Measuring Growth and Development

Investigators at the Universities of Minnesota, Kansas, and Oregon launched the Early Childhood Research Institute on Measuring Growth and Development (ECRI-MGD) in October, 1996, to produce improved methods for continuously measuring the skills and needs of individual children with disabilities (or at-risk for developing a disability) from birth to eight years of age.

ECRI-MGD’s Purpose

One important reason for this project lies in the ever-increasing demands for greater levels of accountability from early childhood practitioners, represented in part by Goal 1 of the National Education Goals (i.e., by the year 2000, all children in the United States will start school ready to learn.) and by the Head Start Reauthorization Act of 1998, among other sources. Without such accountability, national constituencies have difficulty gauging how well early childhood practitioners are achieving programmatic objectives and how much more can be done to optimize services and child outcomes. This is especially true for young children with disabilities, who have been traditionally excluded from typical measures of educational accountability.

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developmental information available to families as their young children receive educational services. While roughly 85% of the parents who responded to our survey attached great importance to information about their children’s development both before and after the children enrolled in school, only 45% of them indicated the information they received qualified as “very adequate.” In a similar vein, 78% of the professionals who responded to our survey felt clear, easy-to-understand information about individual children’s development was “very important” to share with families. However, only 29% of them indicated they had “very adequate” information to share.

Another reason for initiating this project centers on the current state of early childhood assessment and the need for tools to monitor the growth of young children continuously toward important, long-term outcomes. Instruments are available that allow educators to screen young children’s skills to determine if additional assessment is needed. Other instruments assist educators in determining a child’s eligibility for special education services. Once a child qualifies for special education services, additional assessment tools may be used to generate relatively short-term goals by identifying specific skill deficits in need of intervention. However, none of these instruments have been...
designed to monitor young children’s developmental growth efficiently over both short and long periods of time as these children progress toward broad, valid outcomes, such as fluency in expressive communication, proficiency in reading, and skill in positive social interaction. Additionally, many early childhood assessment instruments have been developed without paying enough attention to use with the diversity of the nation’s young children who receive educational services, including those with disabilities, those who speak a language other than English as their first or primary language, and those who live in socioeconomically difficult circumstances. Staff of ECRI-MGD seek to create an assessment system that will fill an unfilled “niche” in the toolbox of early childhood assessors, measuring a wide range of young children’s growth toward general outcomes in efficient yet effective ways.

ECRI-MGD’s Scope

Work on ECRI-MGD has focused on three major elements, each of which will be described in more detail: (a) a set of general growth outcomes describing important developmental progressions for children between birth and age eight; (b) growth and development indicators for monitoring the progress of individual young children (i.e., individual growth and development indicators, or IGDIs); and (c) “Exploring Solutions” Assessments (i.e., ESAs) allowing families and early childhood and early elementary educators to identify features of classroom and home settings they can change to improve children’s developmental outcomes.

These elements are used together as part of an ongoing, decision-making model to enable educators to meet the needs of individual children. In this model, we use general outcomes and IGDIs to monitor a child’s developmental growth and decide if we need to intervene in any way to boost the child’s trajectory. We use ESAs to generate options for intervening on the child’s behalf and deciding which options to implement as potential solutions. Finally, we continue to use outcomes and IGDIs to evaluate attempted solutions and monitor the child’s ongoing developmental progress.
General Growth Outcomes

In the project’s first two years, we relied on current research to craft a set of “common” developmental outcomes describing children’s growth between birth and eight years of age, and then conducted a mail survey of parents and education professionals to determine the accuracy and acceptability of these outcomes. It was important to us to craft these outcomes with four principles in mind —

1. These outcomes should describe children’s growth from birth through age eight using the same terms, even if specific behaviors differed across the age range. For example, we know an infant points to objects to “tell” an adult she wants it. A preschooler may simply ask an adult to give it to him. Although the behavior differs between the infant and preschooler, both of them use communication to convey their desire to obtain the object.

2. It was important to strike a balance between outcomes that globally described young children’s growth from birth through age eight while maintaining a manageable number of statements. Too many specific statements would make it impossible to design an efficient system of indicators to monitor children’s growth toward the outcomes. By shaping broadly stated outcomes, we facilitated creation of indicators that both described children’s development across the entire early childhood range and would likely not overwhelm teachers and others who eventually use the indicators.

