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Response-to-Instruction and Universal Design for Learning: How Might They Intersect in the General Education Classroom?

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Introduction

Response-to-Instruction[1] (RTI) and Universal Design for Learning (UDL) represent innovative approaches to addressing the needs of students with disabilities. In recent years, RTI and UDL have both received increased attention from the education, policy, and disability communities. Both of these strategies are important to improve the ability of students with disabilities to participate and progress in the general education curriculum. The purpose of this paper is to provide an introduction to RTI and UDL and to explore their possible intersection in the classroom. It is structured into three sections: the first providing a basic overview of RTI; the second providing a basic overview of UDL; and the third sharing ideas for the possible synergism of these two approaches in the general education classroom. Sections 1 and 2 are descriptive, while Section 3 is largely theoretical.

Response-to-Instruction

As a result of its federal approval (Individual with Disabilities Education Improvement Act, 2004), Response-to-Instruction has recently garnered great attention as a means to identify students with learning disability (LD).[2] Within the context of LD identification, RTI aptly may be described as an operational definition for LD and an alternative to IQ-achievement discrepancy, which the federal government previously recognized as the primary operational definition of LD (U.S. Office of Education, 1977). Although the use of RTI for LD identification is a major emphasis within IDEA 2004, RTI may be more broadly defined as an approach that uses students' response to high-quality instruction to guide educational decisions, including decisions about the efficacy of instruction and intervention, eligibility for special programs, design of individual education programs, and effectiveness of special education services (Batsche et al., 2005). Thus, RTI has the potential to influence how and when LD is identified, as well as the nature of early intervention and instruction.

[1] Also referred to as "response-to-intervention," "response-to-treatment," and "responsiveness-to-intervention."
[2] Note that the legislation does not require the use of RTI for LD identification.

IQ-Achievement Discrepancy and Concerns Motivating Response-to-Instruction

First, critics have disapprovingly described IQ-achievement discrepancy as a "wait to fail" approach; because intervention is withheld until discrepancy can be demonstrated, students may experience years of decline before an identification is made.

IQ-achievement discrepancy, as its name suggests, identifies LD based on severe discrepancy between intelligence and achievement test scores. Although this approach has long been in use, in recent years it has been called into question by some professionals and academics (Speece & Shekitka, 2002). Concerns have been motivated in part by the burgeoning numbers of students identified as LD, which has increased special education costs (Fuchs & Fuchs, 2006; Fuchs, Mock, Morgan, & Young, 2003). The approach has been criticized on a number of fronts. First, critics have disapprovingly described IQ-achievement discrepancy as a "wait to fail" approach; because intervention is withheld until discrepancy can be demonstrated, students may experience years of decline before an identification is made, at which time remediation may be more difficult (Fletcher, Coulter, Reschly, & Vaughn, 2004; Fuchs et al., 2003; Gersten & Dimino, 2006; Vaughn & Fuchs, 2003). Second, the approach has been criticized for its variable implementation (Fuchs et al., 2003; Kavale, Holdnack, & Mostert, 2005; Vaughn & Fuchs, 2003), with inconsistent or even arbitrary definition of LD (Fuchs & Fuchs, 2006; Fuchs et al., 2003), owing perhaps to the fact that the teacher-based referral process is vulnerable to bias (Vaughn & Fuchs, 2003). Third, although regulations stipulate that students must show discrepancy under conditions of appropriate learning experiences, critics raise concerns about false positives, where low achievement reflects poor teaching rather than disability (Fuchs & Fuchs, 2006). Fourth, and conversely, it has been argued that IQ-achievement discrepancy overlooks a population of students with similarly low achievement and processing deficits but no discrepancy (Fletcher et al., 2004; Fuchs & Fuchs, 2006; Fuchs et al., 2003). Collectively, these concerns helped to propel the emergence of RTI.

The Process of Response-to-Instruction

The process of RTI involves: 1) screening for at-risk students; 2) monitoring of responsiveness to instruction; and 3) determination of the course of action. Steps 2 and 3 are iterative. (Fuchs & Fuchs, 2006; Kavale et al., 2005).

