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FOCUS ON EXCEPTIONAL CHILDREN

Matching Strategies with Performance in Facilitating Generalization

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Successfully teaching students who have severe handicaps is a relatively recent achievement in education. In receiving systematic instructional procedures, students with serious learning problems have demonstrated that they can acquire and master self-help, social, domestic, vocational, and many other skills required to live and be productive in their home and communities.

Having attained success in teaching functional skills, educators are facing another problem: Acquisition of skills rarely guarantees that the individual can apply those skills in natural settings. Skills that are performed only in school settings will not provide the necessary bases for functioning independently in an integrated community environment. To solve this problem, educators have to apply strategies that consistently facilitate the generalization of skills from instructional to natural community settings. To generalize a skill, the student must recognize that the setting is appropriate for the skill, identify specific antecedent stimuli, and then respond with the skill appropriate to the situation. Next, the consequence that follows that response must reinforce it, or the response probably will not occur again.

Application of results from a large number of studies has shown that tactics or strategies can facilitate the process of generalization. We have established principles that can be a guide in facilitating generalization. Most recently, our research has built on and refined those principles to establish a procedure for making decisions about how best to match instructional strategies with performance patterns to increase the probability that newly acquired skills will generalize across persons, materials, and settings.

WHAT IS MEANT BY GENERALIZATION?

Definition of Generalization

Broadly speaking, skill generalization means *responding appropriately to new settings*. In the instructional setting the student learns to perform a skill under certain conditions. These conditions include not only a specific physical setting but also certain

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people, specific cues, directions, praise, assistance, special or familiar materials, positions, and arrangements. In short, everything within the setting, even if it is not directly associated with the instructional goal, comes to be associated with that skill. In new settings the student must respond to new conditions—conditions that were not part of the setting in which learning occurred. To the extent that the student responds appropriately, we say that the skill has generalized.

The ultimate purpose of teaching skills that generalize is to provide the individual with the means for adapting to new situations, solving problems, and living in a changing world. The generalized response must be both appropriate and functional. "Hi, my name is Charles" may be said perfectly in a new setting, but if it follows the question, "Where is the theater?" it is entirely wrong. For the skill to be useful, the student also must be able to modify or physically adapt the response to the demands of the new setting.

Many instances of generalization involve changes in the physical actions that constitute the response. For example, putting on a T-shirt with long sleeves requires somewhat different physical movements than putting on a short-sleeved T-shirt or a shirt that buttons up the front. In some instances totally different physical responses will be required to achieve the same effect as that achieved by performing the learned skill. For example, teaching a student to put on a shoe achieves the effect of covering and protecting the feet. Putting on a pair of rubber boots achieves the same critical effect, but physically different responses usually are involved. [See White (1980) for an excellent discussion of critical effect.]

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Dimensions of Generalization

Sometimes we specify the dimension across which generalization will have to occur. Descriptors such as this can allow us to determine the nature of the differences between the instructional situation and the target generalization situation so we can plan instruction to assist generalization or to understand generalization problems.

Generalization Across Persons

Usually generalization across persons means that the only difference between the instructional situation and the generalization situation is the people with whom the learner interacts while performing the skill. This can become a problem when the student is responsive to only a few people, and it may be a good explanation of why parents observe different skills in their child than does a teacher. Usually the child is more responsive to the parent and does not generalize across persons to the teacher.

Generalization Across Objects or Materials

This type of generalization also includes generalization across verbal directions or other specific stimuli. The difference is in the objects, cues, directions, or other stimuli the learner manipulates or responds to while performing the skill. When different materials are substituted, the student may not know how to respond. For example, a student who has been taught to cross streets by obeying a pedestrian light that shows the word "WALK" in green may not recognize that a stylized figure in white on a pedestrian light has an identical meaning.

Generalization to Natural Consequences

In this case, the consequences available in the natural setting, instead of the consequences used in instruction, must come to control the skill. This difference is critical, especially when instructional consequences such as praise for appropriate responding and verbal feedback for errors are not provided in the generalization situation, and the

natural consequences instead are passive acceptance of appropriate behavior and ridiculing errors. For example, people waiting in a grocery line don't say "Good waiting" to each other, but those who push or shove or cut in might be reprimanded or ridiculed. If not prepared, the student's misbehavior might be reinforced by the reprimand attention, and the target skill will not be demonstrated in the target setting.

Generalization Across Stimuli

In generalization across stimuli, all of the *antecedent* events, or the constellation of antecedent events, differ, while consequences do not.

Generalization Across Settings

This more general term encompasses changes in most of the antecedent and consequent events that control responding.

Generalization Across Time

Generalization across time refers to skill generalization during periods when instructional conditions are not in effect, such as from a resource room to a general education classroom. This is an important consideration in mainstreaming. Although we certainly desire skill generalization from the special education classroom, we do not wish to impose many constrictions, requirements, and modifications in the natural classroom setting. Therefore, we desire the student to generalize his or her appropriate behavior from the resource room, where a special program is in effect, to the high school choir, for example, where the contingencies are different. To the extent that generalization does occur, it can be described as "generalization across time." Skills that are maintained after instruction is concluded also may be described as generalizing over time.

STUDYING GENERALIZATION

The generalization phenomenon has been recognized and studied in research laboratories for many years, but the need for application of strategies to facilitate generalization in educational settings has never been more critical than it is now. As we face the integration of persons with severe handicaps into all facets of society, we realize that the main stumbling block is the difficulty encountered with skill generalization.

In 1982 the Office of Special Education and Rehabilitation Services of the U.S. Department of Education contracted with the University of Washington's Washington Research Organization (UWRO) to conduct research into generalization.

