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Response to Intervention (RTI) Services: An Ecobehavioral Perspective

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Abstract

School-wide Response to Intervention (RTI) services are growing in prevalence in U.S. schools. Most advanced are RTI programs in elementary schools, with preschool and secondary education programs beginning to discuss, develop, and experiment with school-wide RTI. At its heart, RTI seeks to account for individual differences in student learning success by discovering the instructional situations in which each student learns best and providing them for all who need them. RTI is an early intervening approach to the prevention of learning and behavior problems before they become disabilities later. The implementation of school-wide RTI approaches reorganizes school ecology at multiple levels and when implemented with fidelity, RTI schools have a distinctive “ecological footprint” that differentiates them from traditional, non-RTI schools. Implementers of RTI need consultation that provides them with information on the structure and function of their programs for use in problem solving and decision making. The purpose of this paper is to describe RTI and illustrate an ecobehavioral approach to providing RTI school staff with information they need.

Introduction

A paradigm shift in early intervening services is currently underway in US schools, the implementation of the Response to Intervention (RTI) approach to the education and treatment of children and youth (Berkeley, Bender, Peaster, & Saunders, 2009). While most efforts are well underway in elementary schools, preschools and secondary schools are also beginning to discuss and experiment with RTI (Linas, Greenwood, & Carta, 2009, June; National Center on Response to Intervention, 2009). Supporting this national effort at the macro level are favorable policies of the NCLB (“No Child Left Behind Act of 2001,” 2001) and IDEA (“Individuals with Disabilities Education Improvement Act,” 2004), educational professional organizations (e.g., National Association of School Psychologists, National Association of State Directors of Special Education), and federal and state supported funding for RTI professional development and technical assistance (e.g., IDEA Partnership, 2009). At its heart, RTI seeks to account for individual differences in student learning success by actively discovering the instructional conditions in which each student learns best and providing them for all who need them. RTI is an early intervening approach to the prevent learning and behavior problems from becoming serious disabilities later. The basic components of RTI align with this goal and include: (a) use of evidence-based practices for intervention and measurement, (b) universal screening of students to identify risk and need for intervention, (c) multiple system of supports or tiers of intervention, each with a greater intensity, (d) frequent progress monitoring to support decision making relative to each

student's need to either continue or change a tier of intervention, and (e) teams that plan, manage, and oversee the program to improve the outcomes of students and who work to improve the program over time (Greenwood, Kratchowill, & Clements, 2008).

Purpose

The purpose of this paper is to describe the ecobehavioral observational approach developed over the years by this author (Greenwood, Carta, Kamps, & Arreaga-Mayer, 1990; Morris & Midgley, 1990) and others to address these and other related questions about the structure and function of classroom instruction in RTI schools. Structure refers to those units of the ecology that organize activity in RTI schools; function is used to refer to the probabilistic association between the activities of these ecological units and individual student behaviors occurring within ecological units. Following a brief presentation of the ecological implications of RTI, the ecobehavioral approach is described and illustrated using observational assessment tools and data based on the approach. These instruments currently support the collection and reporting of objective data in a number of schooling applications including preschool (3 to 5) (Atwater, Lee, Montagna, Reynolds, & Tapia, 2009), general and special education (K-12), (Carta, Greenwood, Schulte, Arreaga-Mayer, & Terry, 2009), and K-12 programs supporting English Language Learners (Arreaga-Mayer, Carta, & Tapia, 2009) and multi-language instruction. The aim is to illustrate how these tools can be used to support consulting services that address and support RTI issues in local schools.

Prevention in Schools

RTI is a proactive approach to the prevention of behavior and learning problems in schools (Kratchowill, Clements, & Kalymon, 2007). Prevention models are designed to manage risk in an elementary school by linking an identified problem to its exposure-disorder-outcomes intervention knowledge base. The goal of prevention is to employ problem solving efforts to address known causes of learning problems by providing protection against the onset of the problem (Tier 1 Supports), accelerating progress learning a skill in the context of a delay (Tier 2 Supports), and, where the problem exists, preventing it from getting worse (Tier 3 Supports) (e.g., Merrell & Buchanan, 2006; Shinn, Walker, & Stoner, 2002). The ultimate goal of prevention is to maximize positive outcomes at all levels, including those experienced by the individual, the organization, the system, and society. Prevention outcomes for some at-risk children may be keeping them from having to experience the problem and its costs altogether (Tier 1). For example, where behavior problems and risks for special education services are high, evidence-based treatments are used to reduce problem behaviors and ameliorate developmental delays before they become disabilities (Tier 2). Where a child has a disability (e.g., behavior disorder), evidence-based treatments are used to ameliorate these existing conditions and, to the extent possible, reduce greater negative impact when compared to the natural course of the disability (e.g., early onset, greater loss of function, early school failure, suspension, drop-out) (Tier 3). Interventions in this case are designed to improve function, key skill levels, and independence, thereby reducing costs compared to traditional practices or no response at all. Typically, progress data are used to assess whether or not the universal intervention (Tier 1) is sufficient, and to identify those students who are not responding and need more intense support. Key decision

making within a prevention framework seeks to move a student either into or out of Tier 2 or Tier 3 intervention, rather than waiting several years for the student to become eligible for an Individual Education Program (IEP).

Implementers of school-based RTI programs need consultation services capable of informing them about a range of important issues and questions to guide and evaluate implementation progress, improve effectiveness, and plan needed improvements. The school personnel in need of these consulting services are administrators, individual teachers and support personnel who provide instructional-intervention services, and building RTI management teams that evaluate and oversee the setting of goals and strategies for improving the performance of the program. These informational consulting services include:

