RTI: Best Practices in Reading & Math Interventions

Jim Wright
www.interventioncentral.org

INTERVENTION CENTRAL

Workshop PPTs and Handout Available at:

http://www.jimwrightonline.com/marathoncounty.php

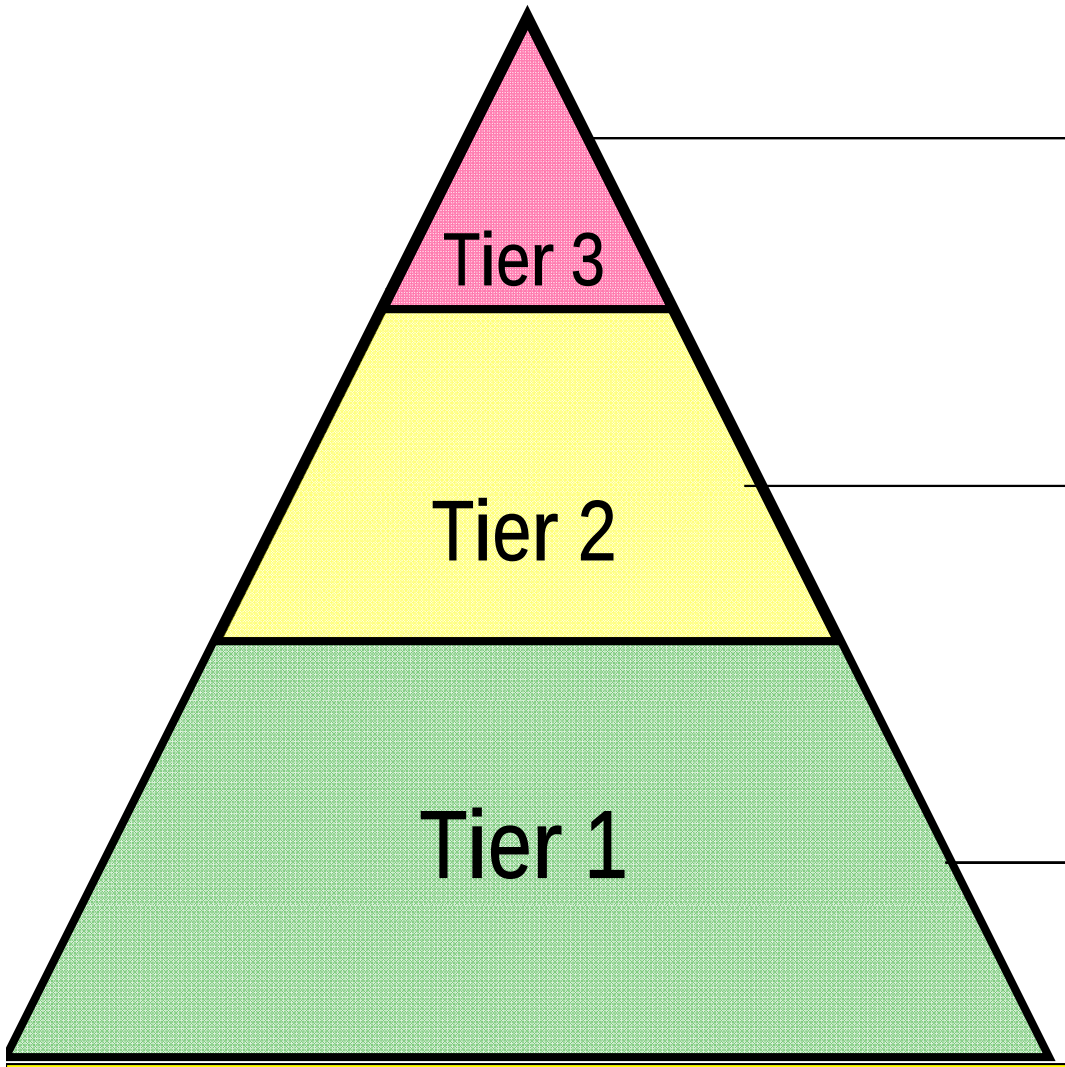
Additional Intervention and Assessment Resources Available at:
http://www.interventioncentral.org

Workshop Agenda

1. Academic Interventions: 'Big Ideas' and Critical Components
2. A Sampling of Reading Interventions
3. A Sampling of Math Interventions
4. Accessing Free Internet Resources to Support Academic Interventions

1. Academic Interventions: 'Big Ideas' and Critical Components

RTI 'Pyramid of Interventions'



Tier 3: Intensive interventions. Students who are 'non-responders' to Tiers 1 & 2 are referred to the RTI Team for more intensive interventions.

Tier 2 Individualized interventions. Subset of students receive interventions targeting specific needs.

Tier 1: Universal interventions. Available to all students in a classroom or school. Can consist of whole-group or individual strategies or supports.

RTI & Intervention: Key Concepts
p. 2

Core Instruction, *Interventions*, Accommodations & Modifications: Sorting Them Out

- **Core Instruction.** Those instructional strategies that are used routinely with all students in a general-education setting are considered 'core instruction'. High-quality instruction is essential and forms the foundation of RTI academic support. NOTE: While it is important to verify that good core instructional practices are in place for a struggling student, those routine practices do not 'count' as individual student interventions.

*Core Instruction, **Interventions***, Accommodations & Modifications: Sorting Them Out

- **Intervention.** An academic intervention is a strategy used to teach a new skill, build fluency in a skill, or encourage a child to apply an existing skill to new situations or settings. An intervention can be thought of as "a set of actions that, when taken, have demonstrated ability to change a fixed educational trajectory" (Methe & Riley-Tillman, 2008; p. 37).

