The RIOT/ICEL Matrix: Organizing Data to Answer Questions About Student Academic Performance & Behavior

When a student displays serious academic or behavioral deficits, the Response to Intervention model adopts an inductive approach that begins with educators collecting a range of information to better analyze and understand the student's intervention needs (Fuchs, Fuchs & Compton, 2010).

However, this investigative RTI problem-solving approach can be compromised at the outset in several ways (Hosp, 2008). For example, educators may draw from too few sources when pulling together information about the presenting problem(s)—e.g., relying primarily on interviews with one classroom teacher -- which can bias the findings. Also, educators may not consider the full range of possible explanations for the student's academic or behavioral problems—such as instructional factors or skill-deficits—and thus fail to collect information that would confirm or rule out those competing hypotheses. And finally, educators may simply not realize when they have reached the 'saturation point' in data collection (Hosp, 2008) when stockpiling still more data will not significantly improve the understanding of the student problem.

One tool that can assist schools in their quest to sample information from a broad range of sources and to investigate all likely explanations for student academic or behavioral problems is the RIOT/ICEL matrix. This matrix helps schools to work efficiently and quickly to decide what relevant information to collect on student academic performance and behavior—and also how to organize that information to identify probable reasons why the student is not experiencing academic or behavioral success.

The RIOT/ICEL matrix is not itself a data collection instrument. Instead, it is an organizing framework, or heuristic, that increases schools' confidence both in the quality of the data that they collect and the findings that emerge from the data (Hosp, 2006, May). The top horizontal row of the RIOT/ICEL table includes four potential sources of student information: Review, Interview, Observation, and Test (RIOT). Schools should attempt to collect information from a range of sources to control for potential bias from any one source.

The leftmost vertical column of the RIO/ICEL table includes four key domains of learning to be assessed: Instruction, Curriculum, Environment, and Learner (ICEL). A common mistake that schools often make is to assume that student learning problems exist primarily in the learner and to underestimate the degree to which teacher instructional strategies, curriculum demands, and environmental influences impact the learner's academic performance. The ICEL elements ensure that a full range of relevant explanations for student problems are examined.

Select Multiple Sources of Information: RIOT. The elements that make up the top horizontal row of the RIOT/ICEL table (Review, Interview, Observation, and Test) are defined as follows:

- Review. This category consists of past or present records collected on the student. Obvious examples include report cards, office disciplinary referral data, state test results, and attendance records. Less obvious examples include student work samples, physical products of teacher interventions (e.g., a sticker chart used to reward positive student behaviors), and

emails sent by a teacher to a parent detailing concerns about a student's study and organizational skills.

- Interview. Interviews can be conducted face-to-face, via telephone, or even through email correspondence. Interviews can also be structured (that is, using a pre-determined series of questions) or follow an open-ended format, with questions guided by information supplied by the respondent. Interview targets can include those teachers, paraprofessionals, administrators, and support staff in the school setting who have worked with or had interactions with the student in the present or past. Prospective interview candidates can also consist of parents and other relatives of the student as well as the student himself or herself.

- Observation. Direct observation of the student's academic skills, study and organizational strategies, degree of attentional focus, and general conduct can be a useful channel of information. Observations can be more structured (e.g., tallying the frequency of call-outs or calculating the percentage of on-task intervals during a class period) or less structured (e.g., observing a student and writing a running narrative of the observed events). Obvious examples of observation include a teacher keeping a frequency count of the times that she redirects an inattentive student to task during a class period and a school psychologist observing the number of intervals that a student talks with peers during independent seatwork Less obvious examples of observation include having a student periodically rate her own academic engagement on a 3-point scale (self-evaluation) and encouraging a parent to send to school narrative observations of her son's typical routine for completing homework.

- Test. Testing can be thought of as a structured and standardized observation of the student that is intended to test certain hypotheses about why the student might be struggling and what school supports would logically benefit the student (Christ, 2008). Obvious examples of testing include a curriculum-based measurement Oral Reading Fluency probe administered to determine a student's accuracy and fluency when reading grade-level texts and a state English Language Arts test that evaluates students' mastery of state literacy standards. A less obvious example of testing might be a teacher who teases out information about the student's skills and motivation on an academic task by having that student complete two equivalent timed worksheets under identical conditions—except that the student is offered an incentive for improved performance on the second worksheet but not on the first ('Can't Do/Won't Do Assessment'). Another less obvious example of testing might be a student who has developed the capacity to take chapter pre-tests in her math book, to self-grade the test, and to write down questions and areas of confusion revealed by that test for later review with the math instructor.

Investigate Multiple Factors Affecting Student Learning: ICEL. The elements that compose the leftmost vertical column of the RIO/ICEL table (Instruction, Curriculum, Environment, and Learner) are described below:

- Instruction. The purpose of investigating the 'instruction' domain is to uncover any instructional practices that either help the student to learn more effectively or interfere with that student's learning. More obvious instructional questions to investigate would be whether specific teaching strategies for activating prior knowledge better prepare the student to master

new information or whether a student benefits optimally from the large-group lecture format that is often used in a classroom. A less obvious example of an instructional question would be whether a particular student learns better through teacher-delivered or self-directed, computer-administered instruction.

- Curriculum. 'Curriculum' represents the full set of academic skills that a student is expected to have mastered in a specific academic area at a given point in time. To adequately evaluate a student's acquisition of academic skills, of course, the educator must (1) know the school's curriculum (and related state academic performance standards), (2) be able to inventory the specific academic skills that the student currently possesses, and then (3) identify gaps between curriculum expectations and actual student skills. (This process of uncovering student academic skill gaps is sometimes referred to as 'instructional' or 'analytic' assessment.) More obvious examples of curriculum questions include checking whether a student knows how to computer a multiplication problem with double-digit terms and regrouping or whether that student knows key facts about the Civil War. A less obvious curriculum-related question might be whether a student possesses the full range of essential academic vocabulary (e.g., terms such as 'hypothesis') required for success in the grade 10 curriculum.