1. **Information and advice on the quality of Tier 1 services.** Is Tier 1 instruction conducted at the planned strength and are students engaged in academic responding, task management, and inappropriate behavior at desired levels? If not what can be done to improve? Are Tier 1 services actively helping lower the need for Tier 2 and 3 services by engaging students in desired behaviors and reducing problem behaviors during instruction?
2. **Information and advice on the implementation of Tier level services (multiple systems of support) for individuals and groups of students.** Are specific students receiving Tier 1 and 2 services as planned, for how long and in what settings and activities? Does this actual profile of implemented services reflect the goals and plans for these RTI services and the fidelity of implementation?
3. **Information on individual student's response to tier services in terms of engagement in academic responding, task management, and the infrequency of competing classroom behaviors.** When Tier 2 and 3 level services are expected to be more "intensive," is it the case that students receiving these services are showing the expected improved levels of behaviors. For example, is Student A more engaged in academic responding in Tier 2 than in their Tier 1 baseline, and if not what should be done about it? Should students be moved from one Tier to another Tier of service?
4. **Information and advice on students with IEPs with respect to their appropriate level of tier services; the settings, activities, and instructional situations where these services are being received; and what is the student's response to intervention?** Students with IEPs may be served in any Tier based on their response to intervention within a domain or subject matter outcome. Within tiers of service, in what settings, activities, and instructional situations are students receiving services, and what is the response to intervention?
5. **Information on the teacher aspect of delivering tiered service - who the teachers are that are providing it, their instructional behavior, and the fidelity of teacher implementation of the RTI model.** Is the professional development provided teachers in support of implementing the RTI approach working? Are teachers arranging the instructional environments as planned and desired? Are they

using the instructional behaviors planned and desired? Is the model being implemented with fidelity?

The Ecology of RTI Schools

To achieve prevention goals, RTI schools are structured, arranged, staffed, and managed differently than traditional schools (Greenwood, et al., 2008). Some of the obvious differences separating RTI schools from traditional schools are ecological conditions such as: (a) school-wide implementation and universal practices, (b) multiple tiers of support, (c) evidence-based practices, (d) systematic use of progress monitoring data for decision making, and (e) dynamic flow of students within and across tiers of services as soon as needed to improve and maintain a positive response to intervention.

School-wide implementation and universal practices

School-based RTI models are applied to the entire student body in a uniform way with a high level of implementation fidelity. This is true regardless of age, grade level, socio-demographics, languages spoken, or disability status. All students, teachers, administrators, and parents are included in the model and play a role to achieve the desired outcomes. Partial RTI approaches used in a school would not be conceptually aligned with the larger purposes of prevention. Some teachers using practice X versus some practice Y, as may happen in many traditional schools with respect to other practices, also is not an optimal RTI prevention approach.

One universal is the goal of identifying persons at higher relative risk, and providing them with an intervention of greater intensity. Frequent, universal screening of all students for this purpose is a specific example. A second universal method is the use of evidence-based practice. A third is administration buy in and support. Another universal practice is staff trained to implement practices with fidelity, and use of professional development and feedback to accomplish this goal (Greenwood et al., 2008). Ecological impacts of these features may include more teachers on the same page about school practices, children experiencing frequent assessments, and teacher's experiencing more professional development and consultation on their use of practices, among others.

Multiple levels or tiers of support

School-wide RTI is characterized by multiple tiers of risk and support. Students within RTI schools are considered to be stratified across three, sometimes 4 tiers of risk ranging from no risk to very high risk. There is no empirical consensus on the best number of tiers; however, most models have three (Berkeley, et al., 2009; Tilly, 2008). Expectation at Tier 1 is that about 80% of students will be making expected progress in response to the Tier 1 evidence-based curriculum. About 15% of students are projected to not be making expected progress and in need more intensive Tier 2 intervention. And, about 5% of students are projected to not be benefiting from Tier 2 and need Tier 3. Higher Tiers of support are designed and arranged to include practices known to be of more intensive than lower Tiers and to be effective meeting the needs of students at higher levels of risk. These ideal proportions of students in each tier reflect the reality at each school with either greater or lesser proportions of students needing Tier 2 and Tier 3 supports. The distribution in each school is expected to

be malleable, for example, positively affected by a use of a very effective Tier 1 curriculum, as well as effective Tier 2 and 3 interventions. Alternately, use of ineffective Tier 1 is expected to reduce learning and increase need for Tier 2 and 3 supports. Schools with a Tier 1 portion of the student body of more than 80% of students are considered to be effective. Less than 80% negatively implicates the effectiveness of the Tier 1 intervention. Ecological impacts of these features may potentially include different settings within the school where Tiered services are provided, different teachers providing services, different instructional grouping patterns, and differences in the curriculum used in different Tiers. In Tier 3 services, for example, it may be common to have the ongoing help of parents and home-school programs to boost intensity by extending behavioral and literacy/reading interventions to include both home and school.

Evidence-based practice

The only outcomes that can be prevented are those for which empirical evidence exists demonstrating that some alternative approaches/interventions are more effective than others in reducing problems. Use of evidence-based practice is a tenant of school-wide RTI in each and every tier of support. Examples of such practices are listed on the What Works Clearinghouse website (<http://ies.ed.gov/ncee/wwc/>), and their use impacts differences in a range of ecological features and expected student behaviors during instruction.

Use of progress monitoring data for decision making

RTI models need frequently assessed progress monitoring data as a basis for deciding whether or not individual students are making expected progress. The progress monitoring and problem solving (decision making) approaches of Deno (Deno, 2002, 2003; Fuchs & Deno, 1991) and Good (Good, Gruba, & Kaminski, 2002) provide two concrete methods widely used in elementary schools that are consistent with prevention science and school-wide RTI models. Data from these measures are the basis for moving students from one Tier to the next, changing their micro-ecology for periods of instruction during the day. Ecological effects of some of these changes may include students experiencing more one-on-one or small-group instruction as well as taking more frequent assessments of progress.

Dynamic flow of students within and across tiers of services as needed to improve and maintain a positive response to intervention

Students in RTI schools are expected to change Tiers of support based on indicators of level and growth. Conceptually at least, this suggests greater diversity in micro-ecologies in RTI schools as students add or lose Tier level supports. In some programs, these decisions are made by a building-based team in collaboration with the teacher on a quarterly basis, or as soon as needed. Ecological effects of these changes may include more frequent changes in the ecological arrangements of instruction for some students than is typical in a traditional school.

What are the Desired Functions of the RTI School?

RTI schools are not just differentiated by differences in school and classroom ecological arrangements implicit in the use of observable RTI components, but also in the function of

that structure with respect to improving individual student progress in specific ways during instruction. Consider, for example, the effects of manipulating just one ecological factor such as group size: entire group (Tier 1), small group (Tier 2), and one-on-one (Tier 3). All things being equal, the expectation would be that an individual student's engagement in academic responding would be lower and more variable in entire-group instruction, higher and less variable in small group, and highest in one-on-one. Similarly, we expect the inverse to be true of competing behaviors, that is, they would be highest in the entire group environment, and lowest in one-on-one instruction.

