

# Project Spectrum: An Innovative Assessment Alternative

By evaluating young children's strengths in many domains, not just language and logic, the Spectrum battery promises to give all children a chance to shine.

**I**t's free choice time in the afternoon 4-year-olds' classroom at the Eliot-Pearson Children's School in Medford, Massachusetts. The class is participating in Project Spectrum, an innovative approach to assessment in early childhood. Hallie, not quite 4 years of age, is once again roaming from activity to activity, finding it difficult to concentrate on a task for longer than five minutes at a time. Her ever-patient teacher first tries engaging her in the art table project, then in experimenting with the siphons at the water table, and finally in playing hospital at the dramatic play area, all to little avail. Hallie is easily distracted; she becomes sillier as the hour wears on, making increasingly poor eye contact with the teacher and speaking in nonsense words.

With 20 minutes left until group time, Hallie's turn comes up for the week's Spectrum activity: the assembly task. This task involves taking apart and reassembling two food grinders. Successful completion of the activity depends on a combination of fine motor skills with visual-spatial and problem-solving abilities. Hallie's eyes light up expectantly upon seeing the first grinder, and she immediately touches the main fastener, which loosens the handle and inner mechanism. Within minutes, the grinder is com-

pletely disassembled, and Hallie begins to put the pieces back together, carefully figuring out the correct direction in which to turn each screw. She adopts a trial-and-error approach, her feet swinging excitedly up and down from her chair whenever she succeeds. She remains focused, persistent, and methodical throughout—correcting her own mistakes, oblivious to the rest of the class.

This anecdote illustrates the power of the Spectrum approach to assessment. Spectrum began in 1984 at Harvard and Tufts Universities as an attempt to reconceptualize the traditional linguistic and logical/mathematical bases of intelligence. Our first four years of research centered on identifying young children's distinctive cognitive and stylistic profiles. In addition to assessing linguistic and mathematical abilities, the Spec-



*In assessing young children's abilities, Project Spectrum takes individual differences very seriously. In the Assembly Activity, for example, a child with strong mechanical ability has an opportunity to exhibit her dexterity skills.*

*Photograph by  
Constance Wolf*

trum assessment battery examines mechanical, spatial, bodily, musical, social, and scientific abilities as well (see fig. 1). In a political climate that places increasing pressure on educators to extend formal instruction downward and embrace a narrow view of scholastic readiness, Spectrum offers a developmentally appropriate alternative based on a broad view of the mind.

### A Rich Classroom Environment

The theoretical foundation of the project stems from Howard Gardner's (1983) theory of multiple intelligences and David Feldman's (1980) theory of development in non-universal domains. Although many early childhood educators still think in terms of children's progressing through broad, undifferentiated stages of universal development, Spectrum was designed to recognize variation in both children and areas of activity. Thus, the Spectrum model identifies domain-specific strengths in areas often not included in many Piagetian or neo-Piagetian approaches to education. Spectrum is based on the assumption that every child has the potential to develop strength in one or several content areas and that it is the responsibility of the educational system to discover and nurture these proclivities. Rather than building around a test, the Spectrum approach is centered on a wide range of rich activities; assessment comes about as part-and-parcel of the child's involvement over time in these activities.

As Figure 1 indicates, the Spectrum measures range from relatively structured and targeted tasks (for example, in the number and music domains) to less structured measures and observations (for example, in the science and social domains). These measures form one part of a rich classroom environment that is equipped with engaging materials, games, puzzles, and learning areas. The learning areas enable children to make initial explorations of materials related to the domains assessed by Spectrum, as well as offering follow-up activities. For example, after the storytelling task, children can be asked to create their own storyboards at the art area. The assessment activities are administered throughout the school year. Documentation takes a

variety of forms, from score sheets and observation checklists to portfolios and tape recordings.

