Students Moving Up the Mind's Ladder: Meeting the Needs of Students with Academic Difficulties and Learning Disabilities

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Abstract

This article describes a model to meet the needs of the reauthorized Individuals with Disabilities Education Act (IDEA 2004). It provides a brief description of a family of programs, that educators can use to implement the model, and an overview of the theory, scientific foundations and ongoing research that guide its development. The article focuses on children with academic difficulties and learning disabilities, but it's goal is to introduce the reader to a body of work that enables diverse children with both general and special learning needs to achieve academic standards and learn how to learn. In a broader sense, the model is a tool for schools to develop the knowledge construction and learning skills that students and communities increasingly must rely upon to prosper in the global information economy.

Introduction

Current educational practices fail to develop the thinking and learning skills that students need to achieve academic standards and learn how to learn. From the publication of A Nation at Risk (National Commission on Excellence in Education, 1983), to the passage of the No Child Left Behind legislation by Congress (2002), a series of national studies and reports have highlighted the crisis in the preparation of children in America's schools. The significance of the problem is underscored by the fact that alarms sounded by national studies and reports all have been sounded on the basis of achievement in regular education with, often, little or no mention of the fact, that the identified problems are compounded for children with special education needs. The number of children identified with special learning needs has continued to grow. Over the past decade, the category of specific learning disability (SLD) - the largest category - has seen an increase of 45% (U. S. Department of Education, 2001, 23rd annual report), and this in spite of the fact that "repeated concerns have been expressed about the manner in which individuals are identified as SLD, the manner in which educational services are provided once eligibility has been established, and the types of services and interventions that are available to educators and support personnel." (U.S. Department of Education, 2002, p. 4).

This article provides an overview of a model that draws on advances in the cognitive, neuropsychological and learning sciences to provide a coherent 'reach-to-teach' option for schools to educate students with both general and special learning needs. The model is consistent with the emphasis upon outcomes that is accentuated in the reauthorized Individuals with Disabilities Education Act (IDEA 2004), which went into effect on July 1, 2005.

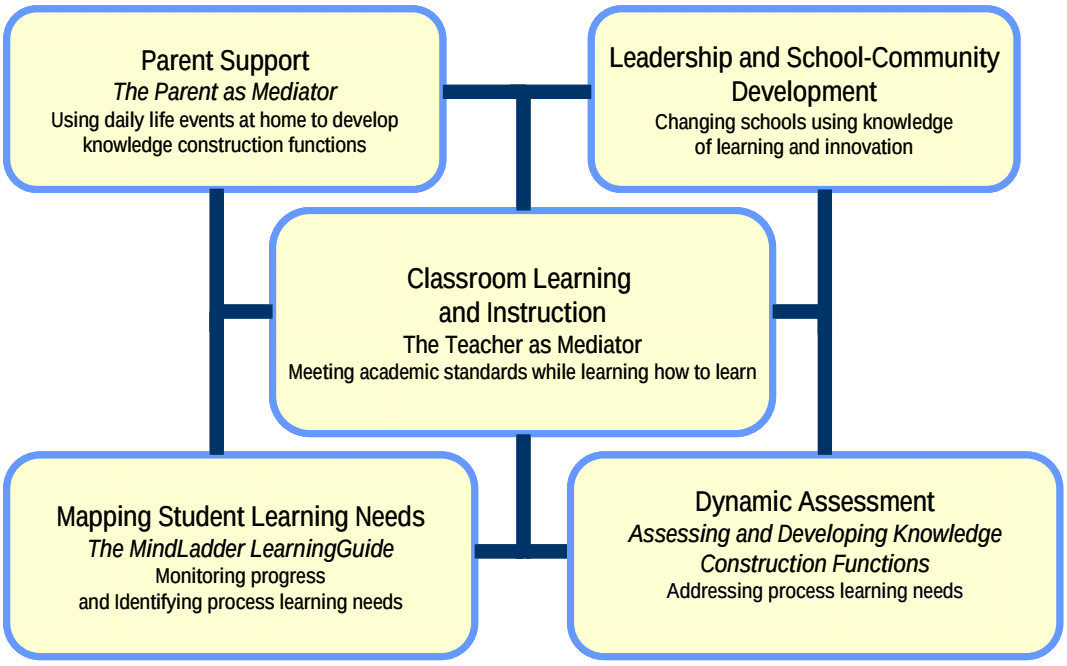
Goals of the MindLadder model

Identified, for shorthand, as the MindLadder model, the approach addresses the priority to enhance thinking and learning skills among all students, including students with special learning needs. The model addresses this priority via programs and services that integrate accumulated scientific advances to enable educators, parents and administrators to work as a collaborating team with specific, high-quality data to promote student learning. The objective is to ensure that all students receive educational services and monitoring to acquire mastery of the thinking and learning strategies they need to achieve academic standards and learn how to learn. The model focuses on reach-to-teach, outcomes and treatment validity.

For children with disabilities, the MindLadder model is consistent with the *findings* of IDEA 2004 (20 U.S.C. § 1400 (c) (5), e.g. see Wright & Wright, 2005) that focus on *high expectations* and *access* to the general education curriculum in the regular classroom, to the maximum extent possible, to meet the developmental goals and challenging expectations, that have been established for all children. The programs, tools and techniques of the MindLadder model are consistent with the *purposes* of IDEA, viz. to ensure that the education of children with special needs is designed to meet their unique needs and prepare them for further education, employment, and independent living (20 U.S.C. § 1400 (d), see Wright & Wright, 2005).

A 'reach-to-teach' model, MindLadder enables schools to move away from the 'wait-to-fail' approach that has become associated especially with the identification of students with specific learning disabilities (see also below). A reach-to-teach model must anticipate, recognize, address and document student learning needs and match them up, without delay, with specific and effective instruction (see also U.S. Department of Education, 2002). In the MindLadder model, these essential requirements are met by an overarching philosophy and by applied programs, that enable this philosophy to be implemented across elementary, middle and high school settings. Specifically, the model embraces the broad philosophy (1) that knowledge, skills, and learning ability are constructed in the mind of the learner, rather than transmitted or inherited; (2) that properly directed effort develops ability; and (3) that educational investments can be made to help all students strengthen their literacy, content achievement, and problem solving ability. The MindLadder model focuses on curricular goals and standards by securing a learning-centered course of action to enable students to acquire academic content and overcome sources of learning difficulty.

Figure 1. MindLadder: Achieving academic standards while learning how to learn



Key to the achievement of these objectives is the development of students' knowledge construction functions. Knowledge construction functions form the organization and control mechanisms that are used by the mind in learning and performance. They form, in a sense, the operating system of the mind (Jensen, 2000). Knowledge construction functions are used, for instance, to regulate attention, orient in space and time, explore systematically, access and search memory, establish relationships, infer conclusions and establish rules. These cognitive processes are identified as 'functions' because their use by students takes on significance, not as isolated acts, but as the functional outcomes of knowledge acquisition and skill development within the larger, dynamic structure of mind. There, the functions enable the conversion of sensory stimulation into information and information into knowledge that students can learn to apply with increasing awareness, efficiency and skill.