The function of the set of practices selected for use at these different levels of support is to promote more engagement in academic responding during instruction and reduce inappropriate behavior. Thus, the most useful data in RTI schools will be those measures able to link structural changes in (a) school-classroom ecology and (b) teacher factors to (c) changes in student behavior and learning outcomes.

What Does an Ecobehavioral Approach to RTI Bring to Measurement?

An ecobehavioral approach to measuring the structure and function of instructional intervention has important implications for data collection in RTI schools. As previously mentioned, measuring ecobehavioral structure provides description of the occurrence of classroom events. Measuring function provides information of the effects of classroom ecological arrangements on the occurrence of behaviors of interest. Both kinds of information are needed in RTI. To provide this information, direct observational instruments using ecobehavioral event taxonomies have been designed to measure the occurrence of three event categories close in time: (a) school and classroom ecological arrangements, (b) the person serving the role of teacher and teacher behavior, and (c) student behavior. Where earlier observational instruments had been designed to be exclusively ecological or behavioral (e.g., Greenwood, Carta, & Dawson, 2000), ecobehavioral methods integrate classroom ecology, teacher, and student behavior event streams and their recording by an observer, one moment to the next, as they change over time. Momentary time sampling makes this possible using application software on a palm-top, mobile computer with software that paces the data entry (e.g., Greenwood, Carta, Kamps, Terry, & Delquadri, 1994; Kim, 2009; Reynolds, et al., 2009). The instruments are standardized, direct observational measures wherein: (a) their goal is to measure specific behavioral and ecological events, (b) their events are operationally defined, (c) data are collected using standardized procedures, (d) the times and places of observation are carefully selected and specified, and (e) scoring and summarizing of data are standardized and do not vary from one observer to another (Hintze, Volpe, & Shapiro, 2008).

Depending on the instrument, the ecobehavioral events are updated every 15–20 seconds by observers so that a 3-channel data stream is produced reflecting the structure of these events at any single point in time and their temporal covariation with student behavior change over time. In ecobehavioral data, student behavior function is indicated by the likelihood of a particular behavior occurring given the occurrence of a particular ecology and/or teacher event structure.

This feature enables answers to questions like those posed earlier and these as well: How much time is Ramon spending in Tier 1 reading instruction? Is this amount of time the same or less than a typical peer in the same class? How often is Ramon reading aloud during reading instruction (the base level occurrence of reading aloud)? And, also for Ramon, which ecological and teacher behavior events appear to be most promoting of his reading aloud? Furthermore, before and after implementing an instructional intervention for Ramon, has the occurrence of reading aloud increased, is it changing, or is it decreasing? And, have the ecological and teacher behavior events logically linked to a planned change in instruction actually changed as expected when compared to before and after intervention? Thus, for individual students, and for groups of students (by pooling separate observations of individual students), answers to these and similar questions (e.g., Has the change in Ramon's oral reading during instruction influenced his rate of progress on reading CBM probes?) can be addressed.

Several principles have guided development of our ecobehavioral instruments setting them apart from other observational instruments. First, we assume that classroom ecology and teacher behavior events are alterable variables that are under the control of classroom teachers; that is, they are components of their ongoing classroom arrangements and teacher interactions with students. We also assume that these instruction variables influence, and are influenced by, student behavior and learning. Second, generating hypotheses about the behavioral function of instruction and of Tier level services requires measurement of a representative sample of instruction actually received by individual students. This student-focused feature in ecobehavioral strategies is critical to an understanding of how these features impact an individual child's behaviors and their RTI. Observation instruments designed to reflect entire class-level average events, for example by rotating momentary observations from one student to another and another, do not lend themselves nearly as well to addressing questions of individual behavioral function needed in RTI schools.

Third, like all instruments, these strategies need to be sound technically, that is, reliable and valid. Fourth, the measurement strategies need to be as friendly and economical as possible to be used in RTI schools. Instruments will need to be sensitive to publically observable ecological and behavioral changes, and produce data that are useful in a timeframe short enough for teachers to act on the results in terms of monitoring progress, instructional decision-making, and changing instruction when needed.

What Does an Ecobehavioral Taxonomy of Events Look Like?: MS-CISSAR

The event taxonomy of the Main Steam Code for Instructional Structure and Student Academic Response (MS-CISSAR: Carta, et al., 2009) is shown in Appendix A. Consistent with the ecobehavioral approach, events are organized under the three main categories of ecology, teacher, and student, and subcategories within each of the three. For ecology, subcategories are Setting, Activity, Task, Physical Arrangement, and Instructional Grouping. For Teacher, subcategories are Teacher Definition, Teacher Behavior, Teacher Approval, Teacher Focus, and Teacher Position. For Students, the subcategories are; Academic Responding, Task Management, and Competing Responses. Objective definitions define each of these events so that observers can learn to record them reliably. While this list

of events appears daunting, in each interval observers are only required to enter one event per subcategory.

The MS-CISSAR taxonomy was designed to capture the ecology of 112 general and special education, teacher, and student events. The Ecobehavioral System for the Contextual Recording of Interactional Bilingual Environments (ESCRIBE) is a similar ecobehavioral instrument for students in similar grade levels that captures additional information about the English and other language aspects of instruction provided, including the instructional model and materials in the ecology, and the language used by the student and the teacher during ongoing instruction (see Appendix B) (Arreaga-Mayer, et al., 2009).

The Classroom Code for Interactive Recording of Children's Learning Environments (Classroom CIRCLE) taxonomy is a third ecobehavioral instrument designed to capture the ecological and behavioral features of the preschool classroom (Atwater, et al., 2009). In this case, the Classroom Contexts (similar to Activities in the other two taxonomies) are seen to be characteristic of preschool as are the Focus of Instruction events, such as phonological awareness, Alphabetic/Print Concepts (see Appendix C). Similarly, child behaviors are focused on communication and learning to talk and socialize, as well as engagement in pre-academic, gross motor, and other typical preschool behaviors.

In summary, these instruments share the ecobehavioral framework and use similar time sampling methods for recording events using mobile computer devices. All three instruments provide an analysis of characteristic ecology, teacher, and student behavior. Additionally, the ESCRIBE makes available the ability to capture the structure of language instruction in languages other than English, as well as the language behaviors of the teacher and student. With CIRCLE, the structure of classroom, teacher and student behaviors are representative of the instructional and behavior expectations of preschool programs.