RTI is used to identify students with LD and to determine early intervention. This is accomplished through evaluation of student response to targeted, high-quality instruction that has been demonstrated as effective for most students (Batsche et al., 2005). In this sense, RTI emphasizes "student outcomes instead of student deficits" (Kavale et al., 2005) and makes a clear connection between identification and instruction (Vaughn & Fuchs, 2003). Whereas IQ-achievement discrepancy is focused on identifying LD (Kavale et al., 2005), RTI informs both LD identification and the design of early intervention and instruction (Batsche et al., 2005). Moreover, it has been argued that RTI can be used for all students, not just those with LD. RTI also prescribes the use of research-validated interventions to help ensure that students have access to appropriate learning experiences. It is focused on providing early and more immediate support for student needs by screening students as early as kindergarten (Fletcher et al., 2004; Vaughn & Fuchs, 2003).

The process of RTI involves: 1) screening for at-risk students; 2) monitoring of responsiveness to instruction; and 3) determination of the course of action (Fuchs & Fuchs, 2006; Kavale et al., 2005). Steps 2 and 3 are iterative. The process begins with the selection of a subgroup of at-risk students (Fuchs & Fuchs, 2006). Initially, students are monitored for their responsiveness to general education instruction, that is, instructional approaches validated as effective for most students and differentiated as needed to meet broad student needs (Batsche et al., 2005). Different courses of action can be taken depending on the number of students found not able to perform. If the number is sufficiently large, it is concluded that the instructional program is inadequate and the overall program is modified. If instead only a small percentage of students fail to perform, such students are removed from the general program of instruction to participate in a targeted, empirically validated intervention.

Student responsiveness to intervention is used to determine further course of action. Students who are responsive to the intervention are reintegrated into the traditional program of instruction. Students determined to be unresponsive are promoted to the next "tier" of intervention, different in content or rigor. Their progress is again monitored and the course redetermined. Ultimately, failure to respond leads either to LD diagnosis and special education or to LD evaluation, depending on the RTI model (Fuchs & Fuchs, 2006; Fuchs et al., 2003). Although some students may respond to an intervention, they still may be referred to special education if it is determined infeasible to maintain the intervention in the regular classroom (Batsche et al., 2005)

Selecting At-risk Students

A variety of methods may be used to identify at-risk students. For example, teachers may apply a criterion to student performance on the previous year's high-stakes assessment; newly test all students and compare their performance to norms (local- or classroom-based) or criterions; or use a benchmark demonstrated to predict end-of-year performance on high-stakes tests or graduation requirements (Fuchs & Fuchs, 2006). Because RTI is best established with respect to reading, screening measures and intervention typically focus on this skill area (Gersten & Dimino, 2006; Kavale et al., 2005).

Intervention

RTI uses empirically-validated interventions that have been demonstrated as effective for most students. The number of levels or "tiers of intervention" ranges from 2-4. The tiers vary in their intensiveness (i.e., frequency and duration), instructor expertise, and size and homogeneity of student groupings. Those who view RTI as primarily a means for identification advocate using fewer tiers, which produces fewer false negatives (i.e., identification of children who cannot succeed in the mainstream classroom as responsive to treatment). Those who view RTI more as a means for improving instruction and remediating students advocate using more tiers, which enables more intensive intervention and produces fewer false positives (i.e., identification of children who can succeed in the mainstream classroom as non-responsive).

Currently, there are two primary intervention approaches: the problem-solving method and the standard treatment response method (Fuchs & Fuchs, 2006). Practitioners

generally use the problem-solving method, while the standard treatment response method has been used in most research studies.

The distinguishing features of the problem-solving approach are that intervention occurs within the classroom and is individualized to the student.

The distinguishing features of the problem-solving approach are that intervention occurs within the classroom and is individualized to the student. The individualized nature of the approach is based on the belief that success of an intervention cannot be predicted based on student characteristics, and no single intervention will be successful for all students (Fuchs et al., 2003). The different versions of problem-solving RTI vary in the number of tiers of intervention. However, all use a 4-step process at each tier: 1) problem identification; 2) problem analysis/selection of intervention; 3) implementation of intervention; and 4) monitoring of response (Fuchs & Fuchs, 2006; Fuchs et al., 2003). The process can involve a range of personnel including parents, general educators, special educators, and school psychologists (Fuchs & Fuchs, 2006).

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The standard treatment response approach provides the same empirically validated, fixed-duration intervention to all students with similar problems in a domain (Fuchs et al., 2003). Unlike the problem-solving approach, the standard treatment response intervention is provided individually or in small groups outside the classroom. Intervention is 2-tiered, and lack of progress in Tier 2 elicits evaluation for possible disability. Because the standard-treatment approach has only 2 tiers, it is thought to be more straightforward to implement, and therefore more practical (Fuchs et al., 2003). However, it is not known for certain that this approach is implemented more faithfully than the problem-solving approach (Fuchs et al., 2003).