Core Instruction, Interventions, Accommodations & Modifications: Sorting Them Out

- **Accommodation.** An accommodation is intended to help the student to fully access and participate in the general-education curriculum without changing the instructional content and without reducing the student's rate of learning (Skinner, Pappas & Davis, 2005). An accommodation is intended to remove barriers to learning while still expecting that students will master the same instructional content as their typical peers.
  - Accommodation example 1: Students are allowed to supplement silent reading of a novel by listening to the book on tape.
  - Accommodation example 2: For unmotivated students, the instructor breaks larger assignments into smaller 'chunks' and providing students with performance feedback and praise for each completed 'chunk' of assigned work (Skinner, Pappas & Davis, 2005).

> *"Teaching is giving; it isn't taking away."*
>
> *(Howell, Hosp & Kurns, 2008; p. 356).*

Source: Howell, K. W., Hosp, J. L., & Kurns, S. (2008). Best practices in curriculum-based evaluation. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology V* (pp.349-362). Bethesda, MD: National Association of School Psychologists..

Core Instruction, Interventions, Accommodations & **Modifications**: Sorting Them Out

- **Modification.** A modification changes the expectations of what a student is expected to know or do—typically by lowering the academic standards against which the student is to be evaluated.

  Examples of modifications:

  – Giving a student five math computation problems for practice instead of the 20 problems assigned to the rest of the class

  – Letting the student consult course notes during a test when peers are not permitted to do so

Big Ideas: The Four Stages of Learning Can Be Summed Up in the 'Instructional Hierarchy' pp. 3-4

(Haring et al., 1978)

Student learning can be thought of as a multi-stage process. The universal stages of learning include:

- Acquisition: The student is just acquiring the skill.
- Fluency: The student can perform the skill but must make that skill 'automatic'.
- Generalization: The student must perform the skill across situations or settings.
- Adaptation: The student confronts novel task demands that require that the student adapt a current skill to meet new requirements.

Source: Haring, N.G., Lovitt, T.C., Eaton, M.D., & Hansen, C.L. (1978). The fourth R: Research in the classroom. Columbus, OH: Charles E. Merrill Publishing Co.

Motivation Challenge:

Analyzing Why a Student Lacks Motivation and Selecting Appropriate Strategies (Excerpt pp. 5-6)

Six Reasons That Students Are Unmotivated (And What Teachers Can Do)

- The student is unmotivated because he or she cannot do the assigned work.
- The student is unmotivated because the 'response effort' needed to complete the assigned work seems too great.
- The student is unmotivated because classroom instruction does not engage.
- The student is unmotivated because he or she fails to see an adequate pay-off to doing the assigned work.
- The student is unmotivated because of low self-efficacy—lack of confidence that he or she can do the assigned work.
- The student is unmotivated because he or she lacks a positive relationship with the teacher.

Motivation Deficit 1: *The student is unmotivated because he or she cannot do the assigned work.*

- **Profile of a Student with This Motivation Problem:**
  The student lacks essential skills required to do the task.

Motivation Deficit 1: Cannot Do the Work

- **Profile of a Student with This Motivation Problem (Cont.):** Areas of deficit might include:
- *Basic academic skills.* Basic skills have straightforward criteria for correct performance (e.g., the student defines vocabulary words or decodes text or computes 'math facts') and comprise the building-blocks of more complex academic tasks (Rupley, Blair, & Nichols, 2009).
- *Cognitive strategies.* Students employ specific cognitive strategies as "guiding procedures" to complete more complex academic tasks such as reading comprehension or writing (Rosenshine, 1995).
- *Academic-enabling skills.* Skills that are 'academic enablers' (DiPerna, 2006) are not tied to specific academic knowledge but rather aid student learning across a wide range of settings and tasks (e.g., organizing work materials, time management).

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **What the Research Says:** When a student lacks the capability to complete an academic task because of limited or missing basic skills, cognitive strategies, or academic-enabling skills, that student is still in the acquisition stage of learning (Haring et al., 1978). That student cannot be expected to be motivated or to be successful as a learner unless he or she is first explicitly taught these weak or absent essential skills (Daly, Witt, Martens & Dool, 1997).

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Verify the Presence of This Motivation Problem:** The teacher collects information (e.g., through observations of the student engaging in academic tasks; interviews with the student; examination of work products, quizzes, or tests) demonstrating that the student lacks basic skills, cognitive strategies, or academic-enabling skills essential to the academic task.

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Fix This Motivation Problem:** Students who are not motivated because they lack essential skills need to be taught those skills.

  Direct-Instruction Format. Students learning new material, concepts, or skills benefit from a 'direct instruction' approach. (Burns, VanDerHeyden & Boice, 2008; Rosenshine, 1995; Rupley, Blair, & Nichols, 2009).

How to Fix This Motivation Problem: Students who are not motivated because they lack esser skills need to be taught those skills.

Direct-Instruction Format. Students learning new material, concepts, or skills benefit from a 'direc instruction' approach. (Burns, VanDerHeyden & Boice, 2008; Rosenshine, 1995; Rupley, Blair, Nichols, 2009). When following a direct-instruction format, the teacher:

- ❑ ensures that the lesson content is appropriately matched to students' abilities.
- ❑ opens the lesson with a brief review of concepts or material that were previously presented.
- ❑ states the goals of the current day's lesson.
- ❑ breaks new material into small, manageable increments, or steps.
- ❑ throughout the lesson, provides adequate explanations and detailed instructions for all conce and materials being taught. NOTE: Verbal explanations can include 'talk-alouds' (e.g., the teacher describes and explains each step of a cognitive strategy) and 'think-alouds' (e.g., the teacher applies a cognitive strategy to a particular problem or task and verbalizes the steps applying the strategy).
- ❑ regularly checks for student understanding by posing frequent questions and eliciting group responses.
- ❑ verifies that students are experiencing sufficient success in the lesson content to shape their learning in the desired direction and to maintain student motivation and engagement.
- ❑ provides timely and regular performance feedback and corrections throughout the lesson as needed to guide student learning.
- ❑ allows students the chance to engage in practice activities distributed throughout the lesson (e.g., through teacher demonstration; then group practice with teacher supervision and feedback; then independent, individual student practice).
- ❑ ensures that students have adequate support (e.g., clear and explicit instructions; teacher monitoring) to be successful during independent seatwork practice activities.