Ecobehavioral Data Used in Support of RTI Problem Solving: A Case Illustration

Linking ecobehavioral assessment information to intervention decisions in RTI requires a problem solving logic and supporting data from which testable hypotheses explaining “the gap between identified problems and factors that contribute to the problem” can be created (Batsche, Castillo, Dixon, & Forde, 2008, pg 178). The ability to build testable hypotheses around empirical data helps understand the conditions that contribute to the problem and suggests what needs to be learned and taught to reduce the problem at any level of Tier service.

The RTI problem solving logic (Fuchs & Fuchs, 2007; Upah, 2008) is as follows:

1. **What seems to be the problem and is it validated** (behavioral definition, baseline data, and problem validation)?
2. **Why is it happening** (problem analysis steps)?
3. **What is the solution** (goal setting, description of the replacement behavior, intervention planning, measurement, and decision making plan)?

4. Is it being implemented (treatment fidelity)?

5. Is it working (progress monitoring, formative and summative evaluation)?

We now turn to an illustration, using a real case, of how ecobehavioral assessment and analysis of the structure and function of instructional intervention can be used to support problem solving. As the result of a school-wide screen by teachers, the school psychologist was asked to conduct a classroom observation of Jason Sanderson (a fictitious name), a 3rd grader whose teacher had reported concerns about his challenging behavior and that he was falling behind academically due to his lack of concentration on school work. Discussion with the teacher suggested observations in the Art Room during Arts and Crafts where it seemed that Jason was better behaved and in the Regular Classroom during Reading and Language Arts where the teacher reported he was struggling. The school psychologist created an observation schedule that focused only on these sessions. The tables and figures that follow were taken from real MS-CISSAR printouts generated by the software for this illustrative case.

What seems to be the problem and is it validated?

The school psychologist planned two 30-minute observations on different days that week. The results of the first observation in the Art Room (see Table 1) indicated that Jason spent 47% of the 30 minute observation engaged in inappropriate, competing behavior (e.g., Disruption = 3.3%, Look Around = 33.3%, Non-Compliance = 10.0%). He only spent 17% of the time engaged in academic responding. The momentary pattern of his engagement in academic responding during the observation indicated that he was engaged in only 5 minutes at about the middle of the 30- minute session (see Figure 1).

The second observation in the Regular Classroom setting produced even higher levels of inappropriate behavior (70%) during that 30 minutes of Language Arts instruction (Look Around = 3.3%, Non-Compliance = 46.7%, Self-Stimulation = 20%). His momentary pattern of engagement in academic responding indicated only 1 out of 30 minutes! Based on these data, a behavior problem pattern defined by looking around, non-compliance, and self-stimulation, across two school settings (Art Room, Regular Classroom), two activities (Arts and Crafts, Language Arts), and two grouping arrangements (Whole class and Independent grouping) was tenable.

With impressively high levels of total inappropriate behavior and very low engagement in academic responding evident, the psychologist now took steps to validate the problem by comparing this student's pattern to that of a teacher-nominated typical peer in the class. Typical peer comparative analyses examined the stability of the target student's pattern over time and generality of this behavior pattern across the different instructional activities. To do this, he developed an observation schedule that would sample the peer's behavior in the activities of interest as well as the target student. A total of twelve 30-minute observations (6 hrs) were planned in addition to the two already conducted, with a similar number collected for the typical peer. Both students were observed in Reading, Math, and Language Arts. Because the target student had been observed in an elective Arts and Crafts class, it was

necessary to observe the typical student in electives. In this case, the typical student attended Music and Gross Motor Activity electives, so these were observed for this purpose.

Results supported Jason's generalized pattern of behavior problems across activities. With respect to typical peer comparison, the data indicated sizeable differences in the occurrence of competing behavior and engagement in academic responding. Jason was much more inappropriate (56% versus 22%) than the peer and much less engaged in academic responding (21% versus 45%) (see Tables 2 and 3). Jason was much more likely to engage in inappropriate talk, look around, and noncompliance (Table 2) than was the peer, and he was much less engaged in writing, task participation, and silent reading (Table 3).

With respect to trend over time, the target student's high inappropriate behavior and low academic responding pattern was highly consistent. On only one occasion (observation #8), did the typical peer exceed Jason in inappropriate behavior level. Otherwise, there was wide separation, on the order of 10 to 20 percentage points, and little overlap (see Figure 2, left panel). Similarly with engagement in academic responding, there was consistent, wide discrepancy over sessions. Overlap occurred for only 2 of 12 sessions, when Jason was more engaged in academic responding than the peer (see Figure 2, right panel).

With respect to generality over target Activities, Jason's pattern of behavior ranged consistently above 0.43 and as high as 0.61 in each of Language Arts, Math, Reading, and Arts and Crafts activities (see Table 4). Thus, a generalized problem behavior pattern was validated for Jason in comparison to a benchmark provided by the typical peer (Tables 2 and 3), in terms of stability of the pattern over time (Figure 2), and generality across instructional activities (Table 4).

Why is it happening?

Using conditional probability analysis (Greenwood, Horton, & Utley, 2002), the school psychologist sought to identify potential trigger situations and maintainers of the problem behavior pattern (see Table 4). He also conducted similar analyses for replacement behaviors in the form of academic responding (data not shown). These findings suggested several hypotheses about what to do by way of developing a change in intervention. With respect to promoters of Jason's problem behavior several hypotheses emerged.

- Settings: Problem behaviors were more frequent in Regular Class (.60) and lower in the Art Room (.43) or the Library (.37) (see Table 4, Settings Panel).
- Activities: Problem behaviors were highest in Language, Math and Reading, and lowest in Arts and Crafts Activities (see Table 4, Activity panel).
- Tasks: Problem behaviors were highest when Listening to Lecture and using Worksheets, and lowest when using either Other Media or Readers (see Table 4, Tasks panel).
- Teacher Definition: Problem behaviors were highest with the Regular Classroom Teacher and a Substitute Teacher, and lowest with a Related Service worker (see Table 4, Teacher Definition panel).

- **Teacher Behavior:** Problem behaviors were highest when the teacher was Reading Aloud, Talking about Academics, Asking Academic Questions, and lowest when Attending to the Students, Talking about Management, and when making No Response (see Table 4, Teacher Behavior panel).
- **Instructional Grouping:** Problem behaviors were highest in Whole Class instruction and lowest with Independent grouping (see Table 4, Instructional Grouping panel).