Assessment of Responsiveness

There is no standardized method for assessing student responsiveness to intervention. Measurement may be based on performance at the end of the intervention, growth over the course of the intervention, or both (dual discrepancy [Fuchs, 2003]). However, RTI has its roots in curriculum-based measurement (Batsche et al., 2005), a form of ongoing instructional assessment (progress monitoring) where short, growth-sensitive measures are administered during an instructional episode in order to determine further course of instruction (Atkin, Black, & Coffey, 2001). Moreover, progress monitoring has been recommended over final status measurement for RTI on the basis that growth during the intervention is more important than absolute performance at the end of the intervention (Fuchs & Fuchs, 2006; Fuchs, 2003). Use of multiple data sources is also encouraged (Fuchs et al., 2003). Therefore, progress monitoring is a frequent form of RTI assessment and considered by some a key component of effective RTI (Batsche et al., 2005; Fuchs & Fuchs, 2006).

A reference standard for assessing progress must also be chosen: scores may be compared to a normative sample; a limited norm (developed using a subset of students who are the focus of the intervention); or a benchmark (Fuchs, 2003). Choice of reference method may be constrained by the type of intervention. With an intensive intervention, it may be necessary to use a limited norm (Fuchs, 2003).

Teacher Roles

It is unclear how RTI may affect teacher roles. However, it is likely that professionals that formerly spent time administering IQ tests will take on responsibilities focused more on intervention-related assessment (Fletcher et al., 2004). According to one model, general educators will be primarily responsible for instruction; monitoring; and advancement through Tiers 1, 2, and 3; whereas special educators will be responsible for instruction and monitoring in Tier 4 (Mastropieri & Scruggs, 2005). However, general and special educators are also expected to play a collaborative role, particularly within the problem-solving approach (Batsche et al., 2005).

Evidence for the Effectiveness of RTI

RTI has the endorsement of many researchers and professional and government organizations (Fletcher et al., 2004; Fuchs et al., 2003). Controlled, research studies using the standard treatment model have shown a significant impact of RTI on student progress (Marston, 2005). Evidence addressing the effectiveness of the problem-solving model is less plentiful and has been described as less persuasive (Fuchs et al., 2003; Kovaleski, Gickling, Morrow, & Swank, 1999; Marston, 2005; Tilly, 2003).

The approach is not without potential problems. Presently, RTI may not be feasible for large-scale adoption (Fuchs et al., 2003) given the necessary knowledge and skill on the part of teachers, particularly if intervention is to be individualized (Gersten & Dimino, 2006; Mastropieri & Scruggs, 2005). As with IQ-achievement discrepancy, fidelity of implementation is crucial (Fuchs & Fuchs, 2006; Johnson, Mellard, & Byrd, 2005; Mastropieri & Scruggs, 2005), but has been questionable with the problem-solving method (Telzrow, McNamara, & Hollinger, 2000). It also has been pointed out there are few criteria for distinguishing between “no response to instruction” and “marginal response to instruction,” making it difficult to accomplish consistent implementation (Kavale et al., 2005). And it is less apparent how RTI would be applied at the middle and secondary school levels (Mastropieri & Scruggs, 2005).

Another criticism is RTI’s emphasis on reading disability. Contemporary conceptualizations of LD include deficits in math, writing, and reading comprehension; thus RTI is considered by some an inadequate means to gauge LD (Johnson et al., 2005; Kavale et al., 2005; Mastropieri & Scruggs, 2005). Critics also allege that by excluding general cognitive ability as a consideration, RTI fails to document underachievement/unexpected learning failure, which is an important defining feature of LD (Kavale et al., 2005). However, from an instructional standpoint, RTI can be used with any academic subject for which frequent data-sensitive measurements are available (Batsche et al., 2005). Although these are generally less well developed outside of reading, they are potentially feasible.

Potential change to how students with LD are identified and early intervention is designed is of great potential significance, and RTI is currently being investigated by the National Research Center on Learning Disabilities and the Office of Special Education Programs. Many experts believe that more needs to be understood before RTI can be accepted as a valid method for LD identification (Fuchs et al., 2003).

Universal Design for Learning

Universal Design for Learning reconceptualizes curriculum design by bringing student diversity to the forefront and supporting the design of curricula that are more flexible and accommodating of diverse students' needs (Rose & Meyer, 2002).