### A Look at Spectrum's Facets

Distinctive features of the Spectrum assessment system include:

**Fig. 1. Areas of Cognitive Ability Examined in Project Spectrum**

#### Numbers

*Dinosaur Game:* Measures a child's understanding of number concepts, counting skills, ability to adhere to rules, and use of strategy.

*Bus Game:* Assesses a child's ability to create a useful notation system, perform mental calculations, and organize number information for one or more variables.

#### Science

*Assembly Activity:* Measures a child's mechanical ability. Successful completion of the activity depends on fine motor skills and visual-spatial, observational, and problem-solving abilities.

*Treasure Hunt Game:* Assesses a child's ability to make logical inferences. The child is asked to organize information to discover the rule governing the placement of various treasures.

*Water Activity:* Assesses a child's ability to generate hypotheses based on his or her observations and to conduct simple experiments.

*Discovery Area:* Includes year-round activities that elicit a child's observations, appreciation, and understanding of natural phenomena.

#### Music

*Music Production Activity:* Measures a child's ability to maintain accurate pitch and rhythm while singing and his or her ability to recall a song's musical properties.

*Music Perception Activity:* Assesses a child's ability to discriminate pitch. The activity consists of song recognition, error recognition, and pitch discrimination.

#### Language

*Storyboard Activity:* Measures a range of language skills including complexity of vocabulary and sentence structure, use of connectors, use of descriptive language and dialogue, and ability to pursue a storyline.

*Reporting Activity:* Assesses a child's ability to describe an event he or she has experienced with regard to the following criteria: ability to report content accurately, level of detail, sentence structure, and vocabulary.

#### Visual Arts

*Art Portfolios:* The contents of a child's art portfolio are reviewed twice a year and assessed on criteria that include use of lines and shapes, color, space, detail, and representation and design. Children also participate in three structured drawing activities. The drawings are assessed on criteria similar to those used in the portfolio assessment.

#### Movement

*Creative Movement:* The ongoing movement curriculum focuses on children's abilities in five areas of dance and creative movement: sensitivity to rhythm, expressiveness, body control, generation of movement ideas, and responsiveness to music.

*Athletic Movement:* An obstacle course focuses on the types of skills found in many different sports such as coordination, timing, balance, and power.

#### Social

*Classroom Model Activity:* Assesses a child's ability to observe and analyze social events and experiences in his or her classroom.

*Peer Interaction Checklist:* A behavioral checklist is used to assess the behaviors in which children engage when interacting with peers. Different patterns of behavior yield distinctive social roles such as facilitator and leader.

1. *Blurring the line between curriculum and assessment.* By gathering information over time in the child's own environment, Spectrum effectively blurs the traditional division between curriculum and assessment. For example, teachers collect children's artwork in portfolios and observe bodily-kinesthetic abilities through a bi-weekly creative movement session. The traditional test setting of a small room with an unfamiliar examiner administering timed and standardized instruments, in the Spectrum view, provides too narrow and skewed a view of the child. In the Spectrum tasks, children's skills are integrated, rather than isolated. Thus, as we saw earlier, the assembly activity engages Hallie in an applied and meaningful task presented as part of her preschool curriculum.

2. *Embedding assessment in meaningful, real-world activities.* Rather than just focusing on skills useful in the school context, Spectrum uses the concept of adult *endstates* to focus its assessments on abilities relevant to achieving significant and rewarding adult roles. Examples of endstates include *naturalist*, *salesperson*, *singer*, *dancer*, and *social worker*. Thus, in the language domain, Spectrum examines a child's ability to tell stories or provide a descriptive account of an experience—valuable skills for novelists and journalists—rather than his or her ability to repeat a series of sentences. For Hallie, the applicable endstate is *mechanic*. In contrast to many standardized assessments, which might have Hallie copy shapes or block patterns, Spectrum provides her with a real machine to work on. This grounding of assessments in real-world activities ensures that the areas addressed are likely to be meaningful to the child, the teacher, and the child's family.