What is the Solution?

Focus now turned to developing a potential solution. Based on all the information collected, an intervention was developed as a result of a clinical review and synthesis of these findings. This review led to the hypothesis that the student's behavior was promoted by the demands in the regular classroom during academic instruction (e.g., language, math, reading) taught by the teacher or substitute teacher using lecture and worksheet tasks in a whole-class format. Development of the intervention, focused on the instructional situations and strategies wherein the student's inappropriate behavior was shown to be the lowest, for example, in non-academic activities, not in the regular classroom, not whole classroom, not taught by the regular teacher, etc.

Based on this review, two parallel plans, one for Tier 1 and the other for Tier 2, were developed to reduce problem behaviors and increase academic responding/progress.

Tier 1 Intervention

The teacher and school psychologist worked out a plan to reduce the amount of whole class, lecture-based instruction in favor of more peer-mediated and independent structures with teacher attention being made much more contingent on the student's engagement in academic responding. ClassWide Peer Tutoring, an evidence-based practice for beginning reading, was selected as a means of reducing lecture and increasing Jason's and all other students' academic responding in Tier 1 (Greenwood, Kamps, Terry, & Linebarger, 2006). They also sought to insure that the difficulty of tasks given Jason were at a consistently manageable level for him. Additionally, they tried to incorporate tasks during subject matter instruction, such as other media, shown to be more successful with this student.

Tier 2 Intervention

Jason was assigned to receive Tier 2 services, small-group reading instruction provided by a trained paraprofessional at the school. The evidence-based curriculum used for this purpose was Early Interventions in Reading (Mathes & Torgesen, 2005). To address his behavior issues, it was decided to use the Social Skills Club (Lewis, Sugai, & Colvin, 1998) and Check in/Check program (Crone, Horner, & Hawken, 2004). These services also were available at the school as part of its regular RTI program.

Is it being implemented?

Additional observations were conducted during times when the intervention was being implemented. The data were analyzed and feedback on progress was reported back to the teacher by the school psychologist. Over the first two weeks, the sampled data indicated

changes were in the desired direction in terms of implementation fidelity. For example, MS-CISSAR data showed that the student was receiving more approval from the teacher than previously and that peer tutors were being coded as the teacher during the Tier 1 peer tutoring activities. It should be noted that in the MS-CISSAR the teacher is defined as the person providing proximal, direct instructional support or guiding the responding of the target student being observed (refer to Appendix A for some examples of who may be coded in the teacher role). Similarly, the Tier 2 program was exposing Jason to small group reading instruction as planned. This teacher was also using approval more frequently as well as interacting with students as described in the curriculum.

Is it working?

Analyses of the Jason's behavior in the days and weeks after intervention indicated an improving trend with replacement behaviors increasing over time relative to declining competing behaviors. For example, during the peer tutoring in Tier 1 his Talk Academic, Task Participation, and Writing soared over previous levels (see student behavior codes, Appendix A), while Look Around, Talk Inappropriate, and Non-Compliance were reduced to equal or lower levels in comparison to the typical peer. Similar improvements were seen in the Tier 2 setting with curriculum based measurement (CBM) data indicating increasing oral reading fluency. Plans were made to conduct additional observations to monitor progress, and maintain and make improvements in the intervention.

Discussion

The purpose of this paper was to illustrate the ecobehavioral approach and how data derived from ecobehavioral assessment and analysis may be of use to consultants and school staff implementing school-wide RTI programs. When implemented with fidelity, RTI schools have an ecological structure that differentiates them from more traditional non-RTI schools. As described, implementers of RTI programs need information on both the structure and function of their programs for a range of purposes related to intervention decision making for individual students. These purposes also extend to evaluating and improving the effectiveness of the multiple tiers of support being implemented in RTI schools. The ecobehavioral measures have strong implications for children with challenging behaviors, as well as replacement behaviors of a social and academic nature. This information, in combination with other data on student progress (e.g., CBM, Dynamic Indicators of Basic Early Literacy Skills - DIBELS, academic outcomes), is helpful in describing the implementation of RTI programs as well as their effects on student behavior change and learning.

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Figure 1.

Plot of the Target student's pattern of engagement in academic responding across consecutive minutes within a single 30 minute observation.

Figure 2.

Comparison of level and trend in target versus typical peer percentage occurrence of competing behavior (left panel) and percentage occurrence of engagement in academic responding (right panel). Legend: The black circular marker is the typical peer, the white circular marker is the target student. The straight horizontal lines indicate the mean level percentage occurrence for the peer (dashed line) and the target student (solid line).

Table 1

Target Student's Ecobehavioral Events Percentage Occurrence Summary of One 30 Minute Observation.

MSCISSAR Molar Analysis Report				

TEACHER REPORT [Janson Sanderson (File = b1-3. TX1)] (N = 30)]				
SETTING:	PHYSICAL ARRANGEMENT:			
Regularcls	EntireGrp	X16.67	TEACHER FOCUS:	
SpecialEd	DividedGrp	XXXXXX83.33	Target	X6.67
ResourceRm	Individual (Missing)		Target&Oth	X16.67
Library			NoOne	X16.67
ComputrLab			Other (Missing)	XXX60.00
MusicRoom				
ArtRoom	XXXXXX100.00	INSTRUCTIONAL GROUPING:		
Gymnasium				
TherapyRm	WholeClass	XX26.67	TEACHER POSITION:	
Hall	SmallGroup			
Auditorium	OneOnOne		InFront	X16.67
Other (Missing)	Independnt	XXXXXX73.33	AtDesk	
	MultiMedia		OutOfRoom	
	NoInstruct (Missing)		Side	XX30.00
			Back	XXX50.00
			AtMedia (Missing)	
ACTIVITY:	TEACHER DEFINITION:			
Reading	Regular		ACADEMIC RESPONDING:	
Math	SpecialEd			
Spelling	Aide/Para		Writing	
HandWriting	StudentTch		TaskPartic	X16.67
Language	Volunteer		ReadAloud	
Science	RelatedSrv	XXXXXX100.00	ReadSilent	
SocialStud	Substitute			
Computing				
FreeTime				