3. We crafted outcomes to capture children’s growing proficiency in reaching developmental endpoints rather than just the endpoints themselves. That is, we did not want to identify skills only an eight-year-old child could perform, even if those skills represented the long-term outcomes we expect all young children to attain. Instead, we wanted to make sure these outcomes described children’s changes across time, facilitating the creation of indicators sensitive to growth.

4. It was important to craft outcomes that could be measured with indicators directly administered to children or their families, including observations of...
General Growth Outcomes for Children Between Birth and Age Eight

The child uses language to convey and comprehend communicative and social intent

• Child uses gestures, sounds, words, or sentences (including sign language and augmentative and alternative communication) to convey wants and needs or to express meaning to others.
• Child responds to others’ communication with appropriate gestures, sounds, words, or word combinations (including sign language and augmentative and alternative communication).
• Child uses gestures, sounds, words, or sentences (including sign language and augmentative and alternative communication) to initiate, respond to, or maintain reciprocal interactions with others.

The child takes responsibility for his/her behavior, health, and well-being, even in the face of challenge or adversity.

• Child engages in a range of basic self-help skills, including but not limited to skills in dressing, eating, toileting/hygiene and safety/identification.
• Child meets behavioral expectations (such as following directions, rules, and routines) in home, school, and community settings.
• Child appropriately varies or continues behavior to achieve desired goals.

The child negotiates and manipulates the environment.

• Child moves in a fluent and coordinated manner to play and participate in home, school, and community settings.
• Child manipulates toys, materials, and objects in a fluent and coordinated manner to play and participate in home, school, and community settings.

The child initiates, responds to, and maintains positive social relationships.

• Child interacts with peers and adults, maintaining social interactions and participating socially in home, school, and community settings.
• Child appropriately solves problems in his/her interactions with others.
• Child shows affect appropriate to the social context.

The child uses cognitive skills to explore the environment, reason, and solve problems.

• Child demonstrates an understanding of age-appropriate information.
• Child demonstrates recall of verbal and non-verbal events.
• Child understands and uses concepts related to early literacy and math skills.
• Child solves problems that require reasoning about objects, concepts, situations, and people.
children in their natural settings (i.e., home, classroom, community). It was also important for the outcomes to be measurable in repeated and efficient ways, again allowing educators to monitor young children’s growth on an ongoing basis.

Once we crafted these outcomes, we sent them to parents of children with and without disabilities and professionals in the fields of early childhood and early elementary education (including special education) to solicit their feedback about the accuracy and acceptability of the outcomes. Representatives of national, child-focused organizations — such as the Council for Exceptional Children (CEC), ZERO-TO-THREE, the National Association for the Education of Young Children (NAEYC), and the National Association of School Psychologists (NASP) — provided us with names of members from all regions of the country. Parents and professionals selected from these lists were asked to rate the importance of each outcome statement, and they were invited to offer comments for revising the outcomes. Overall, we received feedback from 351 parents and 672 professionals. Roughly 70% of parents and 50% of professionals rated the outcomes as critically important. Additionally, qualitative feedback from parents and professionals indicated these outcomes did not require major revisions to apply to all children, regardless of disability or other subgroup label.

Finally, the vast majority of professionals (79%) told us a system of indicators that easily and directly helps them monitor young children’s rates of development toward these outcomes, and helps them plan changes in instruction, would be “very useful” to them.

**Individual Growth and Development Indicators (IGDIs)**

Individual Growth and Development Indicators resemble a “thermometer” used by a pediatrician to gauge a child’s general health status effectively, efficiently, and quickly. High readings from a thermometer will alert you that a child has a fever without telling you why he or she has a fever or what you can do to reduce the fever. Additional assessment will be required to understand the source of the fever and to generate ideas for reducing it. Similarly, our indicators will provide a relatively quick but effective and efficient reading of a child’s status and growth within multiple developmental areas, alerting educators and families to the need to intervene on behalf of children whose trajectories do not meet expectations.

Our team has set multiple criteria for determining if a prospective indicator qualifies as an IGD. First and foremost, the indicator must tell educators the status of an individual child’s skills relative to peers (either within the same classroom, school, district, state, or from a
Individual Growth and Development Indicators resemble a “thermometer” used by a pediatrician to gauge a child’s general health status effectively, efficiently, and quickly.
only need to be accomplished three times a year, as part of a benchmarking process, with more repeated administrations to children who appear at risk (e.g., whose scores fall within the lowest quartile at each benchmarking administration).