3. *Using measures that are "intelligence-fair."* Rather than viewing all abilities through the window of language and logic, as most standardized tests do, Spectrum attempts to tap abilities directly, via their own particular medium. In the above anecdote, Hallie works directly with simple mechanical objects, rather than answering questions about how machines work. The music perception and production tasks of the assessment employ Mont-



*The ability to perform mental computations is one of several skills the Bus Game enables a teacher to evaluate. When teachers see children's strengths in any area, they can then build on those strengths in developing other areas.*

essori bells and simple songs, while the movement activities elicit both athletic and creative movement.

4. *Emphasizing children's strengths.* In contrast to many educational approaches, particularly those used with children at risk for school failure, the Spectrum assessment approach seeks to identify children's areas of strength and to construct their education as much as possible around those domains of competence. Giving children experience in their areas of strength might not only increase their sense of self-esteem but suggest ways to address areas that are not as strong. For example, to boost Hallie's language skills, she could be asked to dictate

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instructions for disassembling a grinder or to tell a story about a machine she might invent.

5. *Attending to the stylistic dimensions of performance.* In order to capture fully a child's approach to a task, we soon discovered it was important to look not only at a child's cognitive skills but at certain stylistic features as well. "Working styles" describe how a child interacts with the materials of a domain, such as his or her persistence, attention to detail, and level of confidence (see fig. 2). While some children exhibit the same working style across domains, others have styles that are much more content-specific. Such information has important implications for designing educational inter-

ventions. In Hallie's case, she revealed the capacity to become extremely focused and reflective when working in her area of strength.

In the Spectrum approach, all of the information collected on a child is compiled at year's end into a "Spectrum Profile": a short description, written in nontechnical prose, of the child's participation in the project's activities. The report addresses each child's areas of strength, either relative to himself or herself or to the child's peer group. Because of our belief that psychologists spend too much time ranking children and not enough time trying to help them, we also give concrete suggestions for follow-up activities that can be carried out at home or

*Photograph by Paul Trotter*

**Fig. 2. Stylistic Features Examined in Project Spectrum**

Child is:

- easily engaged/reluctant to engage in activity
- confident/tentative
- playful/serious
- focused/distractable
- persistent/frustrated by task
- reflective about own work/impulsive
- apt to work slowly/apt to work quickly

Child:

- responds to visual/auditory/kinesthetic cues
- demonstrates playful approach
- brings personal agenda/strength to task
- finds humor in content area
- uses materials in unexpected ways
- shows pride in accomplishment
- shows attention to detail/is observant
- is curious about materials
- shows concern over "correct" answer
- focuses on interaction with adult
- transforms task/material



in the community. A "Parent Activities Handbook" suggests home activities that use inexpensive and easily acquired materials (for example, different ways to grow seeds, measuring and counting games, and so on).

### Early Research Results

Hallie's class was one of two Eliot-Pearson preschool classrooms that participated in the initial phase of Spectrum research. This phase focused on assessing individual children's cognitive and stylistic strengths. Preliminary results from the two classrooms suggest that the Spectrum system does indeed identify distinctive intellectual profiles in young children<sup>1</sup> (for a full report, see Gardner and Hatch 1989, Krechevsky and Gardner 1990). We also found some evidence that a child's strength in one area might facilitate performance in another. For example, one child demonstrated exceptional storytelling ability, yet generally refused to participate in creative movement. However, she moved with unusual expressiveness when presented with storyboard props as a stimulus during one of the movement sessions.

With regard to working styles, most children seemed to exhibit domain-specific configurations. Many were reflective and attentive to detail only in their areas of strength. However, some children demonstrated a more general working style, which at times worked to their disadvantage. For example, one boy approached every activity with his own agenda of ideas. Although in the less structured environment of the class he conducted many compelling experiments to test his hypotheses, he was unable to adjust to more structured task situations.