MSCISSAR Molar Analysis Report				

TEACHER REPORT [Janson Sanderson (File = b1-3. TX1)] (N = 30)]				
PHYSICAL ARRANGEMENT:				
Transition	PeerTutor		TalkAcad	
Music	ElecMedTch		Typing	
ArtsCrafts	XXXXXX100.00	NoStaff (Missing)	NoAcadResp (Missing)	XXXXXXXX83.33
NoActivity				
PreVocatnl				
GrossMotor				
DailyLiving				
Self-Care				
BusManagmt				
TimeOut				
Other (Missing)				
TEACHER BEHAVIOR:				
	QuestAcad		RaiseHand	
	QuestMgmt	X3.33	PlayApprop	X16.67
	QuesDsclpn		ManipMatrl	X3.33
	TalkAcad	X16.67	Moving	
	TalkMgmt	XX30.00	TalkMgmt	
	TalkDsclpn	X3.33	Attention	X3.33
	TalkNonAca	X6.67	NoTaskMgmt (Missing)	XXXXX76.67
	NonVbPrmpt			
	Attention	X3.33		
	ReadAloud			
	Singing			
	NoResponse (Missing)	XX36.67		
COMPETING RESPONSE:				
			Aggression	
			Disruption	X3.33
			TalkInapp	
			LookAround	XX33.33
			NonComply	X10.00
			Self-Stim	
			Self-Abuse	
			NoInappro (Missing)	XXXX53.33
TEACHER APPROVAL:				
	Approval	X6.67		
	Disapproval	X3.33		
	Neither (Missing)	XXXXXX90.00		

Note. Abbreviations are as follows: RegularCIs = Regular Classroom, ResourceRM = Resource Room, Target&Oth = Target and Other, TherapyRM = Therapy Room, NoInstruct = No Instruction, SocialStud = Social Studies, Prevocatnl = Prevocational, BusManagmt = Business Management, QuestAcad = Question Academic, QuestMgmt = Question Management, QuestDscpln = Question Discipline, TalkAcad = Talk Academic, TalkMgmt = Talk Management, TalkDspln = Talk Discipline, TalkNonAca = Talk Non-Academic, PlayApprop = Play Appropriate, ManipMatrl = Manipulate Materials, NoTaskMgmt = No Task Management, Paper&Pen = Paper and Pencil, ListenLect = Listen to Lecture, ElectroMed = Electronic Media, Feich/Put = Feich/Put-away, TalkInapp = Talk Inappropriate, SelfStim = Self Stimulation, NoInappro = No Inappropriate.

Table 2
Similarity in the Occurrence of Competing Behaviors for the Target Student and a Typical Peer

MSCISSAR Profile Analysis Report						

TARGET INPUT DATA: Jason Sanderson 3rd Grader						
INDEX INPUT DATA: Typical Peer 3rd Grader						
COMPETING RESPONSE (Descriptive Comparison)						
CODE	TARGET PROFILE		INDEX PROFILE		DISCREPANCY PROFILE	
	Freq	Percent	Freq	Percent	Diff	DiffSq
Aggression	0	0.00	0	0.00	0.00	0.00
Disruption	5	1.39	0	0.00	1.39	1.93
TalkInapp	30	8.33	6	1.67	6.67	44.44
LookAround	66	18.33	28	7.78	10.56	111.42
NonComply	61	16.94	9	2.50	14.44	208.64
Self-Stim	38	10.56	37	10.28	0.28	0.08
Self-Abuse	0	0.00	0	0.00	0.00	0.00
NoInappro	160	44.44	280	77.78	-33.33	1111.11
(Missing)	0	0.00	0	0.00	0.00	0.00
TOTAL	360		360		66.67	1477.62
						SUM
						38.439868
						D-STAT

Note: The D-statistic is a profile similarity descriptive statistic that considers both level and shape differences between two profiles (Cronbach & Gleser, 1953). When D = 0, the profiles are exactly similar, as D becomes larger the profiles are increasingly dissimilar. Unfortunately, there is no inferential statistic for D.

Abbreviations are as follows: FREQ = Frequency, Percent = Percentage Stat = Statistic; TalkInapp = Inappropriate Talking; NonComply = Non-Compliance; Self-Stim = Self-Stimulation, NoInappro = No Inappropriate

Table 3
Similarity in the Occurrence of Engaged in Academic Responding for the Target Student and a Typical Peer

MSCISSAR Profile Analysis Report						

TARGET INPUT DATA: Jason Sanderson 3rd grader						
INDEX INPUT DATA: Typical Peer 3rd Grader						
ACADEMIC RESPONDING (Descriptive comparison)						
CODE	TARGET PROFILE		INDEX PROFILE		DISCREPANCY PROFILE	
	Freq	Percent	Freq	Percent	Diff	DiffSq
Writing	15	4.44	31	8.61	-4.17	17.36
TaskPartic	35	9.72	68	18.89	-9.17	84.03
ReadAloud	2	0.56	4	1.11	-0.56	0.31
Readsilent	20	5.56	52	14.44	-8.89	79.01
TalkAcad	2	0.56	6	1.67	-1.11	1.23
Typing	0	0.00	0	0.00	0.00	0.00
NoAcadResp	285	79.17	199	55.28	23.89	570.68
(Missing)	0	0.00	0	0.00	0.00	0.00
TOTAL	360		360		47.78	752.62
						SUM
						27.433984
						D-STAT

Note: The D-statistic is a profile similarity descriptive statistic that considers both level and shape differences between two profiles (Cronbach & Gleser, 1953). When D = 0, the profiles are exactly similar, as D becomes larger the profiles are increasingly dissimilar. Unfortunately, there is no inferential statistic for D.

Abbreviations are as follows: FREQ = Frequency, Percent = Percentage, Stat = Statistic; TaskPartic = Task Participation, TalkAcad = Talk Academic, NoAcadResp = No Academic Response.

Table 4

Probability of Problem Behavior Given Classroom Situations.