Universal Design for Learning (UDL) is a new approach to curriculum (goals, materials, methods, and assessment) that is firmly grounded in the belief that every learner is unique and brings different strengths and weaknesses to the classroom (Rose & Meyer, 2002). Indeed, today's classrooms are incredibly diverse, housing students from different cultures, socioeconomic backgrounds, and disability groups. By contrast, traditional curricula are "one-size-fits-all," designed to meet the needs of the "typical" student. The result is a host of barriers for any student that falls outside of this narrow category, such as barriers that impede access, participation, and progress in the general curriculum (Hitchcock, Meyer, Rose, & Jackson, 2002).

UDL reconceptualizes curriculum design by bringing student diversity to the forefront and supporting the design of curricula that are more flexible and accommodating of diverse students' needs (Rose & Meyer, 2002). UDL was inspired by universal design in architecture, a movement to design structures with all potential users in mind and incorporate at the outset access features such as ramps and elevators (Connell et al., 1997). By working at the design level, accessibility features could be incorporated more elegantly and inexpensively. Moreover, beyond providing access for individuals with disabilities, these features had unanticipated benefits for the population at large, producing more widespread usability (Rose & Meyer, 2002). UDL applies this same strategy to curricula, considering the needs of all students at the design stage and building in features that support full accessibility. In addition, UDL extends the concept of universal design by incorporating features that maximize not only access to information, but also access to learning (Rose & Meyer, 2002). Technology plays an important role in UDL, its flexibility enabling practical and elegant solutions.

Another source of guidance and inspiration for UDL is neuroscience. Neuroscience research suggests the existence of three broad neural networks in the brain that oversee three fundamental facets of learning (e.g., the recognition of patterns, the planning and generation of patterns, and the selection and prioritization of patterns [Cytowic, 1996; Luria, 1973; Rose & Strangman, in review]). UDL identifies these three learning substrates as recognition, strategic, and affective networks (Cytowic, 1996; Luria, 1973; Rose & Strangman, in review; Rose & Meyer, 2002). Their respective functions coincide with the three learning prerequisites identified by developmental psychologist Lev Vygotsky (1962/1996), whose work is highly respected in the field of education: 1) recognition of the information to be learned; 2) application of strategies to process that information; and 3) engagement with the learning task. What is distinctive about the UDL perspective is that this triad of abilities is understood to differ from student to student.

The three UDL principles guide the design of flexible curricula by calling for the embedding of options that support differences in recognition, strategic, and affective networks:

- To support recognition learning, provide multiple, flexible methods of presentation.

- To support strategic learning, provide multiple, flexible methods of expression and apprenticeship.
- To support affective learning, provide multiple, flexible options for engagement. (Rose & Meyer, 2002)

Using these three principles, all aspects of the curriculum – goals, methods, materials, and assessments – are made flexible. With respect to assessment, for example, a range of media, formats, and response options are used so that a student's knowledge and skills are not confounded by his or her aptitude with the medium (Rose & Dolan, 2000). In addition, during testing students have access to the same supports that they have during instruction – unless those supports undermine the purpose of the assessment (Dolan & Hall, 2001; Rose & Meyer, 2002). Ideally, curriculum-based measurement is used to perform ongoing assessment, providing a window into the learning process as well as the effectiveness of instruction (Rose & Dolan, 2000).

For teachers wondering *how* to customize instruction, the Center for Applied Special Technology (CAST) has devised three sets of broad teaching methods that support each UDL principle (see Figure 1; Rose & Meyer, 2002). These teaching methods reflect neuroscience-based insights into how each learning network functions, combined with an understanding of how digital media can support flexibility. For example, the third teaching method to support recognition learning is *to provide multiple media and formats.* This teaching method leverages the fact that recognition networks can extract meaning using different sensory modalities and acknowledges that the optimal presentation modality may differ from student to student. Although presentation of multiple media and formats might be challenging in a classroom limited to printed text and hardcopy images, it is realizable using digital materials. This is one example of how digital materials and UDL teaching methods can facilitate the successful implementation of UDL.

Figure 1. CAST has developed three sets of UDL teaching methods to help teachers support learners' diverse recognition, strategic, and affective networks.