- Environment. The 'environment' includes any factors in students' school, community, or home surroundings that can directly enable their academic success or hinder that success. Obvious questions about environmental factors that impact learning include whether a student's educational performance is better or worse in the presence of certain peers and whether having additional adult supervision during a study hall results in higher student work productivity. Less obvious questions about the learning environment include whether a student has a setting at home that is conducive to completing homework or whether chaotic hallway conditions are delaying that student's transitioning between classes and therefore reducing available learning time.

- Learner. While the student is at the center of any questions of instruction, curriculum, and [learning] environment, the 'learner' domain includes those qualities of the student that represent their unique capacities and traits. More obvious examples of questions that relate to the learner include investigating whether a student has stable and high rates of inattention across different classrooms or evaluating the efficiency of a student's study habits and test-taking skills. A less obvious example of a question that relates to the learner is whether a student harbors a low sense of self-efficacy in mathematics that is interfering with that learner's willingness to put appropriate effort into math courses.

Integrating the RIOT/ICEL Matrix into a Building's Problem-Solving. The power of the RIOT/ICEL matrix lies in its use as a cognitive strategy, one that helps educators to verify that they have asked the right questions and sampled from a sufficiently broad range of data sources to increase the probability that they will correctly understand the student's presenting concern(s). Viewed in this way, the matrix is not a rigid approach but rather serves as a flexible heuristic for exploratory problem-solving.

At the very least, RTI consultants should find that the RIOT/ICEL matrix serves as a helpful mental framework to guide their problem-solving efforts. And as teachers over time become more familiar

with the RTI model, they also might be trained to use the RIOT/ICEL framework as they analyze student problems in their classrooms and prepare Tier 1 interventions.

References

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RIOT/ICEL Matrix Example: The matrix below is filled out with some possible sources of information on a student, Rick, whose mathematics teacher is concerned at his apparent *lack of academic engagement in large-group settings*. NOTE: The examples in the matrix are for purposes of illustration only. It is probably somewhat unlikely that all of these sources of information would be collected for a single student, unless his or her needs were intensive.

	Review	Interview	Observe	Test
Instruction	• [Review-Instruction] **Review of past report cards**: The teacher searches for comments from former instructors about instructional techniques to which Rick did or did not respond.	• [Interview-Instruction] **Teacher interview**: The instructor is asked by the guidance counselor which instructional elements help Rick to attend in large-group instruction and which are less effective.	• [Observe-Instruction] **Classroom observation**: During large-group instruction, an observer calculates Rick's rate of on-task behavior (e.g., through momentary time-sampling).	• [Test-Instruction] **Note-taking conditions**: The teacher structures two large-group instruction conditions--regular note-taking and guided notes – and observes whether Rick's level of academic engagement improves with guided notes.
Curriculum	• [Review-Curriculum] **Work products**: The teacher collects the student's math homework and examines it for evidence about whether Rick is able correctly to use the algorithms taught in class.	• [Interview-Curriculum] **Student interview**: The guidance counselor meets with Rick to ask him a series of questions about his math skills.	• [Observe-Curriculum] **Classroom observation**: The teacher pairs students, directs each to describe to the other his/her reasoning for solving a multi-step word problem with math graphic. Rick is observed during this exercise.	• [Test-Curriculum] **Diagnostic test**: The teacher prepares and administers to the class a diagnostic test with problems that test essential foundation math knowledge required for success in the course. Rick's test results are carefully reviewed.
Environment	• [Review-Environment] **Folder review**: Rick's cumulative folder is reviewed for past instructor comments about aspects of the instructional environment (e.g., presence or absence of peers, teacher proximity) that helped or hindered academic performance.	• [Interview-Environment] **Parent interview**: At a parent conference, the teacher asks Rick's father to describe the student's nightly homework routine, as well as those factors in the homework setting that appear to help or hinder Rick's homework completion.	• [Observe-Environment] **Classroom observation**: During observations of Rick in a large-group math setting, the observer looks for environmental factors—e.g., presence or absence of peers, teacher proximity) that help or hinder academic performance.	• [Test-Environment] **Peer seating conditions**: On different occasions, the instructor (a) allows Rick to choose his own seat-mates and (b) seats Rick next to positive peer role models. The instructor observes whether Rick's level of academic engagement improves in the peer role-model condition.
Learner	• [Review-Learner] **Math journal**: The math teacher collects Rick's math journal and reviews the entries for hints about the student's attitude and level of self-confidence toward mathematics [Learner characteristic: math self-efficacy].	• [Interview-Learner] **Parent interview**: In an email exchange with the student's mother, the teacher asks her what her son's study habits [Learner characteristic: study & organizational skills]	• [Observe-Learner] **Behavior rating based on observation**: For one week, the math teacher rates the student daily on a behavior report card. One of the several rating items is the student's 'time on task' [Learner characteristic: attentional focus].	• [Test-Learner] **Reward conditions**: On different occasions, the teacher (a) has Rick participate in large-group instruction with no reward and (b) offers Rick an incentive (reward) if he requires no more than 1 teacher prompt per session to direct him back to task. The instructor observes whether Rick's engagement increases in the reward condition [Learner characteristic: attentional focus].

RIOT/ICEL Assessment Worksheet

Student: _____ Person Completing Worksheet: _____

Date: _____ Statement of Student Problem: _____

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Directions: Fill out the grid below to develop an assessment plan for the targeted student.

	Review	Interview	Observe	Test
Instruction				
Curriculum				
Environment				
Learner				