MSCISSAR Ecobehavioral Analysis Report									
*****< STUDENT CATEGORY >*****									
A=SETTING					COMPETING RESPONSE				
STUDENT BEHAVIORS:									
Aggression LookAround Self-Abuse					Disruption NonComply TalkKnapp self-stim				
FREQ					CONDITONAL PROB				
PCT					Z-SCORE				
SIGNIFICANCE									
FREQ					CONDITONAL PROB				
PCT					Z-SCORE				
SIGNIFICANCE									
1 A=RegularCls					163	0.60	0.802		
2 A=ArtRoom					26	0.43	-1.176		
3 A=Library					11	0.37	-1.334		
SEQUENCES USED					200	0.56	UNCONDITIONAL PROBABILITY		
SEQUENCES RECORDED					360				
*****< STUDENT CATEGORY >*****									
A=ACTIVITY					COMPETING RESPONSE				
STUDENT BEHAVIORS:									
Aggression LookAround Self-Abuse					Disruption NonComply TalkKnapp self-stim				
FREQ					CONDITONAL PROB				
PCT					Z-SCORE				
SIGNIFICANCE									
1 A=Language					53	0.58	0.289		
2 A=ArtsCrafts					26	0.43	-1.189		
3 A=Math					55	0.61	0.614		
4 A=Reading					66	0.56	0.028		
SEQUENCES USED					200	0.56	UNCONDITIONAL PROBABILITY		
SEQUENCES RECORDED					360				

MSCISSAR Ecobehavioral Analysis Report										

-----< ECOLOGICAL CATEGORIES >-----					-----< STUDENT CATEGORY >-----					
A=TASK					COMPETING RESPONSE					
--< ECOL. MODELS >-- (at least 5% data)					FREQ	CONDITIONAL PROB	Z-SCORE	SIGNIFICANCE		
1 A=Worksheets					162	53.8%	92	0.57	0.180	
2 A=OtherMedia					45	15.0%	21	0.47	-0.740	
3 A=ListenLect					70	23.3%	46	0.66	1.035	
4 A=Readers					24	8.0%	8	0.33	-1.402	
SEQUENCES USED					301	83.6%	167	0.55	UNCONDITIONAL PROBABILITY	
SEQUENCES RECORDED					360					
-----< ECOLOGICAL CATEGORIES >-----										
A=TEACHER DEFINITION										
--< ECOL. MODELS >-- (at least 5% data)					FREQ	PCT	FREQ	CONDITIONAL PROB	Z-SCORE	SIGNIFICANCE
1 A=substitute					22	6.1%	14	0.64	0.510	
2 A=Regular					187	52.2%	115	0.61	0.923	
3 A=Relatedsrv					149	41.6%	69	0.46	-1.241	
SEQUENCES USED					358	99.4%	198	0.55	UNCONDITIONAL PROBABILITY	
SEQUENCES RECORDED					360					
-----< ECOLOGICAL CATEGORIES >-----										
A=TEACHER BEHAVIOR										
--< ECOL. MODELS >-- (at least 5% data)					FREQ	PCT	FREQ	CONDITIONAL PROB	Z-SCORE	SIGNIFICANCE
A=Attention					104	31.7%	53	0.51	-0.540	

MSCISSAR Ecobehavioral Analysis Report						

2 A=TalkAcad	80	24.4%	54	0.68	1.293	
3 A=TalkMgmt	58	17.7%	25	0.43	-1.167	
4 A=NoResponse	43	13.1%	20	0.47	-0.743	
5 A=QuestAcad	20	6.1%	13	0.65	0.554	
6 A=ReadAloud	23	7.0%	17	0.74	1.147	
SEQUENCES USED	328	91.1%	182	0.55	UNCONDITIONAL PROBABILITY	
SEQUENCES RECORDED	360					
-----< ECOLOGICAL CATEGORIES >-----						
A=INSTRUCTIONAL GROUPING						
-----< STUDENT CATEGORY >-----						
COMPETING RESPONSE						
--< ECOL. MODELS >-- (at least 5% data) --< VALUES >--						
	FREQ	PCT	FREQ	CONDITIONAL PROB	Z-SCORE	SIGNIFICANCE
1 A=Independent	220	64.5%	101	0.46	-1.394	
2 A=wholeclass	121	35.5%	86	0.71	2.072	.05
SEQUENCES USED	341	94.7%	187	0.55	UNCONDITIONAL PROBABILITY	
SEQUENCES RECORDED	360					

Notes. The conditional probability of student behavior X is its probability of occurrence given A ecological conditions (e.g., Settings, Activities, Tasks, etc). The Unconditional probability of student behavior X is the probability of occurrence over all ecological conditions. The statistical significance of a conditional probability is in comparison to the unconditional probability and a z-score reflecting this difference. In this table, the left panel reports the occurrences of the ecological conditions. The associated panel on the right reports the conditional probability of competing responses (those listed are pooled to form a total competing response probability given the ecological condition). Regarding the issue of statistical significance of conditional probabilities, while important, the size, pattern, and range of probabilities are more important clinically for determining areas of strength and concern for intervention development.

Abbreviations are as follows: FREQ = Frequency, PCT = Percentage, PROB = Probability; NonComply = Non-Compliance, Self-Stim = Self Stimulation; RegularCls = Regular Classroom; ListenLect = Listen to Lecture; RelatedSrv = Related Services Worker; TalkAcad = Talk Academic, TalkMgmt = Talk Management, QuestAcad = Question Academic; Independent = Independent

Appendix A

MSCISSAR 2009 TAXONOMY

ECOLOGICAL VARIABLES (5)	TEACHER VARIABLES (5)	STUDENT VARIABLES (3)
SETTING: (12)	TEACHER DEFINITION: (10)	ACADEMIC RESPONDING: (7)
Regular Classroom	Regular Education	Writing
Special Education Classroom	Special Education	Task Participation
Resource Room	Aide/Paraprofessional	Read Aloud
Library	Student Teacher	Read Silent
Computer Lab	Volunteer	Talk Academic
Music Room	Related Service	Typing
Art Room	Substitute	No Academic Response
Gymnasium	Peer Tutor	
Therapy Room	Electronic Media Teacher	TASK MANAGEMENT: (7)
Hall	No Staff	Raise Hand
Auditorium		Play Appropriate
Other	TEACHER BEHAVIOR: (12)	Manipulate Materials
	Question Management	Moving
ACTIVITY: (20)	Question Discipline	Talk Management
Reading	Talk Academic	Attention
Math	Talk Management	No Task Management
Spelling	Talk Discipline	
Hand Writing	Talk Non-Academic	COMPETING RESPONSE: (8)
Language	NonVerbal Prompt	Aggression
Science	Attention	Disruption
Social Studies	Reading Aloud	Talk Inappropriate
Computing	Singing	Look Around
Free Time	No Response	Non Compliance
Transition Music		Self-Stimulation
Arts Crafts	TEACHER APPROVAL: (3)	Self-Abuse
No Activity	Approval	No Inappropriate
Pre Vocational	Disapproval	
Gross Motor	Neither	
Daily Living		
Self-Care	TEACHER FOCUS: (4)	
Business/Management	Target	
Time Out	Target and Other	
Other	No One	
	Other	
TASK: (10)	TEACHER POSITION: (6)	
Readers	In Front	
Workbooks	At Desk	
Worksheets		