Network-Appropriate Teaching Methods
To support diverse recognition networks: • Provide multiple examples • Highlight critical features • Provide multiple media and formats • Support background context
To support diverse strategic networks: • Provide flexible models of skilled performance • Provide opportunities to practice with supports • Provide ongoing, relevant feedback • Offer flexible opportunities for demonstrating skill
To support diverse affective networks: • Offer choices of content and tools • Offer adjustable levels of challenge • Offer choices of rewards • Offer choices of learning context

CAST is working with schools to implement and research UDL curricula and innovative UDL instructional approaches. For example, CAST has developed digital, supported reading environments that integrate research-supported approaches to reading comprehension instruction with UDL features. These features include text-to-speech and multimedia dual-language glossaries to support differences in recognition; multiple levels of instructional challenge and support; multiple response modes to support differences in strategy; and a choice of multiple animated characters as tutors and varied support and response options to support differences in student engagement (Dalton & Coyne, 2002; Dalton, Pisha, Eagleton, Coyne, & Deysher, 2002; Dalton, Schleper, Kennedy, & Lutz, 2005; Proctor, Dalton, & Grisham, in press; Strangman, 2003). CAST is also researching a technology-based environment for writing science reports that integrates research-based writing strategies and curriculum-based measurement with flexible UDL supports (Murray & Hall, 2006). CAST is conducting this work with diverse students including students with learning disabilities, students who are deaf or hard of hearing, students with cognitive disabilities, and English language learners. Strands of UDL are increasingly apparent in broader research reporting innovative uses of technology to individualize instruction (Erdner, Guy, & Bush, 1998; Hay, 1997; MacArthur & Haynes, 1995).

Response-to-Instruction and Universal Design for Learning

RTI and UDL differ from one another in that RTI is a process for making educational decisions based on an at-risk student's success or failure during specialized intervention, while UDL is a process for making curriculum design decisions to maximize success in the general curriculum. However, RTI and UDL share the objective of improving educational outcomes for students with disabilities and are similar in several important ways.

First, both RTI and UDL recognize that poor achievement does not necessarily reflect disability, but rather may also reflect poor instruction. That is, in some cases the curriculum, not the student, may be deficient. RTI puts this belief into practice by prescribing that general education curricula incorporate research-validated instruction and intervention by making LD identification contingent on the program of instruction and by acknowledging that there are cases where changes should be made to general classroom instruction in place of student intervention (Batsche et al., 2005). UDL also encourages the use of research-validated instruction and intervention (Dalton et al., 2002; Murray & Hall, 2006) and emphasizes the notion of disabled curriculum by further stating that the curriculum, and not the student, must bear the burden of adaptation (Rose & Meyer, 2002).

Second, RTI and UDL both reflect the understanding that a curriculum that is effective for one student may not be effective for another student. With RTI, this is most readily apparent with the individualized approach to intervention that is part of the problem-solving method. With UDL, the curriculum is designed to incorporate a wide variety of options in its goals, materials, methods, and assessment so that the curriculum in its entirety is flexible and accommodating of individual student needs.

Third, RTI and UDL treat assessment as something that should inform instruction and intervention and consider once-a-year test scores insufficient to determine student

ability. In RTI, students' responsiveness is commonly monitored over time and with respect to multiple interventions; while in UDL, multiple, ongoing assessments are administered. The use of curriculum-based measurement as a means to inform teachers about the effectiveness of instruction and guide decision-making regarding appropriate instruction and intervention is a key point of convergence of RTI and UDL. With effective implementation of curriculum-based measurement, interventions can be determined while instruction is still ongoing and before a student fails.

It is important to acknowledge that teachers need new knowledge and skills to successfully implement both RTI and UDL (Dalton et al., 2005; Howard, 2003; Mastropieri & Scruggs, 2005; Rose & Meyer, 2002). Thus, professional development and ongoing support within the schools is important. In addition, technology may be an important tool. UDL solutions often make use of technology to increase flexibility and adaptability, with the added benefit of improving teacher support and student engagement (Pisha & Coyne, 2001). Thus, technology can be used to reduce some of the difficulties of implementation. Its inherent flexibility helps make the design of an adaptable curriculum much more feasible.