Our assumptions, which provided the foundation for our research, are:

1. Generalization must be a target of instruction, and criteria for measuring generalization and conditions under which generalization is expected should be specified in IEPs (Billingsley, 1984).
2. Some learners with severe handicaps may generalize without the need for special strategies, but if a learner does not generalize a skill once it has been acquired, special strategies are needed. In fact, without applying specific strategies, we can honestly expect only about 25% of the skills we teach to be useful in natural settings (Haring, 1988).
3. Direct assessments of student performance in all of the target generalization situations are required to make effective decisions about generalization strategies.

Research was conducted for 5 years to meet the following goals:

1. To identify and validate a set of intervention strategies for teaching specific skills to individuals with severe handicaps in a manner that would lead to the generalization and adaptation of those skills across environments.
2. To develop performance-based guidelines for matching and adjusting generalization-relevant intervention procedures to meet the specific needs of individual learners with severe handicaps.

Identifying and Validating Strategies

To meet the first goal, we conducted a thorough analysis of the published research on generalization (White et al., 1988) and identified 12 relatively discrete strategies that have been studied. These strategies are described briefly in Table 1. For a detailed discussion of each strategy and examples of its application in educational programs for students with severe and profound handicaps, see Liberty & Billingsley (1988). We analyzed the relative success of each strategy as reported by the studies' authors. We recognized, too, that studies in which strategies never produced generalization were probably not published, so the studies we analyzed were likely to put the best picture on the situation.

We found that, with a few exceptions, more than one strategy was used before acceptable generalization was achieved (although this was partly a function of some research designs). When a single strategy was implemented, studies that involved learners with severe handicaps reported that, at best, successful generalization occurred only in 5 or 6 cases out of 10, with the exception of a few studies with few learners. Even training in the

TABLE 1
Strategies for Facilitating Generalization

Strategy	Definition	Example
Antecedents		
Program Common Stimuli	Selecting a salient, but not necessarily task related, stimulus from the situation to which generalization is desired, and including that stimulus in the training program.	Stokes & Baer (1977) report a case in which an individual with severe retardation was taught exercise skills to facilitate integration in a physical education class. Music was played during the PE class, so music was also introduced into the individual's training sessions to make the two situations more similar.
Sufficient Exemplars	A strategy similar to Sequential Modification, involving sequential addition of stimuli to the training program until generalization to all related stimuli occurs.[1]	An adolescent with severe handicaps was taught to name objects, and probed with other objects from the same class. Some objects required only a single exemplar to produce generalized naming, while other objects required 5 exemplars before generalization occurred (Anderson & Spradlin, 1980).
Multiple Exemplars	Several examples of the stimulus class to which generalization is desired are trained at the same time.	Three adults with profound mental retardation were trained in three types of exercise. Generalization occurred to a group exercise program and to two untrained exercises (Stainback, Stainback, Wehman, & Spangiers, 1983).
General Case Programming	The universe to which generalization is desired is analyzed and representative examples of positive stimuli (stimuli in the presence of which the skill should be used), negative stimuli (stimuli in the presence of which the skill should not be used), and irrelevant stimuli (stimuli which should not effect skill use, but might inappropriately do so) are selected for training.	Six young men with moderate or severe retardation were trained on three vending machines which reflected the range of machine-types found in the community. Good generalization was obtained to 10 untrained machines in the community (Sprague & Horner, 1984).
Other		
Train Loosely	Settings, cues, prompts, materials, response definition, and other features of the training situation are purposely varied to avoid a ritual, highly structured, invariate program which might inhibit generalization.	Mothers were taught to vary the type of stimuli and reinforcers they used in working with their children's motor skills. All children learned their skills quickly and generalized well to another setting (Filler & Kasari, 1981).
Mediate Generalization	Teaching a secondary behavior or strategy which will help an individual remember or figure out how and when to generalize, or which will dispel the differences between the training and generalization situations.	Five adolescents with moderate or severe mental retardation were taught to self-instruct task completion using a picture sequence. They then used the self-instruction skill to generalize task completion of a new task with a new picture sequence (Wacker & Berg, 1983).
Train & Hope	Providing simple instruction and then "hoping" that generalization will occur. Actually the *absence* of any special strategy.	Three preschool boys who were blind and severely or profoundly retarded were taught to reach for noise-making toys always presented at the midline. None of the boys generalized to objects presented on the right or left (Correa, Poulson, & Salzberg, 1984).

TABLE 1 (continued)
Strategies for Facilitating Generalization

Strategy	Definition	Example
Setting		
Train in the Natural Setting	Training is conducted directly in at least one type of setting in which the skill will be used. Generalization is then probed in other nontraining settings.	The social interaction skills of several individuals with severe handicaps were trained in the classroom and courtyard during class breaks (Gaylord-Ross & Holvoet, 1985).
Sequential Modification	Training is provided in one setting, and generalization is probed on other settings. If necessary, training is conducted sequentially in more and more settings until generalization to all desired settings is observed.[2]	One girl with moderate handicaps needed articulation training in 3 settings before generalizing to all remaining situations of interest; a second girl only required training in two situations before generalizing (Murdock, Garcia, & Hardman, 1977).
Consequences		
Introduce to Natural Maintaining Contingencies	Ensuring that the learner experiences the natural consequences of a behavior by: (1) teaching a functional skill which is likely to be reinforced outside instruction; (2) training to a level of proficiency that makes the skill truly useful; (3) making sure the learner actually does experience the natural consequence; and/or (4) teaching the learner to solicit or recruit reinforcement outside instruction.	Three teens who were multiply handicapped and severely retarded were taught to use symbols and pictures to request objects. Generalization was encouraged by using objects which would be regularly encountered outside instruction, making sure the boys always carried their communication boards, and that someone would always be present to provide any requested items (Hurlbut, Iwata, & Green, 1982).
Use Indiscriminable Contingencies	If natural consequences cannot be expected to encourage and maintain generalization, artificial consequences or schedules of natural consequences might be used. However, it is best if the learner cannot determine precisely when those consequences will be available, and so must behave as if they always are.	Two behavior disordered and five normal preschool children always generalized their interaction and study skills better when verbal praise by the teacher was provided after progressively greater delays, rather than immediately following each behavior (Fowler & Baer, 1981).
Train to Generalize	The learner is only reinforced for performing some generalized instance of the target skill. Performing a previously reinforced version of the response is no longer reinforced.	Four youths with severe retardation were taught to name specific items. Contingencies were then altered so they were only reinforced if they named *untrained* items. After 3 sessions, all youths generalized well to untrained items (Warren, Baxter, Anderson, Marshall, & Baer, 1981).

