, where X = the targeted task and Y = other tasks performed during the day (Collins, 2007, p. 122). Distributed trials have the advantage of facilitating generalization in that students learn to perform behaviors across natural settings with a variety of people or materials. Instead of having the learner repeatedly write a name on a single sheet, instructors would take the opportunity to conduct an instructional

trial by having the learner write a name at the top of worksheets in academic classes, on attendance sheets at school activities, or on scorecards in physical education classes. Instead of having the learner read sight words on flashcards, the instructor would take the opportunity to conduct instructional trials when target words appear in books, on signage, or on web sites across settings.

It may take a learner longer to master a skill or acquire a behavior when using distributed trials for instruction because the learner has to respond during repeated trials over time across activities, materials, settings, and people. In the long run, however, the acquired response should be more useful because the learner can perform it when it is needed. Note that distributed trial instruction also may be described as **embedded instruction** because the trials can occur within the context of other activities (Grisham-Brown, Schuster, Hemmeter, & Collins, 2000).

Phases of Learning

The previous discussion noted that different trial formats may be appropriate for facilitating different phases of learning. There are four basic phases of learning: 1) **acquisition,** 2) **fluency,** 3) **maintenance,** and 4) **generalization** (Alberto & Troutman, 2009; Collins, 2007). Instruction should be designed to address the appropriate phase of learning for each individual learner and the specific task being taught. It is possible to address more than one phase of learning at a time if the instruction is designed to do so.

Acquisition

Acquisition is the initial learning of a new behavior or response. A behavior is targeted for instruction when assessment has shown that the learner does not have the behavior in his or her repertoire and the instructional team has determined that the behavior will be beneficial to the learner.

Fluency

Fluency is how well a learner can perform a specific behavior. This is usually considered in terms of how quickly a learner can respond. Some behaviors require fluency. For example, it is desirable to be able to count out money when making a purchase without holding up the other shoppers who are in line to pay. It is necessary to be able to enter a personal identification number into an automated teller machine before it logs out. It is necessary to be able to greet or respond to people before they walk away. Fluency also can refer to accuracy. Instructors often measure the number of words read correctly per minute to determine fluency in reading or the number of math problems worked correctly per minute to determine fluency in math. For the skill of playing a musical instrument, fluency would be measured by the percentage of correct notes as well as the timing.

Maintenance

Maintenance refers to the ability of a learner to perform a behavior over time. This is measured once a learner has met criterion and reinforcement has been faded. For example, a learner may have mastered the spelling of a group of words with 100% accuracy. It is important, however, to check whether the learner can still spell those words a week or a month later. Ways to facilitate maintenance are discussed in Chapter 7.

Generalization

Perhaps the most important phase of learning is generalization. *Generalization* is the ability to perform a behavior across different conditions, including people, settings, activities, materials, and times of day. For example, a learner who has been taught to read a list of words should be able to read them regardless of the font color or size and regardless of whether they appear on a worksheet, in a book, or on signage. If learners cannot generalize or apply behaviors that have been acquired, then learning has no purpose. There are a number of ways to facilitate generalization; they are discussed in Chapter 7 as well.

Objectives

Before beginning instruction, it is crucial that the instructor have a **behavioral objective** (Alberto & Troutman, 2009) for each and every behavior that will be taught. This gives focus to the lesson, allows the instructor to develop an appropriate data-collection system, and specifies how well a learner must perform a behavior before it is considered mastered. Each behavioral objective should specify 1) the learner(s) for whom the objective has been written, 2) the observable and measurable behavior that the learner(s) will perform, 3) the conditions under which the behavior will be performed, and 4) the specific criterion that must be met before a behavior can be considered mastered. An example of an objective that focuses on acquisition follows:

> When seated at a computer and told to enter her personal information, Ripley will type her name, address, and telephone number with 100% accuracy for 3 consecutive days.

The above objective can be changed to address fluency as follows:

> When seated at a computer and told to enter her personal information, Ripley will type her name, address, and telephone number within 1 minute with 100% accuracy for 3 consecutive days.

Although the objective specifies 3 days, the time can be lengthened to measure maintenance as follows:

> When seated at a computer and told to enter her personal information, Ripley will type her name, address, and telephone number with 100% accuracy for 3 consecutive days and will maintain the skill until the end of the school year.

The objective also can be extended to facilitate generalization, as follows:

> When seated at a computer and told to enter her personal information, Ripley will type her name, address, and telephone number with 100% accuracy for 3 consecutive days across the following activities:
>
> When working on an assignment in the computer lab
>
> When filling out an application on a laptop computer
>
> When working on an assignment on the classroom computer

If desired, an objective can address all phases of learning, as follows:

> When seated at a computer and told to enter her personal information, Ripley will type her name, address, and telephone number within 1 minute with 100% accuracy for 3 consecutive days and will maintain the skill until the end of the school year across the following activities:
>
> When working on an assignment in the computer lab
>
> When filling out an application on a laptop computer
>
> When working on an assignment on the classroom computer