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Fix This Motivation Problem:** When following a direct-instruction format, the teacher:
  - ❑ ensures that the lesson content is appropriately matched to students' abilities.
  - ❑ opens the lesson with a brief review of concepts or material that were previously presented.
  - ❑ states the goals of the current day's lesson.
  - ❑ breaks new material into small, manageable increments, or steps.

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Fix This Motivation Problem:** When following a direct-instruction format, the teacher:
  - ❑ throughout the lesson, provides adequate explanations and detailed instructions for all concepts and materials being taught. NOTE: Verbal explanations can include 'talk-alouds' (e.g., the teacher describes and explains each step of a cognitive strategy) and 'think-alouds' (e.g., the teacher applies a cognitive strategy to a particular problem or task and verbalizes the steps in applying the strategy).
  - ❑ regularly checks for student understanding by posing frequent questions and eliciting group responses.

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Fix This Motivation Problem:** When following a direct-instruction format, the teacher:
  - ❑verifies that students are experiencing sufficient success in the lesson content to shape their learning in the desired direction and to maintain student motivation and engagement.
  - ❑provides timely and regular performance feedback and corrections throughout the lesson as needed to guide student learning.

Motivation Deficit 1: Cannot Do the Work (Cont.)

- **How to Fix This Motivation Problem:** When following a direct-instruction format, the teacher:
  - ❑ allows students the chance to engage in practice activities distributed throughout the lesson (e.g., through teacher demonstration; then group practice with teacher supervision and feedback; then independent, individual student practice).
  - ❑ ensures that students have adequate support (e.g., clear and explicit instructions; teacher monitoring) to be successful during independent seatwork practice activities.

How to Fix This Motivation Problem: Students who are not motivated because they lack esser skills need to be taught those skills.

Direct-Instruction Format. Students learning new material, concepts, or skills benefit from a 'direc instruction' approach. (Burns, VanDerHeyden & Boice, 2008; Rosenshine, 1995; Rupley, Blair, Nichols, 2009). When following a direct-instruction format, the teacher:

- ❑ ensures that the lesson content is appropriately matched to students' abilities.
- ❑ opens the lesson with a brief review of concepts or material that were previously presented.
- ❑ states the goals of the current day's lesson.
- ❑ breaks new material into small, manageable increments, or steps.
- ❑ throughout the lesson, provides adequate explanations and detailed instructions for all conce and materials being taught. NOTE: Verbal explanations can include 'talk-alouds' (e.g., the teacher describes and explains each step of a cognitive strategy) and 'think-alouds' (e.g., the teacher applies a cognitive strategy to a particular problem or task and verbalizes the steps applying the strategy).
- ❑ regularly checks for student understanding by posing frequent questions and eliciting group responses.
- ❑ verifies that students are experiencing sufficient success in the lesson content to shape their learning in the desired direction and to maintain student motivation and engagement.
- ❑ provides timely and regular performance feedback and corrections throughout the lesson as needed to guide student learning.
- ❑ allows students the chance to engage in practice activities distributed throughout the lesson (e.g., through teacher demonstration; then group practice with teacher supervision and feedback; then independent, individual student practice).
- ❑ ensures that students have adequate support (e.g., clear and explicit instructions; teacher monitoring) to be successful during independent seatwork practice activities.

RTI Interventions: What If There is No Commercial Intervention Package or Program Available?

"Although commercially prepared programs and the subsequent manuals and materials are inviting, they are not necessary. … A recent review of research suggests that interventions are research based and likely to be successful, if they are correctly targeted and provide explicit instruction in the skill, an appropriate level of challenge, sufficient opportunities to respond to and practice the skill, and immediate feedback on performance…Thus, these [elements] could be used as criteria with which to judge potential tier 2 interventions." p. 88

Source: Burns, M. K., & Gibbons, K. A. (2008). *Implementing response-to-intervention in elementary and secondary schools*. Routledge: New York.

Group Activity: *Big Ideas in Academic Interventions*

At your tables:

- Review the big ideas in academic interventions presented in this workshop.
- Select the ONE idea that you feel is most important for your teachers to understand and keep in mind.