**Examples of Individual Growth and Development Indicators for Preschoolers**

Over the past three years, we have developed and tested prospective IGDIs for preschool-aged children in three outcome areas: expressive language, early literacy, and social interaction. While our research continues to evaluate the adequacy of these indicators, the following examples appear to meet the qualifying criteria we have set for IGDIs.

**Expressive Language**

**Picture Naming**

The format of this indicator entails presenting a child photographs and detailed, color line drawings of objects commonly found in preschoolers’ natural environments (i.e., home, classroom, community), one at a time, asking a child to name the pictures as fast as possible. Categories of objects used in this format include animals, food, people, household objects, games and sports materials, vehicles, tools, and clothing. Each photograph and line drawing is printed on an 8” x 5” index card. After providing a set of sample items, the examiner asks the child to look at each card and name it as quickly as possible. After exactly one minute has expired, the examiner stops the activity and counts the total number of pictures named correctly.

**Research Evaluations**

All of the IGDIs described here, as well as new ones under development, are evaluated in a series of studies conducted in preschool and day care programs throughout the Twin Cities. While the details of these research evaluations will not be reviewed here (but can be found at www.ici2.umn.edu/ecri/dissem.html), results of this research are quite promising. In general, ECRI-MGD investigators and graduate students have found that IGDIs correlate with children’s age and show growth over time (evidence of their developmental sensitivity). Further, IGDIs correlate with other standardized measures within their respective domains, like the PPVT-3 or the Test of Phonological Awareness (evidence of IGDIs’ validity). While this research continues, early evidence suggests the value of these measures for assessing developmental progress.
Early Literacy

Alliteration
In this format, adapted from the work of Lonigan and his colleagues (1998), we identified a set of words commonly known by preschoolers and obtained photographs or color line drawings of these words. We assembled stimulus cards with a target photo or line drawing at the top of each card (e.g., bees) and a set of three photos/drawings in a row at the bottom of each card (e.g., pants, gate, cheese), one of which rhymes with the target picture. After providing a set of sample items, the examiner asks the child to look at each card and point to one of the three pictures at the bottom of the card that sounds the same as (or rhymes with) the fourth, target picture. The task continues for a total of two minutes. The score generated from this format is the number of pictures the child correctly identifies within two minutes.

Rhyming
Also adapted from Lonigan and his colleagues (1998), this format is similar to the Alliteration format. Again, after identifying words commonly known by preschoolers, to look at each card and point to one of the three pictures at the bottom of the card that sounds the same as (or rhymes with) the fourth, target picture. The task continues for a total of two minutes. The score generated from this format is the number of pictures the child correctly identifies within two minutes.

Segment Blending
We have assembled a set of words that can be segmented in one of three ways: by word (e.g., tooth - brush), syllable (e.g., pup -py), or phoneme (e.g., r - a - m). The examiner states aloud a word in its segmented form and asks the child to blend the segments to verbally produce a complete word. The task continues for a total of two minutes. The score generated from this format is the number of words the child blends correctly within two minutes.

For progress monitoring indicators to succeed across most classrooms, they must be short in duration, the materials needed to administer them must be inexpensive and easy to obtain, and the procedures for administering them must be clear to a wide range of adults who may use them...
Social Interaction

Picture Prompt
In this format, the examiner presents the child with a photograph of the child’s classroom, playground, or other familiar natural setting. The examiner asks the child to imagine playing in the setting with a friend. The examiner instructs the child to say everything he or she could do with a friend in the setting. The activity lasts for a total of three minutes. One of the scores generated from this format is the number of novel activity ideas the child states for playing with a friend in the pictured setting.

Social Play
In this format, a child plays with a peer using one of two types of materials (only one of which is used for each administration of the format): (a) a “silly face” game in which children use plasticized pieces of human faces to create a design on a blank template; and (b) a set of 12-piece puzzles with puzzleboards. Children participate in this activity for a total of five minutes. One of the scores generated from this format is the duration (in seconds) of joint play in which the target child is engaged. A second score from this format is the number of interactive responses (or, social turns) the target child elicits from the peer.