The development of knowledge construction functions involves careful attention not only to cognitive processes, but also to subject area content, motivation, affect, behavioral skill, self-perception and attitudes, all within a developmental context. The MindLadder programs are listed in Figure 1 and described below. Each can be used by itself, yet all support one another. Schools implement the programs in the order and manner that best meet their needs.

1. Classroom learning and instruction: Using the MindLadder Teacher-as-Mediator (TAM) program, educators learn how to approach curricular achievement and the development of learning ability as two mutually reinforcing parts of one process. They learn how to map academic standards and curricular objectives by identifying their

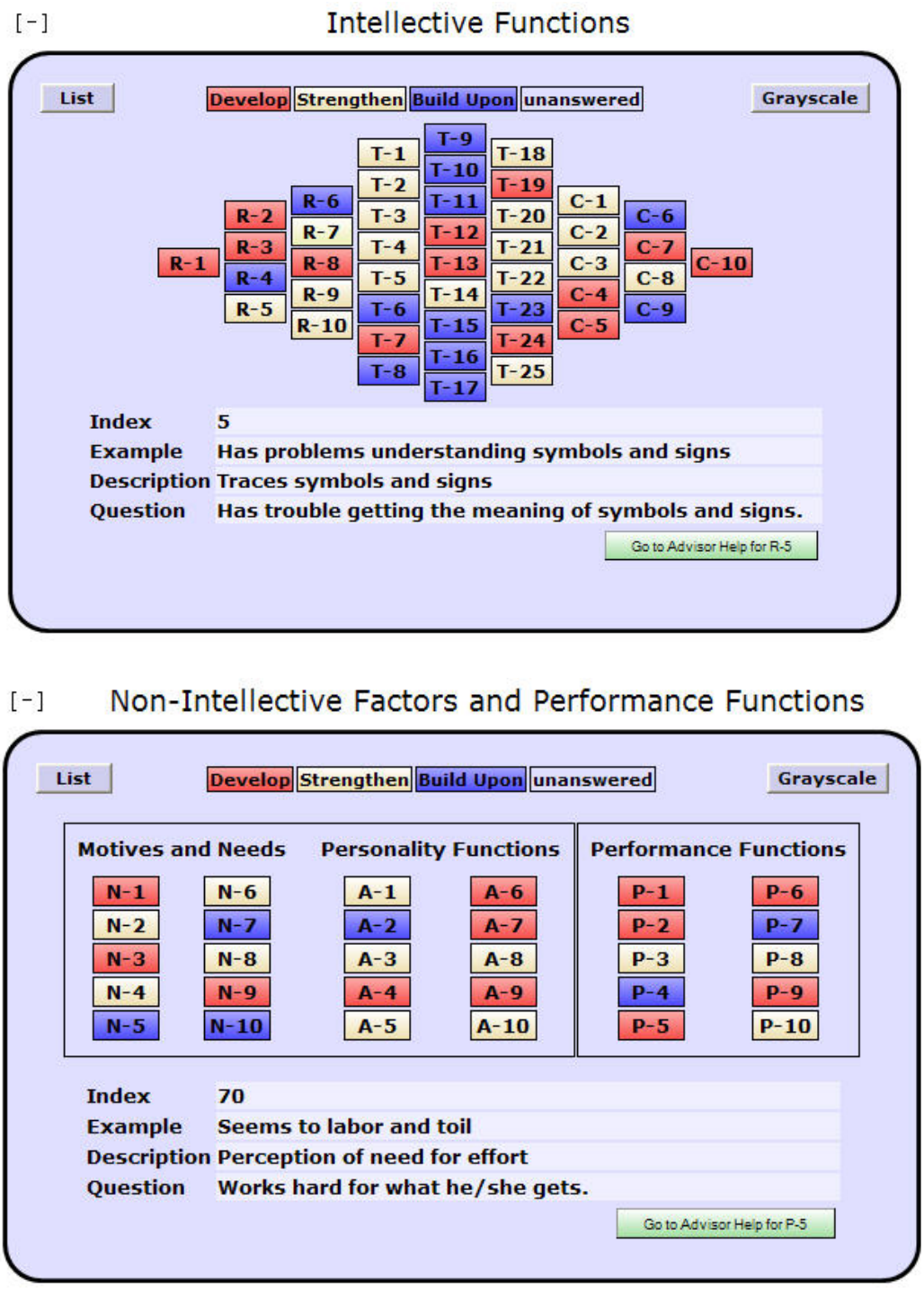
underlying knowledge construction functions. They become skilled at introducing the knowledge construction functions via teacher-student dialogues and in developing the functions within and across academic content and skill areas. The MindLadder classroom emphasizes subject area content and cognitive processes much like the two legs of a pair of scissors: both need to be present - and the better one is, the better the other can be. Teachers use the curriculum to mediate the development of knowledge construction functions via active student involvement in classroom learning activities. They learn how to facilitate students' transition from lower to higher levels of proficiency, through experiences with real and meaningful problems, and to engage students in more challenging academic content, as their knowledge construction functions come into place.

Teachers approach the classroom as a diverse community of learners and provide an emotionally safe, yet challenging environment for whole-group instruction, individual learning, teams, pairs, and shared interest groups. The MindLadder classroom-learning model can be implemented with any coherent, up-to-date content curriculum, any set of high academic standards, and any set of sound outcome measurement devices. In addition to standardized achievement tests, these should include a mix of pre-post testing, quizzes, portfolios tied to reflective self-evaluation, and the preparation of real products, or other forms of authentic performance assessment. – Each of the following MindLadder programs contributes to the achievement of objectives in the classroom.

2. The MindLadder LearningGuide: The MindLadder LearningGuide is a secure, Internet-accessed, server-based application that enables educators to map knowledge construction functions to identify the process learning needs of individual students and groups of learners. MindLadder LearningGuides are created from information collected from those with good opportunities to observe and interact with a learner. These are, usually, a student's teachers, parents and other caregivers. The LearningGuide carefully solicits information about cognitive processes, as well as non-intellective and performance factors that contribute to students' ability to acquire academic content and learn how to learn.

Together, these processes form the knowledge construction functions. Examples of such functions, in addition to those mentioned above, include the use of traces, symbols and signs; allocation of effort; mental representation; goal seeking and goal setting; decision-making; planning; attention to feedback and self-regulation. Figure 2 illustrates the mapping of a student's knowledge construction functions using the MindLadder LearningGuide. A total of 45 functions are included covering the collection (10 functions from R-1 to R-10), the connection (25 functions from T-1 to T-25), and the communication of information (10 functions from C-1 to C-10). Red and yellow areas represent knowledge construction functions in need of development or strengthening. Blue areas represent the functions that the learner and teacher can best build upon. The information in the LearningGuide is embedded within a rich and practical advisor resource, which gives teachers access to the kinds of lesson plans, information and support they need to develop students' knowledge construction functions within the classroom learning environment.