[1]Stokes and Baer used this label to describe the successive introduction of new stimuli or settings, but separating the two variations seemed more advisable for the current study.
[2]Stokes & Baer (1977) described this strategy as training in one situation and, if that fails to produce generalization, training in all remaining situations of interest. The more literally "sequential" nature of the procedure as described above seems better suited for describing current application of the strategy.

natural setting worked with only 20.5% of the students with severe handicaps.

Approximately the same results were found when strategies were combined. This held true even when we categorized strategies as shown in Table 1 (i.e., setting strategies, consequence strategies, antecedent strategies, other). This meant that, even with the best efforts to come up with strategies, implementing them produced only a 25% to 30% gain in generalization—i.e., from 25% to 50% or 60%. This was not encouraging.

Our previous work with students having severe handicaps led us to suspect that generalization might be improved by carefully observing how the student responded in several new situations, classifying the

performance characteristics, and then systematically matching performance to one or more of the strategies. To evaluate student performance in generalization situations, and to make sure that we record information needed to understand generalization problems, we developed procedures for planning and conducting assessments of student performance in generalization situations. These procedures and a form for recording the nature of the setting and of student performance, are discussed later in this article.

Individualization of decisions about instructional strategies is a hallmark of special education. We hypothesized that matching an individual student's performance to types of strategies would produce more generalization than simply using one strategy with all students, as the researchers had generally done.

Developing Decision Rules

We developed a draft set of Decision Rules for Generalization to identify (a) when special strategies should be implemented to facilitate generalization, and (b) what the nature of that strategy should be.

The decision rules consist of a set of questions, arranged in a sequence. The questions are answered using information about what constitutes acceptable performance (from the IEP objective), actual performance in the target situation, and conditions in the generalization setting. At the conclusion of the process, the nature of the problem the student is experiencing is categorized, and types of strategies appropriate for that type of problem are listed. The teacher then selects one or more of the recommended strategies and drafts intervention procedures for the specific skill and situation involved.

Many of the instructional procedures in use today were derived from instructional procedures designed to teach stimulus discrimination. These procedures are especially powerful in educating students to respond a certain way to a select response class. Discriminative responding, however, impedes generalization unless the student is taught to respond to a class of stimuli (that is, all adults, not just one or two particular people; or all stores, not just one or two).

Antecedent strategies focus on expanding the class of stimuli that the student responds to: they differ primarily in how those teaching stimuli are selected, and in fading or reducing the discriminative power of teacher cues, directions, and prompts. The other major category of strategies focuses on ensuring that events in the natural setting reinforce the target skills.

Validating Decision Rules

The effectiveness of decisions made when these rules were used was evaluated in two studies (Liberty, Haring, White, & Billingsley, 1988; Liberty, White, Billingsley, & Haring, 1988; Liberty, White, Billingsley, Haring, Lynch, & Paeth, 1988). In the first study eight teachers and one occupational therapist from three public school districts volunteered to test the procedures. Each teacher selected between two and six students for the project. Chronological ages at the start of the study ranged from 6 years 10 months to 20 years 7 months. Thirty of the 31 pupils were classified as having severe or profound mental retardation, and each had additional handicapping conditions, including cerebral palsy, seizure disorders, or sensory impairments.

During baseline the teachers wrote IEP objectives specifying the functional skills they wanted to generalize (c.f., Billingsley, 1984). Initial generalization probes showed that 27 skills were already being performed in the target situations, although they were not observed at school. For example, one target skill was the use of two-word phrases by Mark, a 7-year-old boy with severe retardation and autism. Mark was using only one word at school. But the initial generalization probe revealed that Mark was using three- and even four-word phrases at home, at his baby sitter's, and with relatives. The problem here, and for the other skills like this, was arranging generalization from the home to the school—a reverse of the situation we normally consider. It is good news, but hardly surprising, that people with disabilities often "behave better" in the community than in school situations (Baker & Salon, 1986).

Instructional programs were implemented for 77 programs. During baseline, in which no specific generalization strategies were used, 3 of the 77 skills generalized.

Next, teachers were divided into two groups. Both groups were trained in special strategies for generalization, and to probe the student's generalization performance. The second group was further trained to use the rules to match strategies to pupil performance. The total training time for each group was the same—approximately 6 hours over two separate training days.

In the first group, in which teachers used strategies, 75% of the skills generalized.[1] In the "rules" group, 88% of the skills generalized. Of the 12 students who generalized all skills, 8 (66%) were from the strategies + rules group.

The results of this study were encouraging for several reasons. First, more skills generalized when teachers used the rules. And teachers in the strategies group sometimes

[1]Skills were not acquired in 27 programs, and these skills were not included in the analysis of generalization, because acquisition is a prerequisite of generalization.

selected strategies that matched what the rules suggested even though they did not have access to the rules. This indicated that the teachers were making individual decisions about what strategy to use. Thus, it's not surprising that these teachers, with a 75% success rate, did better than the researchers, with an average of 59.5% for a single strategy and 43.9% for combinations (White et al., 1988), and all are still better than the 25% average when no strategy is used (Haring, 1988).

Teachers in both groups, however, often applied several strategies at once, which made it difficult to sort some of the results. Therefore, a second study was conducted to further test the effectiveness of the decision rules when controlled strategies were applied with six students from the first study who were assigned to a new teacher at the beginning of the school year.

Twenty-one skills that the students had not acquired or generalized, had not been previously taught, and the teacher and parent identified, were selected. Generalization probes across settings including home and community, across stimuli, and across persons were conducted to make sure that none of the skills had generalized prior to the study.