Field Testing of IGDIs: Heartland AEA, Iowa
In late 1998, staff at the Heartland Area Education Agency (AEA) 11 in central Iowa contacted Institute investigators to discuss the possibility of forming a collaborative relationship. Specifically, Jeff Grimes, Heartland’s Coordinator of Innovation and Best Practices, Jerry Gruba, Coordinator of Early Childhood and Literary Services, asked if they could integrate our Individual Growth and Development Indicators into their current, decision-making model for identifying and serving young children with disabilities. Heartland AEA serves approximately 120,000 students, including roughly 13,000 students receiving special education services, across 56 public and 34 non-public school districts. Agency staff do not rely on traditional methods for identifying and serving children with disabilities (i.e., based on extensive use of standardized tests). Instead, they place more emphasis on using functional assessment, progress monitoring methods, data-based decision making, and trends in individual child performance to make high-stakes decisions about children’s educational needs.
progress monitoring methods, data-based decision making, and trends in individual child performance to make high-stakes decisions about children’s educational needs. Based on the close fit between Heartland’s approach to serving children with disabilities and the Institute’s conceptual foundations, we agreed to work out a collaborative agreement for testing Individual Growth and Development Indicators within Heartland’s problem-solving model.

Meetings between Heartland and Institute staff were held in May, September, and December of 1999 to provide Heartland with detailed information about the purpose and goals of the Institute, and specific training in the use of expressive language IGDIs for infants, toddlers, and preschoolers. Heartland staff in attendance at these meetings included three individuals hired prior to the start of the 1999-2000 academic year specifically to help the agency implement tools and procedures from our Institute. This team consists of a school psychologist (Susan Ward), an early childhood consultant (Stacey Dun), and a speech/language pathologist (Kim Thomas).

Ongoing contacts between Heartland and Institute staff have led to setting the following two priorities in our collaborative efforts: (a) extending the normative data collected thus far on the validity, reliability, sensitivity, and utility of Individual Growth and Development Indicators for as wide a range of young children as possible; and (b) extending the Institute’s research on the sensitivity of IGDIs to the effects of intervention for individual children within a decision-making model.

Exploring Solutions
Assessments

What can an educator do to generate ideas for intervening on behalf of children whose growth trajectories, as measured by IGDIs, do not appear to meet expectations? Staff of ECRI-MGD have explored the use of three different types of tools to assist educators with this endeavor, each of which may be used alone or in combination with each other, depending on preliminary analyses of child-related concerns —

1. We have identified critical program features of natural settings in which young children play and learn, features that have been empirically linked with children’s developmental growth of their expressive language and early literacy skills across time. These features have been organized by age group (i.e., birth to three-years-old, three-to-five-years-old, and five-to-eight-years-old). They have also been organized as an observation form for educators to use to rate the broad quality of settings in which children participate. Ratings by teachers or external observers may lead to general changes in setting arrange-
ments, availability of materials, or curricular goals, benefiting a group of children rather than just one child.

2. We have begun to develop an activity-based assessment for more fine-grained observation of an individual child’s developmental strengths and needs. This assessment will utilize typical, everyday activities in a child’s routine (e.g., pretend play, snack) to create structured, standardized scenarios in which an adult (or adults) interacts with the child in scripted ways to elicit behavior from the child across developmental domains. Observation of the child’s behavior in these structured contexts will enable educators to evaluate the child’s skills and needs in greater detail than will be possible through administration of IGDI’s, which in turn should lead to specification of areas to target through intervention.

3. We have utilized ecobehavioral assessment to evaluate the effects of interactions between a setting’s ecological factors (e.g., type of activity, materials available, group structure) and adult behavior on a child’s behavior. Ecobehavioral data allow us to identify in minute detail the ways in which specific combinations of ecological factors and adult behavior appears to accelerate or decelerate a child’s behavior (e.g., providing opportunities — or lack thereof — and reinforcement for the child’s use of expressive language). By identifying specific combinations that accelerate desired behavior for a child whose growth trajectory does not meet expectations (based on IGDI data), we may begin to mold an intervention strategy to better meet the child’s needs. Three computerized instruments are available to conduct ecobehavioral assessment, all of which were developed at the Juniper Gardens Children’s Project at the University of Kansas: the Code for Interactive Recording of Caregiving and Learning Environments (CIRCLE) for observation of infants and toddlers, the Ecobehavioral System for Complex Assessments of Preschool Environments (ESCAPE) for observation of preschoolers, and the Code for Instructional Structure and Student Academic Response: Mainstream Version (MS-CISSAR) for observation of early elementary-aged students.