Figure 2: Mapping of student's knowledge construction functions using the MindLadder LearningGuide



Each knowledge construction function is represented by a rectangle. To improve academic achievement and learning ability, educators b*uild upon* knowledge construction functions in blue, *develop* functions in red and *strengthen* functions in yellow. Advisor assistance on how to develop each function is a click away.

The MindLadder LearningGuide can be used individually, in response to a single student's needs, or systematically, in support of improved school achievement for any group of students. For an individual student, the LearningGuide answers the question: "How can this student best learn how to learn?" For a group of learners, educators rely on the application's ability to aggregate records for any cluster of individual students to create compound or 'composite' LearningGuides. This enables educators to identify learning-centered solutions and oversee progress for any specific group of learners within their student population. As such, the LearningGuide is both a planning and a monitoring tool that enables educators to take specific steps to close the gap between tests, that tell them where their students are, and standards, that tell them where they ought to be. For parents, LearningGuide materials are available in both English and Spanish.

3. Dynamic assessment program: The MindLadder model uses a dynamic, interactive assessment system that is designed especially to address the learning needs of students who experience difficulties in the classroom. Rather than a test yielding a score for classification purposes, the system is a powerful assessment, teaching and learning resource that yields detailed information - for educator and student alike - about the knowledge construction functions, and how they can best be developed. The dynamic assessment provides a framework that is adaptable to students' diverse cultural and linguistic backgrounds and to a wide range of developmental needs across cognitive, academic, social, emotional, motivational, and attitudinal areas of functioning.

The MindLadder dynamic assessment is not a high-stakes test but, rather, a specialized educational intervention-and-development tool. The principal differences between the MindLadder dynamic assessment and traditional testing are summarized in Table 1. Use of the assessment is typically initiated by the teacher, but it can also be parent or student-initiated. Clinicians, school psychologists, counselors, classroom teachers, special education teachers and resource teachers can all learn to use this assessment approach. In each group, educators use it to achieve objectives within their areas of responsibility and expertise. For trained teachers, the ability to assess their own students can eliminate the delay between a referral for assessment and the onset of relevant instruction and intervention.

Dynamic assessment enables the educator to present a large variety of problem-solving tasks using different modalities of verbal, numerical, figural, pictorial, symbolic, and logical information. The tasks can be used to determine the specific knowledge construction functions in need of development. In addition, they provide vehicles for the mediation of learning experiences, and for trial teaching, to explore and document how a student's knowledge construction skills and learning ability can be developed. Based on a response-to-intervention approach, the MindLadder dynamic assessment program can be used to provide intensive individualized services to students, who are not responding adequately to high quality interventions in the classroom. Likewise, it can be used as an early intervention tool for students at risk for learning failure. LearningGuides frequently inform the use of dynamic assessment.

Table 1. Principal differences between the MindLadder dynamic assessment and traditional testing

MindLadder Dynamic Assessment: Gateway Model - Reach to Teach	**Static Testing: Gatekeeper Model - Labeling/Placement**
Assumptions capitalizing on plasticity and modifiability of human functioning; open system model of intellective functioning (change model)	**Assumptions** capitalizing on stability and linear predictability of human functioning; closed system models of intellective functioning (stability model)
Learning is embedded in context and culture - in assessment situations, students work interactively with a trained examiner	**Learning** is isolated, individual act - in testing situations, students work alone and unaided
Primary concern: Academic achievement and development of learning ability; development of knowledge construction functions; discovery and remediation of learning problems - diagnosis and prescription: invests in learners (autoplastic orientation), relatively active-modification approach	**Primary concern:** Identification of rank relative to referent group - classification and prediction: invests in environments with modified expectations (alloplastic orientation), relatively passive-acceptant approach
Comprehensive theory modeling process of knowledge construction - focus on developing knowledge construction skills, processes of cognitive functioning, problem solving and novice-to-proficient transitions	**Little or no theorizing** about underlying processes or mechanisms - focus on available knowledge and products of problem solving
Constructs investigated within single individual - goal is to model actual process of knowledge construction and application using mediated learning techniques focusing on the interplay of declarative knowledge, knowledge construction functions, affective-motivational factors, processing strategies, behavioral skill and experience	**Constructs investigated** through statistical analysis of attributes and their distribution within large study samples - emphasis upon correlations and the identification of patterns among measured responses
Scores acquire meaning from parametric analyses of quantitative information comparing post-mediation performance to pre-mediation performance and from qualitative information obtained in quasi-controlled experiments (see footnote page 7)	**Scores acquire meaning** with the use of norms
Performance mapped against internal (own baseline) and external criteria - produces dynamic characterization of individual, that can be used to develop learning efficiency in the classroom and the home	**Performance mapped** against external criterion - produces static characterization and information that can be used to inform decisions about classification, eligibility and student placement

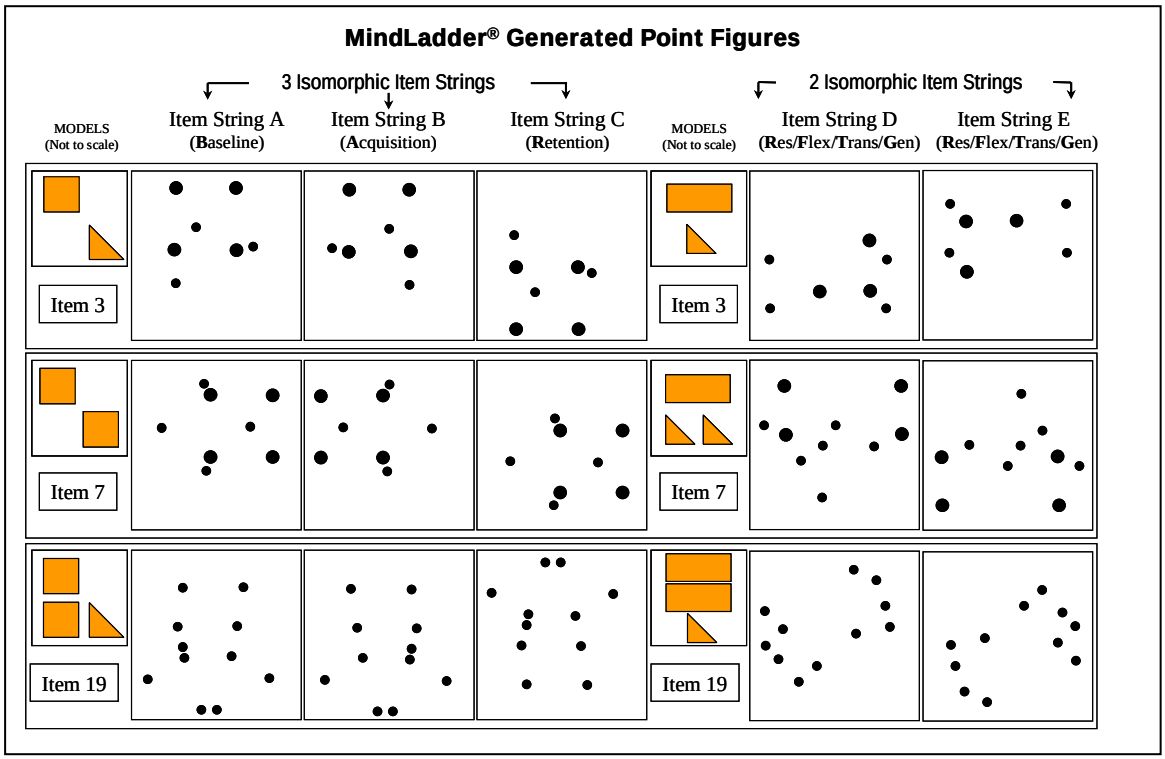
The dynamic assessment program is constructed around two basic design principles: 1) the assessment must give the educator opportunity, and freedom, to explore and 'mediate' the development (see below) of any knowledge construction function that can promote the student's learning ability and academic achievement; and 2) the assessment must enable the educator to secure empirical data regarding the benefit of the investment that is made to develop the learner's knowledge construction functions. The first criterion reflects the need to optimize the diagnostic learning environment for each student. The second reflects the need for valid and reliable data to guide the development of each learner's knowledge construction functions (Jensen, 2003b, p. 119).