Instructional procedures were developed for each skill using the practices generally prescribed for facilitating skill acquisition (e.g., Gaylord-Ross & Holvoet, 1985; Snell, 1983) but avoiding any specific strategies known to facilitate generalization.

Previously validated rules for acquisition were applied until the students met the acquisition aim (Haring, Liberty, & White, 1980, 1981; Liberty, 1972; White, 1986; White & Haring, 1980, 1982). Fourteen of the 21 skills met aim for skill acquisition, in an average of 11 days (range 1—27 days).

Generalization probes were conducted again following acquisition, and only one skill had generalized. This is further confirmation that instruction to promote acquisition is, by itself, generally inadequate to produce generalization.

Next, appropriate generalization strategies for each skill were selected via the decision rules. Appropriate interventions then were made for half of the skills, and 80% generalized after an average of 14 days of strategy implementation. But, for the other half, non-recommended strategies were selected in opposition to the rules. Only 13% of these skills generalized in the same period. When we then put in an appropriate strategy for some, 75% generalized within 7 days of its implementation.

These are encouraging results, because they say that which strategy you use *does* make a difference, and they confirm the notion that the rules can help teachers match strategies to the needs of individual students as demonstrated by their performance problems in generalization situations.

More than 300 students with handicaps and nearly 200 teachers, aids, communication specialists, occupational and physical therapists, and others from more than 150 school districts participated in one of our 31 research studies. It is to them that we owe our understanding of generalization. They also taught us the importance of the initial skill selection, initial assessment procedures, general instructional procedures, and the IEP objectives in achieving generalization.

PROGRAMMING FOR GENERALIZATION

Generalization can occur spontaneously after skill acquisition, but most often it does not. Instead of hoping for generalization, we must actively program for it. This section covers techniques that will help achieve the goal of generalization.

Identify Skills

First, teachers should try to teach skills that are naturally reinforced in the target situation. Skills that function to access available reinforcers are more likely to generalize than skills that do not. Skills that the student is most likely to use in other situations are ones that will help him or her achieve some goal in those situations. Achieving the goal using the skill means that the skill will be reinforced. If the skill is not reinforced, the student will not use it, because it serves no purpose from the student's point of view.

A naturally reinforced skill is one that provides the student a means of gaining reinforcement in a new setting. For example, teaching a student to communicate "yes" and "no" might allow the student to access a whole new set of reinforcers, because this skill fosters natural interactions with others. If the student had no means of acceptable expressive language prior to learning to answer yes/no, generalization might be almost immediate and at a level that accesses sufficient reinforcement to ensure maintenance (Liberty, 1984a: 1984b).

Sometimes skills that are useful to others in the student's environment are labeled as *functional skills*. Sometimes functional skills are difficult to teach, because of the natural reinforcers available for dependency. Functional skills are practical for caregivers, because they can reduce caretaking time, but they may not be naturally reinforcing skills for the student.

Consider: If a student has no independent eating skills, he or she is fed by others, an interaction that results in a considerable and sustained interpersonal interaction, involving verbal communication, gestural communication, and physical touching, as well as gaining the enjoyment of consuming food. The student who eats independently may miss out on the interaction—may sit alone, may have fewer

verbal interactions, and would certainly have reduced proximity, physical contact, and intimate face-to-face interactions. For some, such intense personal contact is more reinforcing than the satisfaction of being able to feed oneself. So the natural reinforcer for independent eating (intense personal contact plus food) is stronger than the reinforcer for independent eating (personal satisfaction plus food). If this is the case, it is *more* functional for the student to get what he or she wants (personal interaction plus food) by being dependent.

When skills are selected, the second consideration is to determine the nature of the available reinforcers and to plan for the difficulty involved when teaching the skill will reduce intimate contact. Although we can devise and implement strategies that will facilitate generalization of functional skills—for example, by changing the nature and density of reinforcement used during acquisition for both self-feeding and for dependent-feeding—these skills must be recognized as significant challenges to achieving generalization.

Skills that are useful in many settings also are more likely to generalize than are skills usable in only one or two settings. For example, communication skills, which are useful in virtually every setting, will generalize more readily than a floor-cleaning skill, which is likely to be limited in usefulness to work and house-cleaning situations. This is related to the number of opportunities the student has to use the skill. Usually, the greater are the opportunities, the more likely it is that generalization will occur and maintain, because the student will have more chances to recognize appropriate antecedents cuing the skill, as well as more frequent reinforcement to maintain it.

Strategies that will facilitate generalization of skills useful in only a few settings, and needed only occasionally, are available. But recognizing this problem prior to programming can allow us to improve instruction before any problem with generalization, by paying specific attention to the number of opportunities that can be provided in any setting, and by strengthening reinforcement available for infrequently used skills.

Assess Skills Prior to Instruction

As we found in our study, even specially trained teachers picked for instruction 27 skills that students had already acquired and already generalized. Yet the teachers thought the students didn't know the skill. Parents have reported that as many as 56% of IEP objectives target skills the student already does at home (Billingsley, Thompson, Matlock, & Work, 1984). The problem obviously wasn't one of acquisition; it was one of generalization—of getting the student to perform previously acquired skills in the school setting.

A second component of assessment relates to maintenance of previously acquired skills. Perhaps as many as 30% of IEP objectives written for students with severe handicaps inappropriately target acquisition of previously mastered skills (Hilton & Liberty, 1986). Instead of acquisition strategies, these skills require recovery and generalization strategies. Instructional time is our most valuable resource, and the most costly. Assessment in instructional situations prior to instruction (c.f., Browder, 1987; Snell, 1987) and in generalization situations (White, 1988) *before* completing the IEP process will identify the type of instructional approach most appropriate: instruction for acquisition and mastery, instruction for maintenance, or instruction for generalization. Assessment for generalization is described here.