Although IDEA 2004 is largely focused on the use of RTI to identify students with LD, we believe that the greatest potential for synergism with UDL is around instruction. In particular, the UDL framework may be able to support more effective decision-making within RTI, which remains a significant challenge in RTI. Indeed, RTI has been criticized as lacking a systematic decision-making process (i.e., few criteria for distinguishing between no response to instruction and marginal response to instruction, and little ability to predict which intervention will be effective for a particular student [Kavale et al., 2005]). Teachers often struggle with interpreting curriculum-based measurement data and using it to modify instructional programs effectively (Fuchs, Deno, & Mirkin, 1984; Fuchs, Fuchs, & Hamlett, 1989). Moreover, individualization, a central component of the problem-solving approach, is of great difficulty for teachers (Batsche et al., 2005; Gersten & Dimino, 2006).

The UDL framework offers a potential means to guide such decisions. For example, differences in recognition, strategic, and affective learning parameters offer a means for selecting effective interventions. The problem-solving approach to RTI is already an individualized approach that considers students in a case-by-case fashion. The UDL framework could help to guide analysis and decision-making for each student as part of RTI by focusing attention on individual learner's recognition, strategic, and affective strengths and challenges. (CAST has developed an online tool, the *UDL Class Profile Maker*, for helping teachers to use the UDL framework to better understand students [CAST, 2002-2006b].)

Another means in which to integrate RTI and UDL is to use UDL to design more flexible RTI interventions. Research has shown that instructional programs designed according to the UDL principles can be effective for a range of students (Dalton & Coyne, 2002; Dalton et al., 2002; Dalton et al., 2005). By designing interventions with flexible supports for recognition, strategy, and affect it may be possible to reduce the number of RTI tiers that are necessary and increase the number of students who respond.

Currently, some students identified as responders with RTI are not reintegrated into traditional instruction because they have been determined to require intervention that is too resource-heavy for the general education classroom. It may be possible to extend the ability of the general education curriculum to offer various nontraditional forms of instruction by integrating more technology, guided by the UDL principles and teaching methods. Technology can make it more practical and feasible to provide alternative means of instruction in the same classroom and, together with UDL, might better support the delivery of specialized RTI intervention in the general education classroom.

Beyond improving the efficiency of RTI, UDL might ultimately be used to limit its necessity by building the capacity of the general education curriculum to accommodate the diverse needs of students. This could help to reduce the numbers of students requiring intervention and/or special education. For example, UDL could be used to identify and minimize barriers in the general education curriculum that, if left unaddressed, might unnecessarily undermine student performance and increase the number of students selected for targeted intervention. (CAST's *Curriculum Barriers Finder* and *UDL Solutions Finder* can assist with these tasks. [CAST, 2002-2006a, 2002-2006c].)

Conclusion

Access, participation, and progress for all students in the general education curriculum are sought-after goals of education. However, in spite of impressive reform (Individual with Disabilities Education Improvement Act, 2004; Individuals with Disabilities Education Act, 20 U.S.C. §1400 et seq., 2000; U. S. Department of Education, 2001), there remains a significant gap in the performance of students with and without disabilities (Blackorby et al., 2004; Frieden, 2004; National Center for Education Statistics, 2003).

The success of our efforts to provide students equal access, participation, and progress in the general education curriculum hinges on how we understand the curriculum or, more precisely, the "conception, design, and implementation of the general curriculum and the assumptions that underlie it" (Hitchcock, Meyer, Rose, & Jackson, 2005, p. 1). Response-to-Instruction and UDL embody a new and important understanding about curriculum: Poor performance may reflect curriculum disability rather than student disability. They also represent relevant and useful approaches for improving student learning based on manipulation of instruction. Response-to-Instruction uses a tiered approach of specialized intervention to identify disability and investigate the effectiveness of alternative instructional approaches. Universal Design for Learning seeks to design curricula that are capable of meeting every student's needs through flexible and adaptive instruction.

These two approaches are still being developed, and RTI is a topic of current debate. By applying the UDL framework, it may be possible to target some of the key uncertainties about RTI, such as how to effectively individualize intervention and make instructional decisions. Beyond this, their synergism may enable achievement of a loftier goal: By simultaneously implementing RTI and using UDL to build the capacity of the general education curriculum, it may be possible to realize broadly effective general

education curricula that anticipate students' difficulties and eliminate the need for intervention.

References

Atkin, J. M., Black, P. J., & Coffey, J. E. (2001). *Classroom assessment and the National Science Education Standards*. Washington, D.C.: National Research Council, National Academy Press.

Batsche, G., Elliott, J., Graden, J. L., Grimes, J., Kovaleski, J. F., Prasse, D., et al. (2005). *Response to intervention: Policy considerations and implementation*. Alexandria, VA: National Association of State Directors of Special Education, Inc.