The MindLadder dynamic assessment instruments incorporate these two design principles in their use of *isomorphic*, or same-structured, item strings. Two isomorphic item strings (A and C) are used to assess performance at baseline and retention, whereas an intervening item string (B) is used for exploration and mediation. Item string B satisfies the first design principle (freedom to explore and mediate). By enabling retention (performance after mediation) to be compared with baseline (performance before mediation), item strings A and C satisfy the second design principle (valid and reliable data). Each MindLadder assessment instrument typically has two additional item strings (D and E) that consist of more difficult, isomorphic items. These are used to assess properties pertaining to the resilience and pervasiveness of newly developed knowledge construction functions. A detailed explanation of these and other aspects of the theory behind the MindLadder assessment program is available in the literature (Jensen, 2003a, 2005). By controlling sources of item variation, isomorphic strings enable evolving performance differences to be ascribed more precisely to changes in the learner. Figure 3 illustrates how rotations around the y- and x-axes are used in the MindLadder Generated Point Figures tool to create isomorphic item strings.[1] Use of the assessment system over time allows for accurate, timely, and efficient progress monitoring, and informed decision-making, relative to clearly differentiated process development and instructional goals.

The MindLadder dynamic assessment provides a gateway to better learning outcomes: It is based on a problem-solving approach, mediation of learning experiences to develop knowledge construction functions, and the measurement of student performance in response to effective instruction. The information that is returned by the investment in the MindLadder dynamic assessment can be applied directly within the classroom-learning environment. In sum, the MindLadder dynamic assessment enables schools to move from a 'gatekeeper' to a 'gateway' model of assessment and from a 'wait-to-fail' model, that stresses eligibility requirements and the validity of categorical placements, to a 'reach-to-teach' model that stresses early detection, intervention, treatment validity, and outcomes.

[1] Printed dynamic assessment tools easily meet the majority of dynamic assessment needs in the schools. However, from time to time, more precise collection of performance data, and documentation of change over time, is warranted. For this purpose, ICML has developed a computerized touch-screen version that allows parametric performance data to be collected and analyzed within and across dynamic assessment sessions (see also Jensen, 2003b, p. 119-121). The computerized version does not in any way replace the educator but, rather, enables the educator to raise the proficiency of the development of students' knowledge construction functions by providing ongoing feedback about the process of doing so.

Figure 3: Illustration of isomorphic item strings



There are 20 items in each string. In each serial position items are isomorphic between strings A, B and C and between strings D and E. String B is used to explore and initially mediate knowledge construction functions in need of development or strengthening. The additional strings are used to secure and track their development.

4. Parent program: The MindLadder Parent-as-Mediator (PAM) program addresses the need for closer interaction between parent and child, and school and home. Children's prospects for success are determined to an unprecedented degree by the education they receive in school and the parenting they receive at home. Parents can play a major role in the development of their children's ability to learn by the way they interact and communicate with them. How parents share themselves, their culture, and their heritage can make a difference in how their children learn how to learn. Children who acquire basic concepts and knowledge construction functions at home will find it easier to participate, learn and succeed in a challenging school environment (Jensen & Jensen, 1996).

The MindLadder parent program is facilitated by trained parent-educators. Using daily life events, parents learn how to foster the cognitive, social, emotional and language skills that nourish the development of knowledge construction functions, which are used to acquire knowledge and learn how to learn. Parents learn how families can connect the development of their children's thinking and learning ability with the development of their sense of identity and belonging within their own unique culture and community. The

program stresses the connection between the development of the sense of cultural identity and the development of the capacity to learn, grow and change.

The parent program is based on the same philosophy and theory that underlie all of the MindLadder programs. In the classroom, educators use curricula and learning events to develop the knowledge construction functions. In assessment, educators use specially prepared tools to nourish the development of the knowledge construction functions. In the home, parents use the daily life events that are embedded in their own heritage and culture. Stories and legends, songs, games and plays can be used along with ordinary activities of everyday life such as cooking, setting the table, or organizing a closet. - A trip to the supermarket becomes an opportunity to develop planning ("What do we need to buy?"), sequencing ("What will be the best way to go through the supermarket?") and many other knowledge construction functions that can be labeled, modeled and supported by parent-child activities and interactions. A Parent-Child Activities Workbook is available in English, Spanish and French.

The parent program is for all parents. It can be used by itself, or in conjunction with other MindLadder programs. When used with parents of students with special needs, the program enables a broader school-home coalition to be formed, where each member on the collaborating team contributes to enable the student to achieve specified outcomes. The program uses a flexible format to meet the specific needs and goals of each parent group. Most often, parent educators are intimately familiar with the language, culture and community that support the school where the program is offered.

5. Leadership and school development program: Two broad approaches distinguish among the initiatives for educational reform. One aims to *induce* change using standards, sanctions and rewards. The other aims to *infuse* change with the help of knowledge of human learning. The first approach channels pressure from the federal, state and local level to produce school improvement. The second makes such improvement possible.

School superintendents, program directors and principals manage the delivery of complex services in environments that require consideration of many interrelated and, often, conflicting interests, priorities and constraints. The complexities of a school system make it difficult even for school leaders to see how systematic and meaningful changes in educational programs and services can be planned, implemented and evaluated. The MindLadder leadership program enables superintendents, principals, and program directors to establish the conceptual foundations and practical points of reference, that are needed to provide effective leadership for programs that develop knowledge construction functions in their schools.