Big Ideas in Academic Interventions

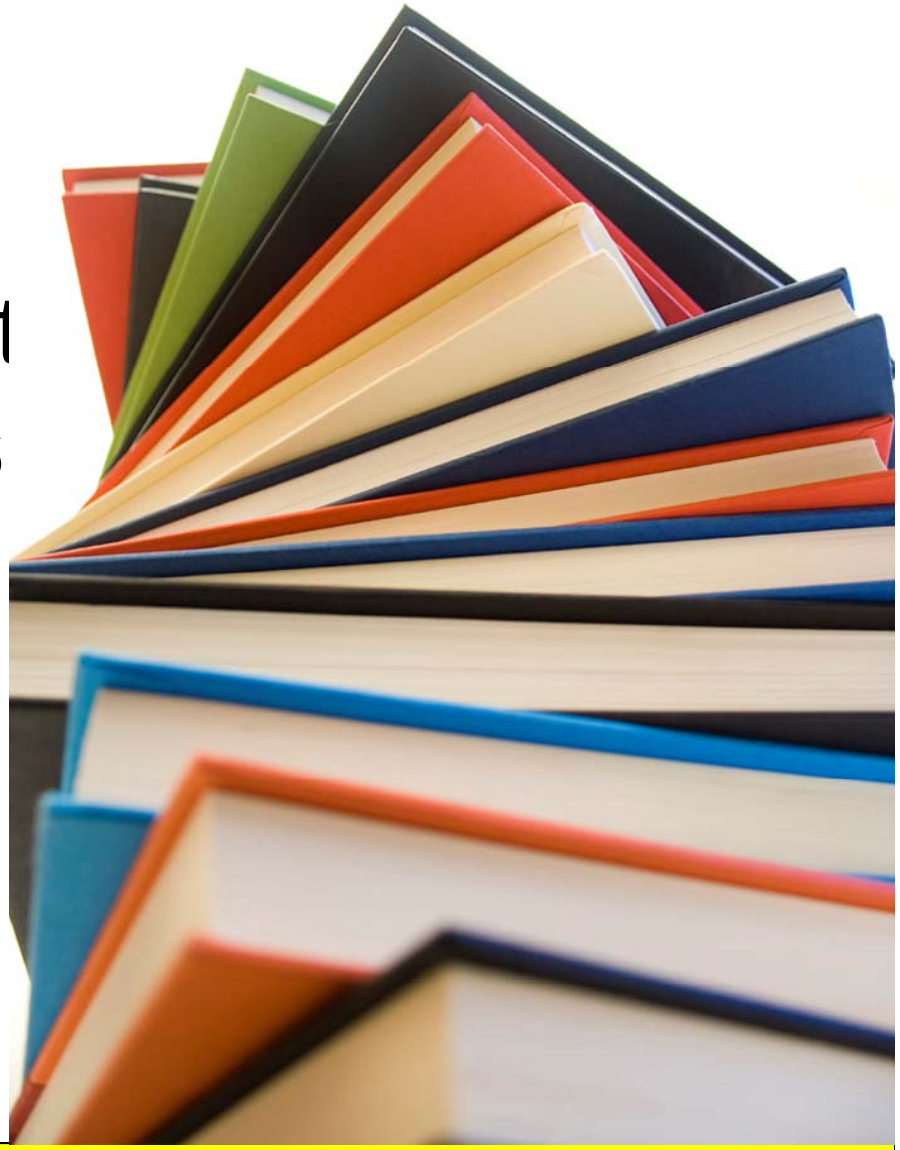
1. Definition of terms: Core instruction, intervention, accommodation, modification (with modifications to be avoided on RTI plans)
2. Learners advance through predictable stages: Acquisition, Fluency, Generalization, Adaptation
3. Intervention as high-quality instruction is research-based if it is correctly targeted, provides explicit instruction in the skill and an appropriate level of challenge, gives the student sufficient opportunities to respond to and practice the skill, and offers immediate feedback on performance.

2. Reading Instruction & Interventions

Creating an RTI Literacy Program at Tiers 1 & 2 That is Responsive to the Needs of All Students

Jim Wright
www.interventioncentral.org

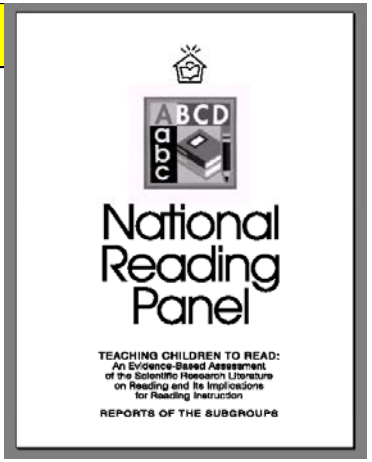
INTERVENTION CENTRAL



“Risk for reading failure always involves the interaction of a particular set of child characteristics with specific characteristics of the instructional environment. Risk status is not entirely inherent in the child, but always involves a “mismatch” between child characteristics and the instruction that is provided.” (Foorman & Torgesen, 2001; p. 206).

Source: Foorman, B. R., & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. Learning Disabilities Research & Practice, 16, 203-212.

Five Big Ideas in Reading



- "Phonemic Awareness: The ability to hear and manipulate sounds in words.
- Alphabetic Principle: The ability to associate sounds with letters and use these sounds to form words.
- Fluency with Text: The effortless, automatic ability to read words in connected text.
- Vocabulary: The ability to understand (receptive) and use (expressive) words to acquire and convey meaning.
- Comprehension: The complex cognitive process involving the intentional interaction between reader and text to convey meaning."

SOURCE: University of Oregon: http://reading.uoregon.edu/big_ideas/trial_bi_index.php

> *"…we want to emphasize that effective interventions for almost all children highly at risk for reading disabilities should contain strongly explicit instruction in the knowledge and skills required for learning to read words accurately and fluently, and that this instruction should be balanced and integrated with explicit instruction in other language and reading skills that are also important for good reading comprehension." (Foorman & Torgesen, 2001; p. 209).*

Source: Foorman, B. R., & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. Learning Disabilities Research & Practice, 16, 203-212.

Direct / Indirect Instruction Continuum

"Literature-based instruction emphasizes use of authentic literature for independent reading, read-alouds, and collaborative discussions. It stands in contrast to skills-based programs that are typically defined as traditional programs that use a commercially available basal reading program and follow a sequence of skills ordered in difficulty." (Foorman & Torgesen, 2001; p. 204)

"**direct instruction** in letter-sound correspondences practices in controlled vocabulary texts (direct code)" (Foorman & Torgesen, 2001; p. 204)

"**less direct instruction** in sound-spelling patterns embedded in trade books (embedded code)" (Foorman & Torgesen, 2001; p. 204)

"**implicit instruction** in the alphabetic principle while reading trade books (implicit code)" (Foorman & Torgesen, 2001; p. 204)

Source: Foorman, B. R., & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. Learning Disabilities Research & Practice, 16, 203-212.