Preliminary follow-up data on children in the original Spectrum class indicate that strengths and working styles remained roughly constant one to two years later. Sometimes the particular combination of a child's areas of strength and working style determined whether or not a strength would re-emerge. One girl, who in preschool constantly sought the positive regard of her peers, spent a lot of



*A teacher observes her student's language skills and working style during the Storyboard Activity. Styles may be consistent across domains or content-specific.*

time at the writing table because her language abilities were advanced for her age group. However, because she was not the most able in her group the following year, she devoted the majority of her free time to art activities. Thus, the language abilities identified earlier were less likely to resurface and develop.

Responses from parents indicated that the areas where they were most surprised to learn of strengths included music perception, mechanical ability, and creative movement. A number of parents in the follow-up found it very useful to have a written profile to which they could compare more recent views of their child. The area parents were most likely to encourage at the one-year follow-up was drama, perhaps because they saw it as an especially effective way to combine ability in the language, social, and movement domains.

Currently, the Spectrum approach is

being modified for use with children in kindergarten and 1st grade and for children who are more at risk for school failure. A broad-based Spectrum curriculum is being implemented in selected 1st grade classrooms with a large at-risk population in Somerville, Massachusetts. Children are being encouraged to develop their areas of strength in an apprentice-type model and to bring these strengths to bear on the established curricular goals of the 1st grade. We are administering pre- and post-tests to determine change in children's academic achievement, self-esteem, attitude toward school, and school adjustment.

### Their Place in the Sun

It may be important at this point to outline the disadvantages and the advantages of Spectrum. First, a pluralized model of intelligence runs the risk that achievement-oriented parents will push their children in 15 areas,

instead of a few. Second, parents and teachers may be tempted to track a child prematurely into pursuing his or her area(s) of strength. Finally, parents outside the mainstream culture may not be as concerned with their children's performance in domains not valued by the traditional culture.

Nevertheless, the approach offers a number of benefits. The Spectrum battery exposes children to more domains than are typically included in early childhood assessments or curriculums. Spectrum also actively involves children in the assessment process. They collect their work for the art portfolios and tape their own stories and songs. Time is also set aside for children to reflect on the activities in general. The Spectrum approach can be used on many levels: as assessment, as curriculum, or as a powerful philosophical framework through which to view children and their particular sets of strengths and working styles. In fact,

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*During the Dinosaur Game, a teacher considers her student's use of strategy, grasp of number concepts, and other skills. When assessment is part of natural activities, a child's skills can be seen in an integrated, real-world context.*

the approach is as much a framework and set of ideas as it is a discrete program. Spectrum is currently being adapted for a variety of purposes by both researchers and practitioners in the field.<sup>2</sup> Because the approach takes individual differences seriously, it enables teachers to accommodate diverse populations and to individualize their curriculums. Moreover, because of its provision of many ways to demonstrate excellence, including ways that go beyond conventional scholastic success, Spectrum may be particularly suited for at-risk children. At best, the Spectrum approach promises to increase the chances for all children to find their place in the sun. □

<sup>1</sup>Because of the small sample size, the results reported in this article should be regarded as tentative.

<sup>2</sup>We encourage these efforts and are interested in hearing from people who have tried to implement Spectrum. However, for reasons of logistics and limited resources, at present we cannot provide much in the way of support.

#### *References*

- Feldman, D.H. (1980). *Beyond Universals in Cognitive Development*. Norwood, N.J.: Ablex.
- Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences*. New York: Basic Books.
- Gardner, H., and T. Hatch. (November 1989). "Multiple Intelligences Go to School: Educational Implications of the Theory of Multiple Intelligences." *Educational Researcher* 18, 8: 4-10.
- Krechevsky, M., and H. Gardner. (1990). "The Emergence and Nurture of Multiple Intelligences: The Project Spectrum Approach." In *Encouraging the Development of Exceptional Skills and Talents*, edited by M.J.A. Howe. Leicester, U.K.: The British Psychological Society.

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