Leaders learn about each MindLadder program and how it contributes to higher levels of academic achievement and the development of students' learning ability. Specifically, leaders learn (1) to incorporate the MindLadder programs into a compelling vision for their school; (2) to design implementation plans based on clear conceptual foundations, awareness, community acceptance and ongoing support; (3) to provide leadership that maintains clear connections between what is expected, inspected and

respected in their community of learners; and (4) to use the MindLadder LearningGuide to assist in the implementation and progress monitoring of school improvement plans.

The MindLadder model provides a common language for educators, students, parents, and administrators that enables them to identify goals and contribute direction to the processes whereby children achieve academic standards and learn how to learn. The leadership program enables schools to evolve their own distinctive culture to continually improve learning and instruction, while providing an environment for all to grow.

Implementing the MindLadder model for students with academic difficulties and special needs

For students with academic difficulties and special needs, the MindLadder model recognizes continued underachievement in response to high quality instruction and intervention as the core of the eligibility process. For students with specific learning disabilities (SLD), a principal difference between this and more traditional approaches is that the delivery of services, in the MindLadder model, is based on the student's response to intervention, rather than on static test results that confer eligibility only after large discrepancies emerge – and, even then, provide little or no information about how to address the identified difficulties.

While the content of information flowing through the MindLadder system is different from traditional approaches, the parental role and the IEP process continue to direct and regulate the flow of resources to children with special needs. The operation of the MindLadder model is depicted schematically in Figure 4. Four tiers describe services rather than places. From tier 1 to 4, respectively, the words *All, Some, Few* and *Special Needs* roughly summarize the expected utilization of services. Tiers 1 – 3 are used to meet general education needs. Tier 4 is used to meet special education needs. Concepts such as RTI, SST and IEP are readily connected with the tier structure.[2] The tiers as a whole embody the thrust of RTI to serve all students in Tier 1 to the maximum extent possible. In this model, SST is associated with Tier 3 and IEP with Tier 4.

Tier 1 (*All*). Education in the regular education classroom emphasizes the achievement of curricular objectives, using standards and evidence-based instruction, together with the development of knowledge construction functions. Systematic collection of LearningGuides at the end of the school year enables receiving teachers to develop composite LearningGuides (see page 6) and identify the process learning needs of their incoming groups of students. LearningGuides are examined individually for students who complete the previous year with signs of falling behind. Teachers address content and process objectives as two parts of the same whole. Teachers and students use a mix of formats to evaluate progress and identify opportunities for growth: Standardized achievement tests, quizzes, direct observation of processing skills, preparation of real products, portfolios and reflective self-evaluations all contribute useful information for ongoing adjustments and quality control.

[2] RTI is an acronym for Response-to-Intervention. SST is an acronym for Student Study Team. IEP is an acronym for Individualized Educational Program.

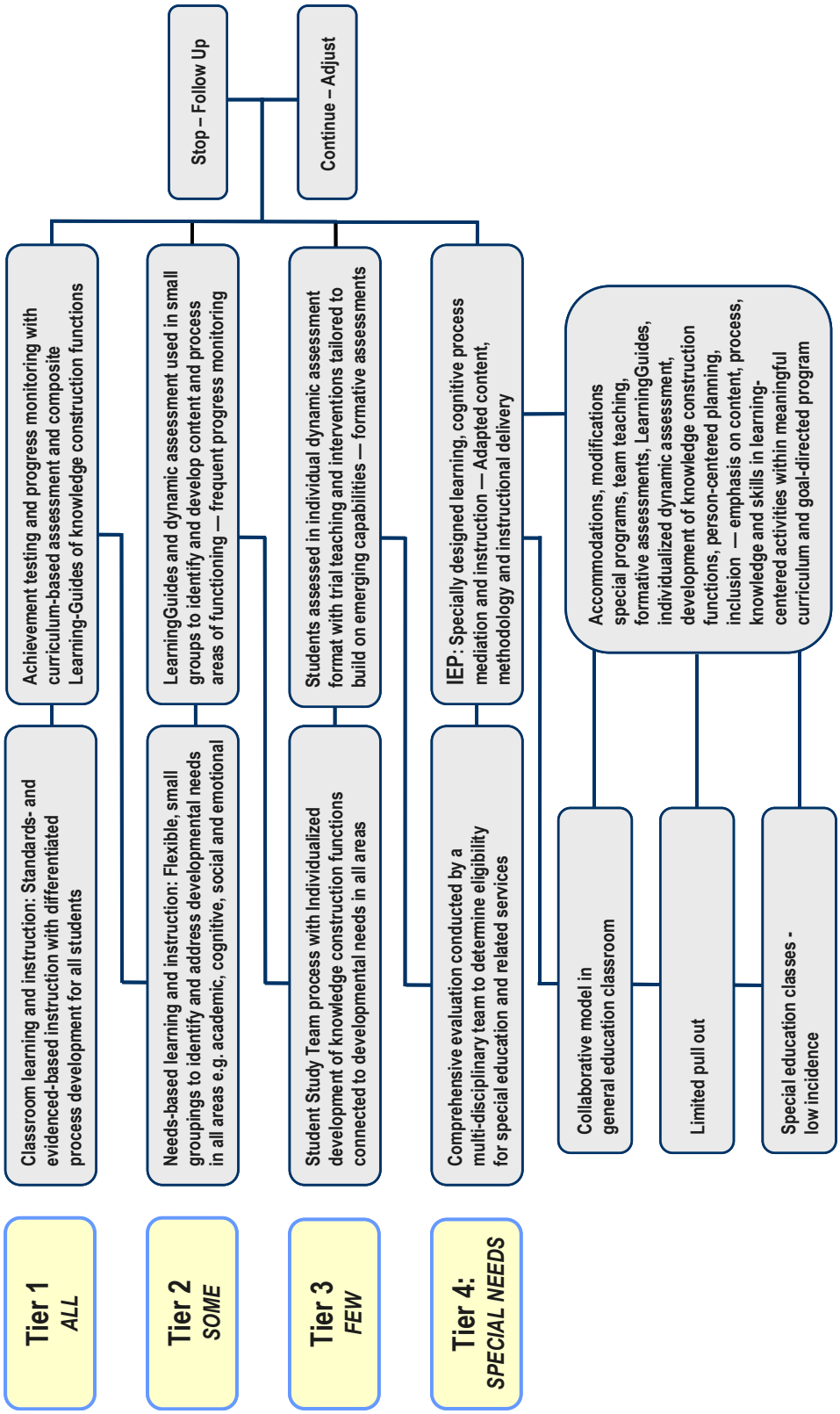


Figure 4. Using MindLadder programs to implement a multi-tiered, collaborative problem-solving approach with early intervention, trial teaching, progress monitoring and interdisciplinary evaluation

Tier 2 (*Some*). LearningGuides are collected at the end of grading periods for students newly showing signs of learning difficulties. Educators use small group formats to identify and address developmental needs, not only in the academic areas, but in the cognitive, social, emotional, attitudinal and behavioral areas. LearningGuides inform the use of dynamic assessment, often in small group formats, to promote students' development of their knowledge construction functions. Frequent progress monitoring enables educators to phase out Tier 2-services for responding students and phase in Tier 3-services for non-responding students.