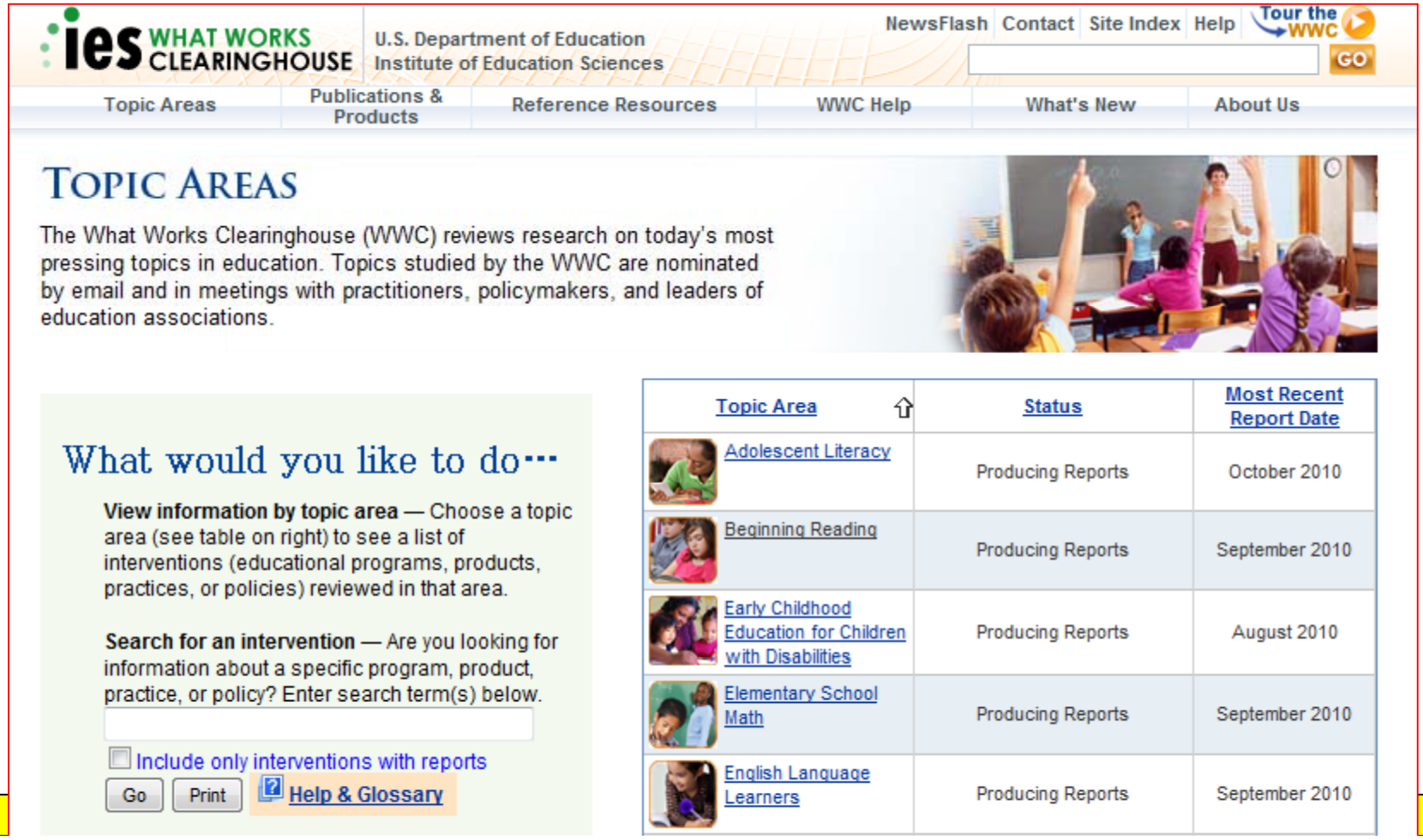
RTI Core Literacy Instruction: Elements

1. **Verify that the School's Reading Program is 'Evidence-Based'.** The school has an evidence-based reading program in place for all elementary grades.

- The program is tied to a well-designed literacy curriculum and may consist of one or several commercial reading-instruction products.
- The program is supported by research as being effective.
- Teachers implementing the reading program at their grade level can describe its effective instructional elements.

Clearinghouse for RTI Tier 1-3 Programs

- The What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/) is a federally-sponsored website that lists research supporting various Tier 1, 2, and 3 intervention programs.



RTI Core Literacy Instruction: Elements

2. **Use Benchmarking/Universal Screening Data to Verify that the Current Core Reading Program is Appropriate.** The school uses benchmarking/universal screening data in literacy to verify that its current reading program can effectively meet the needs of its student population at each grade level.

- In grades K-2, if fewer than 80% of students are successful on phonemic awareness and alphabetics screenings, the core reading program at that grade level is patterned after direct instruction (Foorman & Torgesen, 2001).

- In grades K-2, if more than 80% of students are successful on phonemic awareness and alphabetics screenings, the school may choose to adopt a reading program that provides "less direct instruction in sound-spelling patterns embedded in trade books (embedded code)" (Foorman & Torgesen, 2001; p. 205).

RTI Core Literacy Instruction: Elements

3. **Establish a Breadth of Instructional Expertise in Reading.** Teachers are knowledgeable about the causes of reading delays. They understand that the most common explanation for deficiencies in foundation reading skills for students entering kindergarten is that—prior to public school—those delayed students did not have the same exposure to spoken vocabulary, phonemic awareness activities, and print as did their more advanced classmates. Classroom teachers have the instructional expertise to teach children whose reading skills are up to **2 years** below those of their classmates.

RTI Core Literacy Instruction: Elements

4. **Adopt Efficient Methods of Instructional Delivery and Time Management.** The teacher uses an appropriate range of efficient instructional delivery and time-management methods to match student readers to effective learning activities. Examples include:

- reading centers (Kosanovich et al., n.d.)
- using students as peer tutors (e.g. Mathes et al., 2003)
- incorporating paraprofessionals (Foorman, Breier, & Fletcher, 2003), adult volunteer tutors, or other non-instructional personnel under teacher supervision to review and reinforce student reading skills
- scheduling core literacy instruction at the same time for each grade level to allow students to access reading instruction across classrooms as needed (cf. Burns & Gibbons, 2008).

“The most effective early intervention is prevention—in the form of differentiated classroom instruction. Many techniques and programs exist for helping classroom teachers with small-group instruction, such as classwide peer tutoring…and cooperative grouping. But one of the persistent problems of differentiated classroom instruction is how to engage classroom teachers in continuous progress monitoring and translating the results of assessment to differentiated instruction.” (Foorman & Moats, 2004; p. 54).

Source: Foorman, B. R., & Moats, L. C. (2004). Conditions for sustaining research-based practices in early reading instruction. Remedial & Special Education, 25, 51-60.