Write IEP Objectives for Generalization

After skills have been selected for generalization programming, objectives are prepared for the individualized education program (IEP). This is a critical process, as explained by Billingsley (1984):

> One of the major functions of instructional objectives is that of guidance. By stating the desired educational outcome, objectives guide the teacher in his or her search for appropriate methods of instruction and pupil progress evaluation. . . . The inclusion of generality as an outcome in objectives could increase the likelihood that educators will attend to the need for active generalization programming. (pp. 186—187)

The generalization objective specifies performance, conditions of measurement, and criteria that are appropriate to the generalization situation. The first component of the instructional objective is a *behavioral description* of the skill. Sometimes the description may change over time, especially when the student must be able to modify or physically adapt the response to meet performance expectations of the generalization situation. For example, if the skill is self-feeding, the instructed skill form might be "uses spoon." But, in generalization, self-feeding consists not only of spoons; use of forks, fingers, and chopsticks may all produce acceptable forms of self-feeding in community settings.

The second component of the instructional objective describes the *conditions* under which the skill is to be performed. In IEP objectives for generalization, the conditions are those that exist in the target generalization situation. The conditions are identified during selection of the skill and initial probes. Usually the conditions in the objective specify the differences from instruction, the dimensions across which generalization must occur for the objective to be passed.

The third component of an objective, *performance criteria*, also may differ from the usual standards established for accurate and fluent performance in the classroom, such as 100% correct. Ideally, the requirements of current and future environments are used to set the standards. In most cases the criteria will be the level needed for entry in the target situation (e.g., criteria needed for getting hired), expected by community member (e.g., behavior appropriate to a grocery store), shown by equivalent age peers (e.g., acceptance of toy sharing), or expected by parent (e.g., allowable eating time and manners).

The fourth component of an IEP objective describes *how it will be determined that the student has passed or failed the objective*. Has the student performed the target skill (described in the first component of the objective) under generalized conditions (described in the second component) to generalization criteria (described in the third component)?

In most situations, direct observation of the skill determines when the objective is passed. But observation is not appropriate when:

1. The skill should be done in private, so no one should observe while the student is doing it (getting dressed, toileting).
2. The instructor of the skill is not one of the people who will be or should be present in the target situation, and the people who will be present while the skill is performed will not be trained or able to collect precise performance data (for example, the grocery clerk is not likely to be able to collect typical direct observation data).
3. You cannot observe the skill without affecting the student's performance. For example, if you or another person known to the student is present when he is asked his address, the target condition of being "lost" will not really be duplicated.

In such cases, criteria in a generalization objective will be evaluated as the opinion or judgment of key people as to the quality and acceptability of performance. That judgment is not a comparison of precise performance data with a criterion but, rather, a "yes" or "no" judgment of acceptability made by the key people in the generalization situation. This does not mean that performance criteria (the third component) should be omitted from the objective, because you will have to interview the key people and ask specific questions about performance (to get information for the probe report).

Sample objectives for generalization are shown in Table 2.

Avoid Instructional Strategies That Can Cause Generalization Problems Later

Generalization can be facilitated by being careful that our instructional methods do not cause generalization problems. Problems may arise when specific antecedent and consequent events used during instruction are different from the conditions in the generalization situation. For example, candy, praise, and hugs for every correct response may not occur as natural reinforcers in the generalization situation. If the student generalizes, and candy and hugs don't appear, the student may not do it again.

The same consideration applies to verbal cues, special materials, or other adjustments. For example, if the student has learned that the verbal cue "take a bite" or "sign sandwich" precedes the opportunity to eat, he or she may sit quietly in a restaurant waiting for the cue to occur. If artificial cues and reinforcers are necessary, they should be faded before expecting generalization.

Materials, directions, and feedback should encompass or represent those that are available in the generalization situation, and program reinforcers should be available in the generalization situation. Cues, prompts, and correction procedures should be used sparingly, because they may come to control performance and hinder generalization. Reinforcers should be used minimally because the schedule of reinforcement eventually will have to match that available in the generalization situation.

Before terminating instruction in school, all extraneous instructional cues, prompts, correction procedures, should be faded, and the schedule of reinforcement reduced to approximate that in the generalization situation. Reinforcers used during instruction should be paired with reinforcers available in generalization situations until natural events acquire reinforcing properties.

These strategies will facilitate generalization. But not all plans will be successful for all students. Before implementing additional strategies, the teacher should probe for generalization; if generalization has not occurred, the decision rules should be applied to determine which special strategy to implement.

Probe for Generalization

Because assessing generalization in all applicable target situations, under all the possible conditions, is not possible, performance is measured in a representative sample of the target situations. This sampling is called *probing*.

Probes should be conducted in a sampling of the target situations identified by the ecological inventory. If there are many situations in which the skill might or should prove useful, probes can sample all of those possible, including

TABLE 2
IEP Objectives for Generalization

Skill	Conditions of Performance	Criteria for Passing	Conditions of Measurement
Puts on shirt	Long-sleeved shirts; no tags on shirts; at home, in changing rooms at clubs or parks; with other people or no other people present; with no praise; when already wearing a shirt	Be dressed appropriately by time for breakfast Dress after swimming within 20 minutes	Determined by parent interview As observed by recreation specialist
Says address	Asked by complete stranger in unfamiliar surroundings; no error correction	Stranger understands answer and answer is correct Stranger does not have to repeat question or request	Determined by interview with stranger or observation (if possible)
Buys item in grocery store	New items, new stores	No error items No complaints or negative comments from clerk or other customers about performance Completed within 30 minutes	Determined by observation of purchased items and interview with clerk
Sits up	In different chair; on sofa; on floor; no pillows; at home; at friend's home; natural consequence of watching the surroundings	For 90 minutes at home including at dinner, in kitchen and family room, on at least 2 different pieces of furniture and at a friend's home, for 90 minutes. No "head downs" in either situation.	Observed by parents and sister
Asks for help	In third grade room; cafeteria, gym; auditorium; playground	Less than 25% error rate in assignments Help-asking behavior acceptable to teacher or supervisor	Determined by passing grades in class; and acceptable rating of citizenship on report card

situations in which the skill will be most frequently used, or ones in which there is concern over generalization.