Tier 3 (*Few*). A Student Study Team (SST) process is initiated. LearningGuides are collected from the network of educators, parents and others who represent primary sources of information for the learner. Students work one-on-one with trained educators using dynamic assessment and trial teaching to develop knowledge construction functions and strengthen academic content knowledge. Frequent progress monitoring enables educators to phase out Tier 3-services for responding students and phase in Tier 4-services for non-responding students.

Tier 4 (*Special Needs*) Students are referred for a comprehensive evaluation conducted by a multi-disciplinary team to determine eligibility for special education and related services. LearningGuides are used in an individualized format. Guided by an IEP, students participate in specially designed programs where teachers use accommodations, modifications, team teaching, formative assessments, and individualized dynamic assessment. The emphasis focuses on the development of knowledge construction functions within meaningful curricula that prepare the student for future learning, employment and independent living to the maximum extent possible. For children with developmental disabilities, person-centered-planning is recommended as a systematic way to generate an "actionable understanding" of the person as a contributing community member (O'Brien & O'Brien, 2002, p. 25).

Since the MindLadder model underpins what educators do on an ongoing basis for all students, there is no discernible entry or exit from the system based on categorical decision-making. As an intervention program, the extent of the use of the MindLadder dynamic assessment comes closest to the provision of special services to students with SLD in the traditional approach. Looking at just the MindLadder dynamic assessment system in this light, exit from the system is based on increases in student proficiency, learning and achievement using pre-post scores based on the student's own dynamic assessment, classroom performance, test scores and ecological measures of adjustment. As categorical testing does not drive decision-making in this system, an exit from this system does not mean that the student had, but no longer has a disability, nor would it preclude a decision to reenter and use the assessment system again at a later time.

In a report sponsored by the Office of Special Education Programs in the U.S. Department of Education, experts called for approaches that "capture relevant instructional data and afford students targeted, meaningful and early instruction to circumvent or prevent learning failure … [through a] …multi-tiered, collaborative problem-solving approach, which incorporates early intervention, trial teaching, progress

monitoring, and an interdisciplinary evaluation" (OSEP, 2002, p. 15). The MindLadder model provides a framework for precisely this type of service delivery model.

Specific learning disabilities and the theory of mediated constructivism

Among the disabling conditions that affect school-age children, the category of specific learning disabilities (SLD) remains the least understood, and the most controversial (Office of Special Education Programs, 2002). The absence of a convergent knowledge base follows decades of research, and, as already noted, a 45% increase over the past decade in the number of SLD-identified children. This amounts to approximately 2.8 million students, ages 6 – 21, or just over 50% of all students with special learning needs (U. S. Department of Education, 23rd annual report, 2001)).

The state of knowledge reflects the difficulties of integrating the multitude of factors that are known, or suspected, to contribute to the cause of learning disabilities or their manifestation. These are associated with numerous specific skills that are involved in information gathering, processing and communicating, often in the areas of reading, listening, writing, and mathematical problem solving. Individually and combined, these skills affect the development of normal proficiency regarding basic skills, reasoning, fluency, conceptual understanding and strategic deployment of cognitive and mental resources. Genetic, neurobiological, hormonal, behavioral, perceptual and cognitive factors have all been associated with SLD. So have a host of individual differences (such as gender, personality and cognitive style), and environmental variables (such as socio-economic status, ethnic or cultural variables) - and all of these variables may moderate the appearance of SLD (Kaufman & Kaufman, 2001; Morris, Stuebing, Fletcher, Shaywitz, Lyon, Shankweiler, Katz, Francis & Shaywitz, 1998; Shaywitz, Shaywitz, Pugh, Fulbright, Constable, Mencl et al., 1998; Semrud-Clikeman, & Hynd, 1990; Shephard, 2001; Spreen, 2001; Swanson, & Alexander, 1997).

The uncertain state of knowledge contributes to the uncertain state of practice. In 2002, one report observed that the identification of SLD "is a highly subjective process that varies from state to state or school district to school district …[with] no uniform assessment procedures to determine what constitutes a specific learning disability" (National Institute of Child Health and Human Development, 2002, p. 2). In addition, children are typically identified only after a period of two to three years of school failure ('wait-to-fail'), which compounds the difficulty, not only in correctly detecting the underlying problems, but also in treating them. Even on top of this, treatment of specific learning disabilities is a mission for which many teachers currently are poorly or not at all prepared (National Institute of Child Health and Human Development, 2002).

The MindLadder model builds upon the theory of mediated constructivism (Jensen, 1992, 2003a, 2005). The development and research of this theory reflect two trends that have been strengthened, over the course of the reform movement, by the continued unsatisfactory state of both knowledge and practice in the field of SLD, in particular, and education in general. The first is the development of new models and assessment tools for measuring and developing cognition, learning and

psychoneurological functioning. (e.g. Day, Engelhardt, Maxwell and Bolig, 1997; Deno, Fuchs, Marston & Shin, 2001; Hong, Morris, Chiu & Benet-Martinez, 2000; Jensen, Robinson-Zañartu and Jensen, 1992; Kaminsky & Good, 1998; Kaufman & Kaufman, 2001, Lidz & Elliott, 2000). Compared to previous approaches that stressed the use of IQ tests, the new approaches stress active student use of cognitive processes in problem solving, conceptual understanding, knowledge construction and learning within the assessment situation[3]. The second is a trend in the cognitive sciences away from the study of discrete aspects of cognition, under highly controlled laboratory settings, in favor of the study of how real classroom students learn subject matter and achieve proficiency within the domains of knowledge (Costa & Liebman, 1997; Doerr & Jensen, 1998; Grinder, 1989; Long & Westphal, 1994; Robinson-Zañartu & Campbell, 2000; Whitrock, 1989): Consistent with this trend, the MindLadder programs have been designed to facilitate the daily, on-going work of effective teams of school-based educators who seek to infuse cognitive and learning science advances into both general and special education classroom settings.

Mediated constructivism theory stresses the development of students' knowledge construction functions based on extensive research in the cognitive and learning sciences. This research has clarified the role of specific cognitive processes that influence learning and performance via the collection, transformation and communication of information. These include, for example, attention, exploratory behavior, mental representation, memory, reasoning, planning and self-regulation (Ablard & Lipschultz, 1998; Bransford, Brown, & Cocking, 1999; Craik, Naveh-Benjamin, Ishaik, & Anderson, 2000; Posner, 1989; White & Fredrickson, 1998). Based on this type of research, the emphasis of mediated constructivism theory is upon identifying and addressing students' specific process learning needs within the context of a challenging academic curriculum and an emotionally safe classroom learning environment (see also Anderson, Reder, & Simon, 1996; Bassok & Holyoak, 1989; Boyer, 1995; Bruer, 1993; McCormick, Miller, & Pressley, 1989).