Next Steps

During the 2000-2001 school year, ECRI staff will develop and test IGDI’s for monitoring the progress of young children’s motor (or, movement) and adaptive skill development. Studies of the adequacy of prospective indicators, using the criteria earlier in this report, will involve working with a diverse range of children, including children with disabilities and children enrolled in Head Start classrooms.
Additionally, we will initiate two new projects at the University of Minnesota. The first new project focuses on development of a Web-based application for helping teachers obtain IGDIs and related measures, manage data they collect using these measures, and collaborate with others in designing and evaluating interventions for children whose growth does not appear to meet expectations. Named Get It, Got It, Go!, this Web tool will provide educators with information on using measures such as IGDIs to monitor the ongoing progress of young children. Detailed administration procedures, stimulus materials (e.g., picture cards), and scoring forms will be available for teachers to download from the site and use after a minimum of self-study. Once teachers begin to use IGDIs or related measures to collect data from individual children, they will be able to enter such data into a password-protected, secure area of the site. In return, teachers will receive reports of each child’s status and growth over time, compared to the child’s previous performance and to results from groups of peers in the same classroom, school, district, or in other programs. Finally, teachers will be able to “invite” fellow teachers, parents, University faculty, and others to participate in a password-protected threaded discussion for interpreting individual child reports, planning interventions, and evaluating the effects of interventions.

The second new project, entitled Improving Preschoolers’ Reading Outcomes through Measurement and Intervention in Classroom
Environments (‘PROMICE), has two major goals. First, we will examine the connections between expressive language/early literacy IGDIs for a diverse group of preschoolers and comparable measures for kindergartners and first-graders. This effort may enable us to begin to identify “typically developing” children as young as three who may experience difficulties becoming proficient readers by the end of third grade. Second, we will collect detailed observations of preschoolers participating in regular classroom activities related to their expressive language and pre-literacy skill development. These observations will serve as the foundation for elaborating an intervention program for use with preschoolers whose growth of expressive language and early literacy skills may not appear to meet expectations.

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Related Courses at the University of Minnesota

EPsy 5200-03 Hierarchical Linear Modeling
EPsy 5231 Introductory Statistics and Measurement in Education
EPsy 5616 Behavior Analysis and Classroom Management
EPsy 5849 Observation and Assessment of the Preschool Child
EPsy 8706 Single Case Designs in Intervention Research

ECRI-MGD Web Site
http://ici2.umn.edu/ecri/
For additional information and resources about ECRI-MGD, visit the project Web site.
CEED-Affiliated Projects

Positive Approaches to Problem Behavior for Young Children with Disabilities: Multi-State Outreach Project
This project trains teams of early intervention faculty and parent/family advocacy organization representatives to provide inservice and technical assistance to individuals providing services to young children with challenging behaviors.
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http://ici2.umn.edu/multistate

Early Childhood Research Institute on Measuring Growth and Development
This project is producing a comprehensive, individualized measurement system for tracing the growth and development of children with disabilities from birth to age eight, and is creating assessment procedures for identifying features of home and school settings amenable to intervention.
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Minnesota Infant Mental Health Project
This project is a cross-agency initiative funded by the Minnesota Departments of Health, Human Services, and Children, Families, and Learning that seeks to establish and support a statewide framework of mental health services for infants, young children and their families by enhancing existing programs and resources.
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Head Start Project
CEED’s Head Start Grant is the Minnesota branch of the Great Lakes Head Start Quality Network (Qnet). It provides high quality training and technical assistance services related to all Head Start program areas, including those related to children with disabilities.
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Training Leadership Personnel Specializing in Augmentative/Alternative Communication and Proactive Strategies to Address Challenging Behavior Among Preschoolers and Youth with Severe Disabilities
This project prepares doctoral students and postdoctoral associates in a transdisciplinary personnel preparation program offered by school psychology, special education, and communication disorders at the University of Minnesota. Trainees are taught to assume a leadership role in the areas of service delivery that have been demonstrated to be among the most significant stumbling blocks to inclusive educational services for children and youth with developmental disabilities.
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The Role of Higher Education in Child Care

Minnesota Roundtable 01 on Early Childhood Education

May 4, 2001
Radisson Metrodome, Minneapolis

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CEED provides information regarding young children (birth to age eight), including children with special needs, in the areas of education, child care, child development, and family education. CEED activities include research, training, and publications geared toward improving professional practices, supporting parents, and informing policy development.

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