Ideally, the situations selected should collectively represent all the situations in which the skill eventually will prove useful. For example, dressing might be probed in private areas such as the student's own bedroom and in more public situations such as the locker room at the school or local swimming pool, when staying over at a friends, or trying on clothes at a store. Shopping should be probed in stores that differ in size, in price labeling, in displaying, and in check-out systems.

Probe situations should be selected carefully so that the conditions described in the generalization objective match the conditions during the probe. For example, if the objective specifies that a total stranger interact with the student, the school secretary should not do it. Events that occur during probes should be the events that would or could occur *naturally* in the generalization situation. Each condition and event can be planned for its naturalness: time of day, key people, cues and assistance, consequences and feedback.

Probes should be scheduled for the time of day that is natural to performance of the skill. For example, it would not be natural to evaluate use of the communication board by asking 105 questions during a 10-minute period and then never ask another question all day.

Opportunities might have to be created for proper evaluation of a skill. If parents are used to feeding their child, they might be asked to provide at least some opportunity for the child to eat independently. Or perhaps special equipment, such as a communication board or walker, might be sent to the new situation before the skill is assessed.

If the criteria in the generalization objective specify that the student perform the skill more than one time, several different probes would be conducted over several days,

rather than setting up unnatural repetitious situations. For example, it is not natural to have a student get dressed, undressed, and dressed again several times in a row.

People should be included who would naturally be in the target situations in the probe situations, and as the primary cue providers, stimuli, "reinforcers" in conducting the probe. For example, most dressing tasks will be performed in the privacy of one's own home. If other people are involved to assist or are "just around," such as a sibling who shares the same room, they are likely to be members of the family. It would not be natural for an unknown person or even the student's teacher to invade the student's bedroom to conduct a dressing probe.

For probing communication skills, anyone might ask a student a question. In probing communication, therefore, a real mix of familiar and unfamiliar people would be appropriate. But the questions should be ones that naturally flow in a conversational sequence, and the nature of the question should be appropriate to the setting. Almost anyone might be around when a student is eating in a public place, or even in the home if the family has a visitor.

Probes should be planned so that the natural cues or signals exist within the environment to tell the pupil when it is appropriate or inappropriate to behave in a certain way or to perform a skill. Especially in community situations, natural cues and assistance should be provided by the "community" people, not by the teacher or parent. At home, parents and siblings can provide cues and assistance. At some events, peers will provide these. It is hardly ever appropriate for the student's teacher or instructional aide to interact with the student during a probe situation. Their role should be to plan the situation, observe the student, and record performance or interview key people about performance.

For example, getting dressed is naturally signaled by getting out of bed in the morning, or after a shower or bath. The probe should be planned to evaluate how the student does when given the opportunity to demonstrate the skill given only those natural conditions. If the student does not begin to get dressed in a reasonable period, however, it is also natural for a parent or roommate to nag a bit ("Come on, it's time to get dressed"). Therefore, it is acceptable to expect that type of cue.

For another example, many natural cues could control requests for food at a fast-food restaurant, including moving to the front of the line and hearing the person behind the counter say something like, "May I help you?" or "What would you like?" It also might be natural for a waitress to ask something very specific such as, "Would you like a hamburger?" or for a friend or parent to provide alternatives: "Would you like a hamburger or chicken chunks?" It would not be natural for a person to hold up a picture card for the student to read, or to shout at the student, "*Hamburger*, say *hamburger* !"

Pointing to a picture on a communication board in response to a question should be prompted solely by the question itself. People who understand the purpose of a communication board, however, might well add extra prompts such as, "Point to a picture" or "Can you tell me by using your picture board?" It would be especially appropriate for a parent or friend to add cues such as these. It would not be natural for a virtual stranger to take the pupil's hands and make the student touch each picture in turn while chanting, "Show me the answer, point..."

Walking should be prompted simply by the desire to get somewhere. Given a choice of walking, crawling, or being carried—if all three modes of locomotion are possible—the best probe for walking would be to simply see which way the student chooses to travel. To ensure proper motivation, an explanation should be given for going to the destination (e.g., "Come to the kitchen and I'll fix you a snack").

Key people should also provide natural consequences and feedback, or natural reinforcers should be found in the setting. If a skill is to be truly useful, it must be maintained by natural consequences and feedback. For example, the consequences for dressing are usually warmth and the avoidance of stares from other people. Children are sometimes also threatened with cost contingencies (e.g., "You won't get any breakfast unless..."), and they might also be praised if they get dressed nicely. It is not natural, however, to consequate each correctly performed step in a dressing sequence with a bit of Fruit Loops, or to follow errors with a physical mandate, an undoing of the step, and request for the student to try again. A hurried parent is much more likely to consequate errors by scowling and doing it himself or herself.

The consequence for crossing the street is usually to get closer to some destination. The reason for street crossing could be explained (e.g., "Let's go to the park" or "Why don't we get an ice cream cone"), but it would not be natural to have someone cross a street just to turn around and cross back.

The natural consequence for eating is the pleasure of food. The results probably will be different if the food is something the student likes versus something he or she does not. Occasional praise for polite manners may be natural, as long as it comes from a familiar person, rebukes for slopping or poor manners also might be in order.

If planning for a natural probe doesn't seem reasonable, the skill should be reevaluated. Perhaps associated skills must be developed before skill-use probes make sense, or maybe the skill is one that is useful only in the special school situation and should not be probed. Or perhaps the probe should be delayed until after the student is independent in the instructional setting.

Performance in the probe situation can be recorded and evaluated by direct observation of the teacher or by someone trained to measure precisely, or it can be done by carefully interviewing people in the target situation about the student's skill performance.