Blackorby, J., Wagner, M., Cameto, R., Davies, E., Levine, P., Newman, L., et al. (2004). *SEELS: Engagement, academics, social adjustment, and independence: The achievements of elementary and middle school students with disabilities*. Retrieved March 31, 2005, from http://www.seels.net/info_reports/engagement.htm

CAST. (2002-2006a). *Curriculum barriers finder*. Retrieved May 4, 2006, from http://www.cast.org/teachingeverystudent/tools/curriculumbarriers.cfm

CAST. (2002-2006b). *UDL class profile maker*. Retrieved May 4, 2006, from http://www.cast.org/teachingeverystudent/tools/classprofile.cfm

CAST. (2002-2006c). *UDL solutions finder*. Retrieved May 4, 2006, from http://www.cast.org/teachingeverystudent/tools/udlsolutionsfinder.cfm

Connell, B. R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., et al. (1997). *The principles*. Retrieved June 10, 2004, from http://www.design.ncsu.edu:8120/cud/univ_design/princ_overview.htm

Cytowic, R. E. (1996). *The neurological side of neuropsychology*. Cambridge: The MIT Press.

Dalton, B., & Coyne, P. (2002). Universally designed digital picture books to support beginning reading in children with cognitive disabilities. *52nd Annual Meeting of the National Reading Conference*. San Antonio, Texas.

Dalton, B., Pisha, B., Eagleton, M., Coyne, P., & Deysher, S. (2002). *Engaging the text: Final report to the U.S. Department of Education*. Peabody: CAST.

Dalton, B., Schleper, D., Kennedy, M., & Lutz, L. (2005). *Shared reading project: chapter by chapter -- thinking reader: Final report*. Wakefield, MA.

Dolan, R. P., & Hall, T. E. (2001). Universal design for learning: Implications for large-scale assessment. *IDA Perspectives, 27*(4), 22-25.

Erdner, R. A., Guy, R. F., & Bush, A. (1998). The impact of a year of computer assisted instruction on the development of first grade learning skills. *Journal of Educational Computing Research, 18*(4), 369-386.

Fletcher, J. M., Coulter, W. A., Reschly, D. J., & Vaughn, S. (2004). Alternative approaches to the definition and identification of learning disabilities: Some questions and answers. *Annals of Dyslexia, 54*(2), 304-331.

Frieden, L. (2004). *Improving educational outcomes for students with disabilities*. Retrieved September 8, 2004, from http://www.educationalpolicy.org/pdf/NCD.pdf

Fuchs, D., & Fuchs, L. S. (2006). Introduction to response to intervention: What, why, and how valid is it? *Reading Research Quarterly, 41*(1), 93-99.
Fuchs, D., Mock, D., Morgan, P. L., & Young, C. L. (2003). Responsiveness-to-intervention: Definitions, evidence, and implications for the learning disabilities construct., *Learning Disabilities: Research & Practice* (Vol. 18, pp. 157-171).
Fuchs, L. S. (2003). Assessing intervention responsiveness: Conceptual and technical issues. *Learning Disabilities: Research & Practice* (Vol. 18, pp. 172-186).
Fuchs, L. S., Deno, S. L., & Mirkin, P. K. (1984). The effects of frequent curriculum-based measurement and evaluation on pedagogy, student achievement, and student awareness of learning. *American Educational Research Journal, 21*, 449-460.
Fuchs, L. S., Fuchs, D., & Hamlett, C. L. (1989). Monitoring reading growth using student recalls: Effects of two teacher feedback systems. *Journal of Educational Research, 83*(2), 103-110.
Gersten, R., & Dimino, J. A. (2006). RTI (response to intervention): Rethinking special education for students with reading difficulties (yet again). *Reading Research Quarterly, 41*(1), 99-108.
Hay, L. (1997). Tailor-made instructional materials using computer multimedia technology. *Computers in the Schools, 13*(1-2), 61-68.
Hitchcock, C., Meyer, A., Rose, D. H., & Jackson, R. (2002). Providing new access to the general education curriculum. *Teaching Exceptional Children, 35*(2), 8-17.
Hitchcock, C., Meyer, A., Rose, D. H., & Jackson, R. (2005). Equal access, participation, and progress in the general education curriculum. In D. H. Rose, A. Meyer & C. Hitchcock (Eds.). *The universally designed classroom: Accessible curriculum and digital technologies* (pp. 52-96). Cambridge, MA: Harvard Education Press.
Howard, J. B. (2003). Universal design for learning: An essential concept for teacher education. *Journal of Computing in Teacher Education, 19*(4), 113-118.
Individual with Disabilities Education Improvement Act. (2004).
Individuals with Disabilities Education Act, 20 U.S.C. §1400 et seq. (2000).
Johnson, E., Mellard, D. F., & Byrd, S. E. (2005). Alternative models of learning disabilities identification: Considerations and initial conclusions. *Journal of Learning Disabilities* (Vol. 38, pp. 569-572).
Kavale, K. A., Holdnack, J. A., & Mostert, M. P. (2005). Responsiveness to intervention and the identification of specific learning disability: A Critique and alternative proposal. *Learning Disability Quarterly* (Vol. 28, pp. 2).
Kovaleski, J. F., Gickling, E. E., Morrow, H., & Swank, H. (1999). Best practices in operating pre-referral intervention teams in Pennsylvania. In A. Thomas & J. Grimes (Eds.). *Best practices in school psychology-IV* (pp. 645-645). Bethesda, MD: National Association of School Psychologists.
Luria, A. (1973). *The working brain: An introduction to neuropsychology*. New York: Basic Books.
MacArthur, C. A., & Haynes, J. B. (1995). Student assistant for learning from text (SALT): A hypermedia reading aid. *Journal of Learning Disabilities, 28*(3), 150-159.