Building Tier 1 Capacity in the Teaching of Reading: Example of Differentiating Instruction

In grades K-3, teachers can differentiate instruction for children during the block of 'core literacy instruction' through flexible small-group instruction.

- Reading centers are set up in the classroom, at which students might work in groups, in pairs, or individually.
- These centers might be designed for students to access *independently* or to be *teacher-led.*
- Group sizes can range from 3-5 for 'struggling students' up to 5-7 for those students who are on grade level.

Source: Kosanovich, M., Ladinsky, K., Nelson, L., & Torgesen, J. (n.d.). *Differentiated reading instruction: Small group alternative lesson structures for all students*. Florida Center for Reading Research. Retrieved on November 5, 2008, from http://www.fcrr.org/assessment/pdf/smallGroupAlternativeLessonStructures.pdf

Building Tier 1 Capacity in the Teaching of Reading: Example of Differentiating Instruction (Cont.)

Reading center activities can include *guided reading* and *skills-focused lessons*.

- *'Guided reading' activities* provide more general reading instruction. The teacher guides a group discussion of the text (e.g., selection of the text, introducing the text to students, talking about the content of the text, providing instruction in 'strategic strategies' to better access the text, etc.).
- *'Skills-focused' lessons* provide specific, focused instruction and practice in crucial reading skills (e.g., letter-sound correspondence, phoneme segmentation). Students with similar reading deficits are placed in specific skills-focused groups to allow targeted interventions.

Source: Kosanovich, M., Ladinsky, K., Nelson, L., & Torgesen, J. (n.d.). *Differentiated reading instruction: Small group alternative lesson structures for all students*. Florida Center for Reading Research. Retrieved on November 5, 2008, from http://www.fcrr.org/assessment/pdf/smallGroupAlternativeLessonStructures.pdf

Building Tier 1 Capacity in the Teaching of Reading: Example of Differentiating Instruction (Cont.)

The teacher determines the composition and instructional activities to be used in reading centers via ongoing reading assessment information (e.g., DIBELS progress-monitoring data, classroom observations, etc.).

- The teacher creates a master 'reading center' schedule (a series of teacher-led and independent reading centers to accommodate all students in the classroom).
- Recruitment for reading centers is flexible: Children are assigned to specific reading centers based on their reading profile. Those center assignments are regularly updated based on classroom reading assessment data.

Source: Kosanovich, M., Ladinsky, K., Nelson, L., & Torgesen, J. (n.d.). *Differentiated reading instruction: Small group alternative lesson structures for all students*. Florida Center for Reading Research. Retrieved on November 5, 2008, from http://www.fcrr.org/assessment/pdf/smallGroupAlternativeLessonStructures.pdf

Peer Tutors as Vehicle for Instructional Delivery: PALS

"Peer-Assisted Learning Strategies (PALS) is a peer-tutoring program. …it is designed to be incorporated into the existing curriculum with the goal of improving the academic performance of children with diverse academic needs. Teachers train students to use *PALS* procedures.

Students partner with peers, alternating the role of tutor while reading aloud, listening, and providing feedback in various structured activities. *PALS* is typically implemented three times a week for 30 to 35 minutes. Although *PALS* can be used in different subject areas and grade levels, this intervention report focuses on the use of *PALS* to improve reading skills of students in kindergarten through third grade…

PALS was found to have potentially positive effects on alphabetics, fluency, and comprehension."

Source: What Works Clearinghouse. *Peer-Assisted Learning Strategies (PALS).* Retrieved on May 8, 2007, from https://dibels.uoregon.edu/

Scheduling Elementary Tier 2 Interventions

Option 3: *'Floating RTI':Gradewide Shared Schedule*. Each grade has a scheduled RTI time across classrooms. No two grades share the same RTI time. Advantages are that outside providers can move from grade to grade providing push-in or pull-out services and that students can be grouped by need across different teachers within the grade.

Anyplace Elementary School: RTI Daily Schedule

Grade K	Classroom 1	Classroom 2	Classroom 3	*9:00-9:30*
Grade 1	Classroom 1	Classroom 2	Classroom 3	*9:45-10:15*
Grade 2	Classroom 1	Classroom 2	Classroom 3	*10:30-11:00*
Grade 3	Classroom 1	Classroom 2	Classroom 3	*12:30-1:00*
Grade 4	Classroom 1	Classroom 2	Classroom 3	*1:15-1:45*
Grade 5	Classroom 1	Classroom 2	Classroom 3	*2:00-2:30*

Source: Burns, M. K., & Gibbons, K. A. (2008). Implementing response-to-intervention in elementary and secondary schools: Procedures to assure scientific-based practices. New York: Routledge.

RTI Core Literacy Instruction: Elements

Mass Resources for Focused Literacy Instruction & Intervention in the Primary Grades. The school organizes its resources to provide the most intensive general-education literacy instruction and intervention support at the early grades – Grades K through 2— because research suggests that student reading deficits can be addressed in these primary grades with far less effort and with better outcomes than for students whose reading deficits are addressed in later grades (Foorman, Breier, & Fletcher, 2003),.

RTI Core Literacy Instruction: Elements

Avoid Use of Less Effective Reading Instructional Strategies. Classrooms make minimal use of inefficient instructional reading activities such as Round Robin Reading that can result in poor modeling of text reading and reduced rates of actual student reading engagement--and may also cause emotional distress for poor readers (Ash, Kuhn, & Walpole, 2009; Ivey, 1999). Furthermore, the school has a clear and shared understanding that purposeful, focused reading interventions are required to help struggling readers: The passive strategy of grade-retention has not been shown to be an effective means of reading intervention (Foorman, Breier, & Fletcher, 2003),

"Children's status as readers is established early… Torgesen et al. (1997) showed that over 8 of 10 children with severe word reading problems at the end of the first grade performed below the average at the beginning of the third grade. Such evidence supports the view that early reading problems are the result of deficits rather than delay. In other words, the early childhood mantra "Just wait; they'll catch up" has no empirical basis." (Foorman, Breier, & Fletcher, 2003; p. 626)

Source: Foorman, B. R., Breier, J. Il, & Fletcher, J. M. (2003). Interventions aimed at improving reading success: An evidence-based approach. Developmental Neuropsychology, 24, 613-639.