Direct observation of the skill is the most reliable and objective method of collecting information about generalization. The observer systematically records the events that occur in the generalization situation and what/how the student performs, using the Probe Record Form, given in Table 3.

Direct observation should *not* be used if the skill should occur in private, or if the observer will be intrusive or disrupt the normal activity of the generalization situation, or if it is not possible to train a reliable observer. An alternative way to evaluate skill use is to interview one or more people who interact with the student in the target situation about what has occurred. This method appears to be much easier and less expensive than direct observation, but it is also more difficult to get reliable information, as well as to get an objective report on the probe conditions needed to determine an appropriate intervention strategy.

Questions should be sufficient to complete the Probe Report Form. To learn if a child is toilet-trained, for example, one might ask parents how many times they had to clean up after accidents during the last few days. Accidents are hard to miss, so parents could generally be relied upon to know. Of course, if the parents have the child on a schedule, going to the bathroom at regular intervals and helping the child undress and eliminate, the parents might not know if the child was already trained, and they would have to be asked to give the child more opportunities to act independently before an accurate probe could be completed.

In another probe, if one target situation is the school playground, asking the playground supervisor about the student's behavior is an easy method of collecting information. In the community, for example, after a student has made a purchase and left a store, the clerk might be asked whether any difficulty had arisen in the transaction and whether the student has used certain "key behaviors" he had been taught.

Before relying on any report, it must be ascertained whether the opportunity to use the skill exists. Parents who have become accustomed to feeding their child may not provide opportunities for self-feeding; thus, their report on how the student is doing may not be accurate or representative. A student who has never responded in the past to peers' invitations to play may not be re-invited. Therefore, asking the playground supervisor how the student responds to play invitations may result in a report that the student doesn't play rather than a report that the student isn't invited to play.

If the skill or the consequences of failing to use the skill are dramatic and hard to overlook, people are much more likely to give accurate reports. If a child had always scooted on the floor to get around and suddenly started to walk, that would be hard to overlook. On the other hand, if the skill is rather subtle, people simply might not notice if it occurs or not. For example, most parents really don't know if their young children use a palmar grasp or a pincer grasp, even if they know the difference between the two grasps.

It is best to interview the key person in person or by telephone. It then will be possible to follow up immediately on unexpected statements and to engage in a conversation to elicit the specific information desired. Before beginning the interview, a list of questions should be prepared, based on the Probe Report, to make sure that all of the information about conditions and performance is solicited. Nothing is wrong with ad-libbing somewhat, but a clear idea of the critical issues to be addressed is important.

To choose the appropriate strategy, accurate probe reports of performance are needed for using the decision rules. In the long run, the time spent carefully evaluating performance will be returned. In contrast, poor reporting will result in an incorrect strategy, which will be a big waste of time. Therefore, the time spent in providing the most meaningful information possible will be time well spent.

Probe frequency will depend on how often you need the information, the number of different target situations, and the time and resources available for probing. The minimum frequency is to first probe after the student has met aim in the educational situation; then, subsequent probes would be conducted after the generalization strategies have been implemented, when the aim for performance during that intervention has been reached. This minimum sequence is:

1. Prior to IEP objective, probe in a sample of target situations (First Probe Set).
2. After aim is met in instructional situation, conduct Second Probe Set.
3. If generalization aims have not been achieved, use rules to select strategy, and then implement strategy.
4. After aim is met again, under conditions established by strategy interventions, conduct Third Probe Set.
5. Repeat steps 3 and 4, using different strategies as required, until generalization is achieved.

If you are able to conduct probes more frequently, you would be able to make adjustments earlier.

Apply Decision Rules and Strategies

Once you have completed the probes, apply the Decision Rules for Generalization. These rules are presented as a sequence of questions, shown in Table 4. Information about student performance and probe events is used to answer

TABLE 3
Probe Record Form

Generalization Probe Report

Student: Date:

IEP Objective:*

Student Performance*

(1) Who provided the information on student performance?

(2) Was the skill directly observed for this probe?

(3) How many opportunities did the student have to perform the skill?

(4) When were the opportunities provided?

(5) Did the student perform the target skill?

(6) Did the student display inappropriate behavior or a previously learned skill instead of, or in addition to, the target skill?

(7) Did the student fail to respond?

(8) Describe the student's performance:

Probe Situation

Reinforcers Accessed by Student*

(9) ( ) Were natural reinforcers for performance of the skill.
(10) ( ) Were not natural reinforcers for the skill.
(11) ( ) Included both natural and not natural reinforcers.
(12) ( ) Person reinforced inappropriate behavior, other behavior, or nonresponse, with reinforcer which should have been available for performance of skill.
(13) ( ) Student accessed natural reinforcer by doing something else.
(14) ( ) Person attended to other behavior.
(15) ( ) Person completed the skill task.
(16) ( ) Person physically assisted the student to complete the skill task.
(17) ( ) Person provided another reinforcer.
(18) ( ) Student did not access reinforcers.
Describe what happened:

Stimuli Which Triggered the Opportunity to Perform the Skill*

(19) ( ) Were natural stimuli which occurred without need for intervention.
(20) ( ) Were naturally provided by persons in the generalizationsituation.
(21) ( ) Were not natural stimuli for the skill.
(22) ( ) Included both natural and not natural stimuli.
(23) ( ) Included training stimuli.
(24) ( ) Other:

Conditions Which Differed From Instruction (Check all that apply)*

(25) ( ) Materials or objects. Describe:

(26) ( ) Setting. Describe:

(27) ( ) Probe manager or persons who interacted with student.
(28) ( ) Person cued the student what to do.
(29) ( ) Person did not cue the student what to do.
(30) ( ) Person encouraged the student.
(31) ( ) Person did not encourage the student.
(32) ( ) Person physically assisted or physically prompted the student.
(33) ( ) Person did not physically assist or prompt the student.
(34) ( ) Person reinforced as often.
(35) ( ) Person reinforced less frequently.
(36) ( ) Student's performance criticized/corrected more frequently.
(37) ( ) Student's performance criticized/corrected less often.
( ) Person provided feedback on performance, especially errors or mistakes.
(38) ( ) Person did not provide feedback.
(39) ( ) Person praised the student during/after skill performance.
(40) ( ) Person did not praise the student.
(41) ( ) Other:

*Answers needed to apply Decision Rules.