The theory of mediated constructivism describes the role of teachers and parents as facilitators, mediators, coaches and guides that operate within a context of culture (Geertz, 1973; Jensen, 2000, 2003a; Shade, 1989). The role of teachers and parents is seen as crucial in enabling students to develop the knowledge construction functions that are needed to secure academic achievement and learn how to learn. Specifically, the theory holds that internalized cognitive dispositions and motivational propensities, for which the learner previously may have had no perceptual basis or need, can be developed through the provision of Mediated Learning Experiences (MLE). These experiences are

[3] The precursors to this paradigm are found in the work of theorists who early envisioned applying the science of psychology to the practice of education (e.g. Dewey; 1902; James, 1899/1958; Thorndike, 1906, 1910; Piaget, 1954; Wertsch & Tulviste, 1992. For reviews of the early contributions, see Mayer (1992) and Walberg & Haertel (1992)). The empirical support for this paradigm increasingly challenges long-dominant views that (a) learning involves a mechanistic process by which feedback strengthens or weakens associations in the learner (see Scandura, Frase, Gagne, Stolurow, Stolurow, & Groen, 1981), or (b) learning involves the acquisition of already-processed knowledge (see Di Vesta, 1989). The former view is associated with the S-R or behavioral paradigm of learning, whereas the latter is associated with long dominant views of curriculum design and classroom instruction (see Mayer, 1992).

seen to foster the development of the mental tools, people use to construct and act upon their experience (see also Feuerstein, 1979; Feuerstein & Jensen, 1980; Feuerstein, Jensen, Hoffman & Rand, 1985; Jensen and Feuerstein, 1987; Jensen, Feuerstein, Rand, Kaniel & Tzuriel, 1988; Jensen, Robinson-Zañartu & Jensen, 1992).

In contrast to situations where the learner is exposed directly to sources of information and stimulation, in MLE an intentioned, affectionate and initiated adult, usually a parent, family member or teacher, filters the learner's experience from both the standpoint of the information, that is received, and from the standpoint of the responses, that are generated. Mediators use a large variety of techniques to strengthen the development of new and initially unfamiliar modes of perceiving, thinking and responding in the learner. These include, among others, selecting, repeating, labeling, highlighting and sequencing sources of information, imbuing sources of information with meaning, grouping them according to attributes, purposes or goals, provoking anticipatory behavior, and modeling cognitive and knowledge construction processes.

Educators, who are familiar with the cognitive processes, and how they can be mediated, are able to recast the nature/nurture dichotomy in terms of an input/output dichotomy. It is within this context that the fuller purposes of the MindLadder classroom learning model, the LearningGuide, the Dynamic Assessment system, the Parent-as-Mediator, and the school leadership programs become clear: The MindLadder model aims to place tools into the hands of educators, psychologists, parents and administrators to enable all students to develop the knowledge construction functions they need to achieve academic standards and learn how to learn.

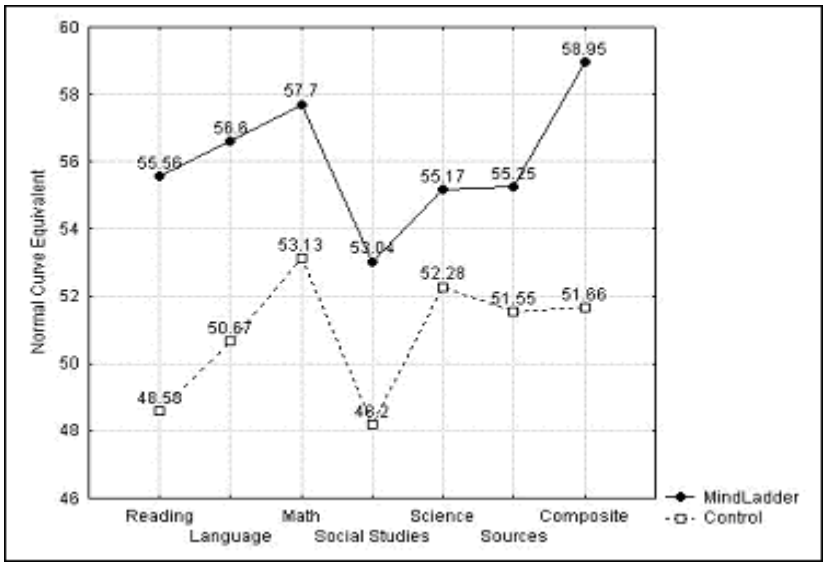
Research

Advances in cognition, learning and brain research have shifted the perception of knowledge, skills and learning ability from something that is transmitted, or inherited, to something that is constructed in the mind of the learner. A corollary of this shift is that effort, properly directed, develops ability, and that educational investments can be made to help all students strengthen their literacy, content achievement, and problem solving skills. The theory of mediated constructivism has been developed to identify active-modification approaches for all learners, and especially learners whose learning disability, cultural or linguistic background often, in the past, have resulted in labeling, passive-acceptance and placement in educational programs lacking treatment validity.

A comprehensive research program has been initiated at ICML to determine the treatment validity of the theory of mediated constructivism, and its associated MindLadder programs, across learner and setting variables. While much remains to be done, the ongoing work in program development builds on the significant results of a large and carefully controlled empirical investigation, whose principal findings are briefly summarized below (see also Jensen 2003b).

The investigation drew on a sample of 347 4th, 5th and 6th grade students attending school in regular education classes in a mixed suburban/rural school district

Figure 5. Mean least square normal curve equivalent ITBS scores for MindLadder and control students: Univariate tests of significance with control for Age, Gender and Pre-ITBS Score in each area across Grades 4, 5, and 6 (N = 347)



At the end of the two year study, MindLadder students scored higher than control students in all subject areas, as measured by the Iowa Test of Basic Skills (ITBS). ITBS scores before the study were used to control for pre-existing differences. The analysis also controlled for age and gender. The difference between MindLadder and control students was statistically significant in all subject areas ($p < .05$ or better) with the exception of Science ($p < .20$). The effect size for the Composite score was $R^2adj = 0.69$.

north of Atlanta, Georgia. The district serves predominantly Caucasian communities with significant pockets of poverty (23.7% and 23.1% of students in the experimental and control settings respectively were eligible for participation in the school lunch program). Two experimental ('MindLadder') and two matched control schools participated in the study. Every effort was made to randomize the selection of schools and teachers, but, even so, the study was treated as a quasi-experimental design. As a result, efforts were made to protect the study against both internal and external threats to the validity of its findings. These protections included, among others (Jensen, 2003b), the use of analysis of covariance to control for pre-existing differences. In the study, 10 experimental teachers (five in each of two elementary schools) received training and coaching in the identification and development of students' knowledge construction functions. Ten control teachers (five in each of two matched elementary schools) served as the contrast group.