RTI Core Literacy Instruction: Elements

Adopt Evidence-Based Tier 2 (Supplemental) Reading Interventions for Struggling Students. The school has a range of evidence-based Tier 2 intervention options for those students who fail to respond adequately to classroom literacy instruction alone. Tier 2 instruction is more explicit (e.g., contains more direct-instruction elements), intensive (e.g., more teacher attention), and supportive (e.g., timely performance feedback, praise, and encouragement) than the reading instruction that all children receive (Foorman & Torgesen, 2001).

RTI Core Literacy Instruction: Elements

Promote Ongoing Professional Development. The school supports teachers with professional development as they implement any reading program (Foorman, Breier, & Fletcher, 2003). Training addresses such key topics as:

- understanding the underlying research, instructional objectives, and components of the program
- managing the classroom during reading activities
- moving at an appropriate instructional pace
- grouping students.

References

- Ash, G. E., Kuhn, M. R., & Walpole, S. (2009). Analyzing “inconsistencies” in practice: Teachers' continued use of round robin reading. Reading & Writing Quarterly, 25, 87-103.
- Burns, M. K., & Gibbons, K. A. (2008). Implementing response-to-intervention in elementary and secondary schools: Procedures to assure scientific-based practices. New York: Routledge.
- Foorman, B. R., Breier, J. Il, & Fletcher, J. M. (2003). Interventions aimed at improving reading success: An evidence-based approach. Developmental Neuropsychology, 24, 613-639.
- Foorman, B. R., & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. Learning Disabilities Research & Practice, 16, 203-212.
- Ivey, G. (1999). A multicase study in the middle school: Complexities among young adolescent readers. Reading Research Quarterly, 34, 172-192.
- Kosanovich, M., Ladinsky, K., Nelson, L., & Torgesen, J. (n.d.). Differentiated reading instruction: Small group alternative lesson structures for all students. Florida Center for Reading Research. Retrieved on November 5, 2008, from http://www.fcrr.org/assessment/pdf/smallGroupAlternativeLessonStructures.pdf
- Mathes, P. G., Torgesen, J. K., Clancy-Menchetti, J., Santi, K., Nicholas, K., Robinson, C., Grek, M. (2003). A comparison of teacher-directed versus peer-assisted instruction to struggling first-grade readers. The Elementary School Journal, 103(5), 459–479.

Team Activity: Tier 1 and 2 Reading Programs

At your table:

- Consider the concepts and strategies (e.g., scheduling an 'RTI Intervention' time in all classrooms) discussed in this portion of the workshop.
- How 'RTI-compliant' is your current reading program?

Building Reading Fluency

NRP Conclusions Regarding Importance of Oral Reading Fluency:

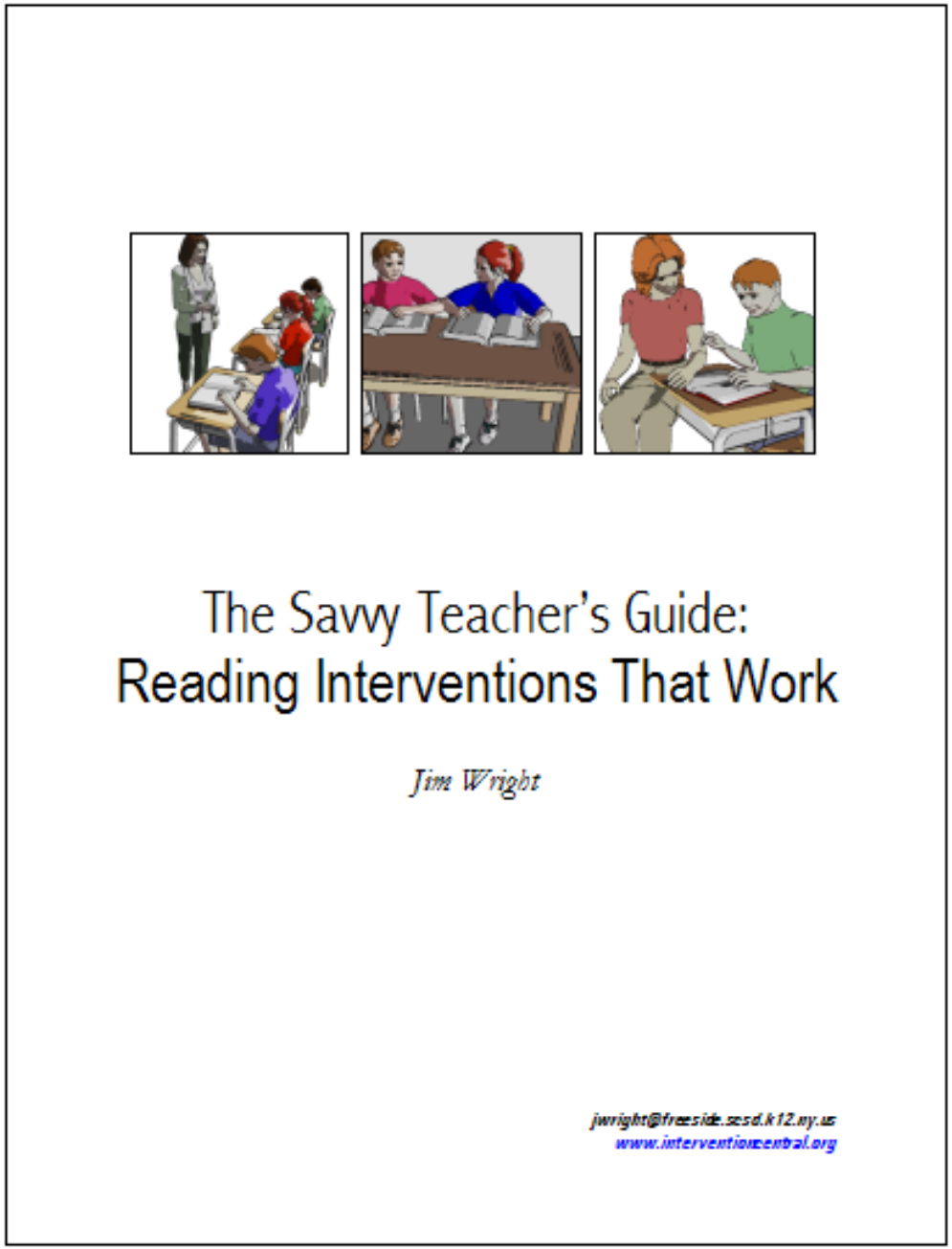
"An extensive review of the literature indicates that classroom practices that encourage repeated oral reading with feedback and guidance leads to meaningful improvements in reading expertise for students—for good readers as well as those who are experiencing difficulties."-p. 3-3