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each question, as described in the "Procedures" column. The answer determines whether to continue in the sequence or to stop (because the nature of the decision to be made has been identified).

It will be necessary to develop an instructional plan incorporating the selected strategy or strategy combination. Depending on the strategy selected, it also may be necessary to train people in the new procedures; to arrange transportation; to adapt, construct, or purchase materials; to survey a number of settings; to identify natural reinforcers; and so forth. For additional information, see Liberty and Billingsley (1988).

The new strategy should be used until the student has reached desired performance levels or the next generalization probe is conducted. A new generalization probe should be done while the strategy is in effect, at the aim date, or when the student has reached desired performance levels in instruction.

CONCLUSION

Enough is known now to state with adequate confidence that, as a field of study, we do have the beginnings of an explicit technology of generalization. Each of the following principles can be used to increase the probability that individuals will generalize new skills across persons

TABLE 4
Decision Rules for Generalization

Question	Procedures	Answer	Next Step/Decision
A. Has skill generalized at the desired level in all target situations?	Probe for generalization in all desired situations, then compare performance with criteria (IEP objective).	yes	**1** *Successful Instruction* Step ahead to a more difficult level of skill/Choose a new skill to teach *Exit* sequence
		no	*Continue* with question B.
B. Has skill been acquired?	Compare performance in instructional situation with criteria for acquisition or performance levels specified in IEP objective. Answer yes if student has met performance levels in training situation but not in generalization.	yes	*Continue* with question C.
		no	**2** *Skill Mastery Problem* Continue instruction *Exit* sequence
C. Is generalization desired to only a few situations?	Analyze function of skill in current and future environments available to student.	yes	*Continue* with question D.
		no	*Continue* with question E.
D. Is it possible to train directly in those situations?	Are all situations frequently accessible for training so that training time is likely to be adequate to meet aim date in IEP objective?	yes	**3** *Limited Generalization Situations* Train in desired situation/Train sequentially in all situations (i.e., sequential modification) *Exit* sequence
		no	*Continue* with questions E.
E. Is the student reinforced even though he/she does not do the target skill?	Observe student behavior during probes and note events which follow appropriate, inappropriate, target, and nontarget skills. Determine if those events which should follow the target skill, or have been shown to reinforce other skills, are presented to the student, or available even if he/she does not respond, or if he/she does the skill incorrectly, or if he/she misbehaves.	yes	*Continue* with question F.
		no	*Continue* with questions H.
F. Does the student fail to respond and is reinforced?	Answer yes only if the student is reinforced for doing nothing (i.e., accesses reinforcers for "no response").	yes	**4** *Noncontingent Reinforcer Problem* Alter generalization contingencies
		no	*Continue* with question G.
G. Is the behavior reinforced by the same reinforcers as the target skill?	If the misbehavior or other behavior accesses same reinforcer available for target skill, answer yes.	yes	**5** *Competing Behavior Problem* Increase proficiency/Amplify instructed behavior/Alter generalization contingencies *Exit* sequence
		no	**6** *Competing Reinforcer Problem* Alter generalization contingencies *Exit* sequence

TABLE 4 (continued)
Decision Rules for Generalization

Question	Procedures	Answer	Next Step/Decision
H. Did the student generalize once at or close to criterion performance levels and then not as well on other opportunities?	Consider performance in current and past probes. Compare student performance for each response opportunity with performance level specified in objective. If near criterion performance occurred on the first response opportunity, and performance was poor or nonexistent after that, answer yes.	yes	**7** *Reinforcing Function Problem* Program natural reinforcers/Eliminate training reinforcers/Use natural schedules/Use natural consequences/Teach self-reinforcement/Teach to solicit reinforcement/Reinforce generalized behavior/Alter generalization contingencies *Exit* sequence
		no	*Continue* with question I.
I. Did the student respond partially correctly during at least one response opportunity?	Analyze anecdotal data and observation notes from probe.	yes	**8** *Discrimination Function Problem* Vary stimuli: Use all stimuli/Use frequent stimuli/Use multiple exemplars/Use general case exemplars *Exit* sequence
		no	*Continue* with question J.
J. Did the student fail to perform any part of the target skill?	Analyze student performance during probe situation.	yes	**9** *Generalization Training Format* Increase proficiency/Program natural reinforcers/Use natural schedules/Use appropriate natural stimuli/Eliminate training stimuli *Exit* sequence
		no	*Stop*. You have made an error in the sequence. Begin again at Question A.

Note. From "Decision Rules and Procedures for Generalization" (p. 182—183) by K. A. Liberty, 1988, in N. Haring (Ed.), Generalization for Students with Severe Handicaps: Strategies and Solutions, Seattle, WA: University of Washington Press. Copyright 1988 by the Washington Research Organization. Reprinted by permission.

and materials, across stimuli and settings: using naturalistic tactics to teach skills in natural settings, selecting naturally reinforced skills, selecting skills that are useful in many situations and are used frequently, developing instructional objectives that include generalization, carefully selecting skills for acquisition, probing for generalization, applying strategies to facilitate generalization, and using decision rules and strategies to solve generalization problems.

In addition to skill acquisition, the conditions that must be met in any successful instructional sequence are: (a) teach the skill until it is performed smoothly and easily as well as accurately, (b) provide opportunities to practice the skill in natural settings, and (c) make sure the skill has functional value in the natural settings and that its performance results in a satisfying experience. Omitting any one point in the chain probably will be sufficient for generalization to fail.

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