Systematic effects on student achievement were assessed via the Iowa Test of Basic Skills (ITBS; Hoover, H. D., Hieronymous, A. N., Frisbie, D. A., & Dunbar, S. B. 1996, see also below). Systematic effects on students' reasoning were assessed via the Cognitive Abilities Test (CogAT; Thorndike & Hagen, 1993). ITBS normal curve

equivalent (NCE) scores at the end of the study were subjected to analysis of covariance with covariates of age, gender, and students' ITBS score in the respective area before the onset of the study. MindLadder students outperformed controls in Reading, $F(1,339) = 21.27$, $p < .0001$, Language, $F(1,334)$ 11.81, $p < .001$, Math, $F(1,338) = 7.38$, $p < .007$, Social Studies, $F(1,335) = 6.23$, $p < .01$, Sources, $F(1, 331) = 3.98$, $p < .05$ and the ITBS Composite, $F(1,327) = 24.55$, $p < .0001$, R^2adj = 0.69. The composite NCE score is derived by combining the standard scores from each of the six subject areas. A difference favoring the experimental students in Science did not reach statistical significance ($p < .20$). Least squares mean NCE scores for each of the academic subject areas and the composite are graphed in Figure 5.

On the CogAT, similar analyses of covariance indicated a significant difference favoring MindLadder students on the Composite Universal Scale Score, $F(1,237) = 12.61$, $p < .0005$, R^2adj = 0.52. The overall difference was principally due to differences in Verbal Reasoning Ability, $F(1,238) = 11.66$, $p < .0007$, and Nonverbal Reasoning Ability, $F(1,240) = 10.42$, $p < .0001$. The difference in Quantitative Reasoning Ability, while favoring the MindLadder students, did not reach significance, $F(1,238) = 2.64$, $p < .11$, NS.

An unexpected opportunity arose to test the benefits of the MindLadder classroom-learning model as the Georgia Department of Education, during the final year of the project, was field-testing, in some grades, a new and therefore unfamiliar measure of student achievement, the Georgia Criterion Referenced Competency Tests (Georgia Department of Education, 2000). Analyses of covariance of the Georgia CRCT, using the pre-ITBS score as the best available control for pre-existing differences, indicated that experimental students, at the end of the study, clearly outperformed control students in Reading, $F(1,238) = 18.04$, $p < .0001$, and nearly outperformed them in Math ($F(1,238) = 3.23$, $p < .07$, NS).

Additional evidence of the systematic effects of the study was obtained by analyzing the Composite ITBS NCE score for main effects (1) between experimental and control groups, and (2) between students who qualified for participation in special programs ('qualifying students') versus those who did not ('non-qualifying students'). Qualification was based on students' pre-existing record of testing and classification by the school system. Speech and gifted classifications were not included as qualifications. The experimental and control samples included, respectively, 39 and 26 students eligible for participation in the following types of special programs (percentages are of the sample population): Learning Disabilities (10 (5.8%) vs. 17 (9.7%)), Remedial Reading or Math (7 (4.1%) vs. 6 (3.4%)), Title 1 (21 (12%) vs. 0), and E/BD (1 (0.6%) vs. 3 (1.7%)). Title 1 serves students from families living in poverty that are two years or more behind academically. As before, the statistical analysis was controlled for age, gender and for student achievement prior to the onset of the study. The interaction effect was significant, $F(1,328) = 5.15$, $p < .03$. Non-qualifying students did significantly better than did qualifying students in each experimental condition, but qualifying students in the MindLadder classrooms did much better ($\bar{X}_{\exp} = 56.76$) than did qualifying students in the control classrooms ($\bar{X}_{con} = 46.14$). At the end of the study, qualifying MindLadder

students did not differ in overall academic achievement from non-qualifying control students.

The data from the available empirical research indicate that the development of knowledge construction functions may be of considerable importance for schools to find ways to secure better outcomes for their students. Replications and extensions of the existing findings, across setting and student variables, are necessary, but the available results suggest that the MindLadder model can be an effective way to address students' academic achievement and cognitive learning needs. Building on these results, scientists and practitioners at ICML have proceeded to develop new and more powerful tools to place reliable information about students' knowledge construction functions into the hands of educators, along with field-tested resources to develop these functions in the classroom and the home. In particular, the secure, Internet-accessed and server-based MindLadder LearningGuide enables schools and districts to scale their implementation of this solution in an easy, efficient and affordable manner.

Summary

The National Education Goals (1991) have long called for "fundamental changes in our education system [to enable people] to think for a living, adapt to changing environments [and] continually learn and develop new skills" (p.1). Other reports have similarly stressed the need for change to emphasize the development of students' abilities to think and learn (Carnegie Council on Adolescent Development, 1989; National Commission on Testing and Public Policy, 1990; National Research Council, 2001, 1999).

The extent of the need for new thinking and new approaches to all of education, and, most especially, to the education of students with special needs, continues to be underscored by the prevalence of inadequate student achievement and preparation across the nation. In a recent National Assessment of Educational Progress, 68% of the nation's 4th graders read below proficiency overall (U. S. Department of Education, 2001a, p. 15) with higher rates of failure among Latino (84%) and Black students (88%), among students in urban areas (central cities, 74%) and among students living in poverty (86%). In mathematics, 74% of the Nation's 4th graders, 72% of its 8th graders and 83% of its 12th graders scored below proficient (U.S. Department of Education, 2001b). The most current National Assessment of Educational Progress (Livingston & Wirt, 2005), while noting minor but statistically significant improvements for some age groups in some areas, continues to highlight the pervasive need for better outcomes.

The MindLadder model is designed to enable schools and communities to use advances in the knowledge of learning to secure successful outcomes. Based on scientifically validated advances in the cognitive, neuropsychological and learning sciences, the MindLadder model equips educators and parents with new and improved options to enable all students to achieve academic standards and learn how to learn. The objectives addressed by the MindLadder model are relevant to America's 52 million school-aged children and critical for over 5 million students with special learning needs,

including nearly 2.8 million children with specific learning disabilities. The MindLadder model provides an integrated set of programs that enable educators, parents and administrators to work as a collaborating team with specific, high-quality data detailing students' learning needs and progress. The programs include the Teacher-as-Mediator, the MindLadder LearningGuide, Dynamic Assessment and Parent-as-Mediator programs, as well as resources for school leaders and program administrators. The objective is to ensure that schools can move effectively to a 'reach-to-teach' approach where all students receive educational services and monitoring to acquire the mastery of thinking and learning strategies they need for academic achievement and ongoing learning within a rapidly changing, and challenging, knowledge economy.

Note

Myltreda L. Jensen, Ph.D. served as co-investigator on the research project described in this article.

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