Marston, D. (2005). Tiers of intervention in responsiveness to intervention: Prevention outcomes and learning disabilities identification patterns. *Journal of Learning Disabilities* (Vol. 38, pp. 539-544).

Mastropieri, M. A., & Scruggs, T. E. (2005). Feasibility and consequences of response to intervention: Examination of the issues and scientific evidence as a model for the identification of individuals with learning disabilities. *Journal of Learning Disabilities* (Vol. 38, pp. 525-531).

Murray, E., & Hall, T. (2006). *Science writer: A universally designed thinking writer for Science.* Wakefield, MA: CAST.

National Center for Education Statistics. (2003). *Digest of Education Statistics, 2003*. Retrieved March 31, 2005, from http://nces.ed.gov//programs/digest/d03/

Pisha, B., & Coyne, P. (2001). Smart from the start: The promise of universal design for learning. *Remedial and Special Education, 22*(4), 197-203.

Proctor, P., Dalton, B., & Grisham, D. (in press). Scaffolding English language learners and struggling readers in a digital environment with embedded strategy instruction and vocabulary support. To appear in *Journal of Literacy Research.*

Rose, D., & Strangman, N. (in review). *Universal access in the information society*.

Rose, D. H., & Dolan, R. P. (2000). Universal design for learning: Assessment. *Journal of Special Education Technology, 15*(4).

Rose, D. H., & Meyer, A. (2002). *Teaching every student in the Digital Age: Universal design for learning*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

Speece, D. L., & Shekitka, L. (2002). How should reading disabilities be operationalized? A survey of experts. *Learning Disabilities Research and Practice, 17*(2), 118-123.

Strangman, N. (2003). Strategy instruction goes digital: Two teachers' perspectives on digital texts with embedded learning supports. *Reading Online, 6*(9).

Telzrow, C. F., McNamara, K., & Hollinger, C. L. (2000). Fidelity of problem-solving implementation and relationship to student performance. *School Psychology Review, 29*(3), 443-461.

Tilly, W. D. (2003). *How many tiers are needed for successful prevention and early intervention? Heartland Area Education Agency's evolution from four to three tiers.* Paper presented at the National Research Center of Learning Disabilities Responsiveness-to-Intervention Symposium, Kansas City, MO.

U. S. Department of Education. (2001). *No Child Left Behind Act of 2001*. Retrieved May 4, 2006, from http://www.ed.gov/policy/elsec/leg/esea02/index.html

U.S. Office of Education. (1977). Assistance to states for educating of handicapped children: Procedures for evaluating specific learning disabilities. Federal Register, 42 (25), 65082-65085. Washington, D.C.: Government Printing Office.

Vaughn, S., & Fuchs, L. S. (2003). Redefining learning disabilities as inadequate response to instruction: The promise and potential problems., *Learning Disabilities: Research & Practice* (Vol. 18, pp. 137-146).

Vygotsky, L. (1962/1996). *Thought and language* (Vol. (Rev. Ed.)). Cambridge, MA: MIT Press.

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