ECOLOGICAL VARIABLES (5)	TEACHER VARIABLES (5)	STUDENT VARIABLES (3)
Paper and Pencil	Out of Room	
Listen to Lecture	Side	
Discussion	Back	
Other Media	At Media	
Electronic Media		
Fetch/Put		
No Task		
PHYSICAL ARRANGEMENT: (3)		
Entire Group		
Divided Group		
Individual		
INSTRUCTIONAL GROUPING: (6)		
Whole Class		
Small Group		
One on One		
Independent		
Multimedia		
No Instruction		

Appendix B

ESCRIBE 2009 Ecobehavioral Taxonomy

ECOLOGICAL VARIABLES (6)	TEACHER VARIABLES (5)	STUDENT VARIABLES (4)
SETTING: (12)	TEACHER DEFINITION: (9)	STUDENT LANGUAGE INITIATION/RESPONSE BEHAVIOR. (3)
Regular Classroom	Regular	Initiate Language
Special Education Classroom	Special Education	Respond Language
Resource Room	Language Education Teacher	Neither
Library		
Computer Lab	Substitute	
Music Room	Aide/Paraprofessional	ORAL RESPONSES: (4)
Art Room	Related Service	Talk Academic
Gymnasium	Peer Tutor	Talk Management
Therapy Room	Electronic Media Teacher	Talk Other
Hall	No Staff	No Talk
Auditorium		
Other		
INSTRUCTIONAL MODEL: (8)	TEACHER FOCUS: (4)	LANGUAGE-STUDENT: (5)
Natural Language Instruction	Target	English
Full Bilingual Language	Target and Other	Non-English
Transitional Bilingual ESL	No One	Mixed Language
Structure Immersion	Other	No Language
ESL		Can't Tell
English Immersion	LANGUAGE-INSTRUCTION: (5)	
Mainstream ESL		
Other	English	ACTIVITY-RELATED RESP.: (10)
	Non-English	Writing
	Mixed Language	Read Aloud
ACTIVITY: (17)	No Language	Read Silent
Reading	Can't Tell	Talk
Math		Other Academic
Spelling	TCHR CORRECTN/AFFIRMATN: (3)	ExSport Game
Hand Writing	Correction	Non Academic
Language		
Science	Affirmation	Non Comply
Social Studies	Neither	Stud Attention
Business Management		None
Computing	TEACHER BEHAVIOR: (10)	
Transition	Question Academic	
Music	Talk Academic	
Arts Crafts	Talk Non-Academic	
Gross Motor	Non-Verb Prompt	

ECOLOGICAL VARIABLES (6)	TEACHER VARIABLES (5)	STUDENT VARIABLES (4)
Free Time Time Out No Activity Other MATERIALS: (8) Books Workbooks Worksheets Paper and Pencil Computer Other Material Manipulate Exercise Equipment No Material LANGUAGE-MATERIAL: (5) English Non English Mixed Language No Language Can't Tell INSTRUCTIONAL GROUPING: (6) Whole Class Small Group One On One Independent Multi-Media No Instruction	Attention Approval Disapproval Read Aloud Singing No Response	

Appendix C

Classroom CIRCLE 2009 Ecobehavioral Taxonomy.

TEACHER VARIABLES (5)	CHILD VARIABLES (4)
*CLASSROOM CONTEXT: (12)	CLASSROOM CONTEXT: (12)
Centers	Centers
Story Time	Story Time
Large Group	Large Group
Small Group	Small Group
Individual Activity	Individual Activity
Meals and Snacks	Meals and Snacks
Clean-Up,	Clean-Up,
Set-Up,	Set-Up,
Transition	Transition
Personal Care	Personal Care
Therapy	Therapy
Restricted Access	Restricted Access
None of Those Listed	None of Those Listed
Can't Tell	Can't Tell
TEACHER VERBAL RESPONSE: (12)	CHILD COMMUNICATION & SOCIAL (10)
Positive Feedback	Negative Social Behavior
Negative Feedback	Words – English
Expansion, Repetition, Extension	Words – Other
Question - Open Ended	Communicative Gesture, Vocalization
Question - Closed Ended	Nonverbal Positive Initiation
Request for Action	Singing
Reading	Laughing
Reciting	Social Attention
Singing	None
Exuberant	Can't Tell
Vocalization,	CHILD'S SOCIAL PARTNER: (7)
Laughter	Teacher
General Conversation	Other Professional
None	Other Adult
Can't Tell	Individual Child
RECIPIENT OF VERBAL RESPONSE: (4)	Group
Focus Child Only	None
Child's Group	Can't Tell
None	CHILD ENGAGEMENT: (14)
Can't Tell	Competing Behavior

TEACHER VARIABLES (5)	CHILD VARIABLES (4)
<p>FOCUS OF INSTRUCTION: (8)</p> <p>Phonological Awareness</p> <p>Alphabetic/Print Concepts</p> <p>Comprehension – Story</p> <p>Comprehension – Other</p> <p>Vocabulary</p> <p>Reading</p> <p>None of Those Listed</p> <p>Can't Tell</p> <p>TEACHER INVOLVEMENT: (5)</p> <p>Sharing</p> <p>Close Proximity</p> <p>General Supervision</p> <p>Not Involved</p> <p>Can't Tell</p>	<p>Writing</p> <p>Reading Words or Letters Aloud</p> <p>Academic Manipulation</p> <p>Academic Verbal Response</p> <p>Academic Attention</p> <p>Music, Recitation</p> <p>Pretend Play</p> <p>Non-Academic Manipulation</p> <p>Gross Motor</p> <p>Eating,</p> <p>Drinking</p> <p>Non-Academic Attention to Materials</p> <p>None of Those Listed</p> <p>Can't Tell</p>

Note. CLASSROOM CONTEXT is the only ECOLOGICAL VARIABLE and “codeable” within TEACHER and CHILD intervals.