Savvy Teacher's Guide: Reading Interventions That Work

(Wright, 2000)

Available for free from:

www.interventioncentral.org

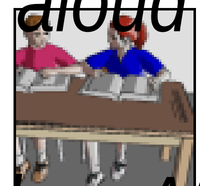


Interventions for…*Increasing Reading Fluency*

- Assisted Reading Practice
- Listening Passage Preview ('Listening While Reading')
- Paired Reading
- Repeated Reading

Paired Reading (p. 24)

The student reads aloud in tandem with an accomplished reader. At a student signal, the helping reader stops reading, while the student continues on. When the student commits a reading error, the helping reader resumes reading in tandem.




Paired
Reading

HELPS Program: Reading Fluency www.helpsprogram.org

- HELPS (Helping Early Literacy with Practice Strategies) is a free tutoring program that targets student reading fluency skills. Developed by Dr. John Begeny of North Carolina State University, the program is an evidence-based intervention package that includes:
  - adult modeling of fluent reading,
  - repeated reading of passages by the student,
  - phrase-drill error correction,
  - verbal cueing and retell check to encourage student reading comprehension,
  - reward procedures to engage and encourage the student reader.

Tier 1 (Classroom) Literacy Interventions for Middle & High Schools: A Skill-Building Lab

Jim Wright
www.interventioncentral.org

INTERVENTION CENTRAL

'Fifteen Elements of Effective Adolescent Literacy Programs'

1. Direct, explicit comprehension instruction
2. Effective instructional principles embedded in content
3. Motivation and self-directed learning
4. Text-based collaborative learning
5. Formative evaluation of reading skills
6. Strategic tutoring
7. Diverse texts
8. Intensive writing
9. Technology component
10. Extended time for literacy across classes
11. Professional development
12. Ongoing summative assessment of students and programs
13. Teacher teams (interdisciplinary with a student problem-solving focus)
14. Leadership
15. Comprehensive and coordinated literacy program (interdisciplinary, interdepartmental)

Source: Biancarosa, C., & Snow, C. E. (2006). *Reading next—A vision for action and research in middle and high school literacy:* A report to Carnegie Corporation of New York (2nd ed.).Washington, DC: Alliance for Excellent Education. Retrieved from http://www.all4ed.org/files/ReadingNext.pdf

Promoting Literacy in Middle & High School Classrooms: Three Elements

- Explicit vocabulary instruction
- Reading comprehension
- Extended discussion

Source: Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). Improving adolescent literacy: Effective classroom and intervention practices: A practice guide (NCEE #2008-4027). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc.

RTI & Secondary Literacy: Explicit Vocabulary Instruction (pp.12-19)

Vocabulary: Why This Instructional Goal is Important

As vocabulary terms become more specialized in content area courses, students are less able to derive the meaning of unfamiliar words from context alone.

Students must instead learn vocabulary through more direct means, including having opportunities to explicitly memorize words and their definitions.

Students may require 12 to 17 meaningful exposures to a word to learn it.

Differences in Vocabulary Development Between Stronger and Weaker Students

"Vocabulary difficulties are not unique to advanced readers as they typically show up before third grade. At that point, those with high vocabularies know thousands more word meanings and are learning new ones at a much faster rate than those experiencing difficulties.

Biemiller and Slonim (2001), for example, found the highest quartile primary students learned approximately three words a day compared to 1.5 for the lowest quartile students. By high school, top achievers have been shown to know four times the words of lower performing classmates. Perhaps the most disturbing fact about these trends is that they persist." p. 401

Source: Howell, K. W. (2008). Best practices in curriculum-based evaluation and advanced reading. In A. Thomas & J. Grimes (Eds.), Best practices in school psychology V (pp. 397-413).

Provide Dictionary Training

The student is trained to use an Internet lookup strategy to better understand dictionary or glossary definitions of key vocabulary items.

- The student first looks up the word and its meaning(s) in the dictionary/glossary.
- If necessary, the student isolates the specific word meaning that appears to be the appropriate match for the term as it appears in course texts and discussion.
- The student goes to an Internet search engine (e.g., Google) and locates at least five text samples in which the term is used in context and appears to match the selected dictionary definition.

Promote 'Wide Reading'

Students read widely in the content area, using texts that supplement and extend information supplied by the textbook. 'Wide reading' results in substantial increases in student vocabulary over time due to incidental learning. To strengthen the positive impact of wide reading on vocabulary development, have student texts available that vary in difficulty and that are of high interest. Discuss readings in class. Experiment with ways to document student independent reading and integrate that 'wide reading' into an effort grade for the course. If needed, build time into the student's school schedule for supervised 'wide reading' time.

Hold 'Read-Alouds'

Select texts that supplement the course textbook and that illustrate central concepts and contain important vocabulary covered in the course. Read those texts aloud for 3 to 5 minutes per class session--while students follow along silently. Read-alouds provide students with additional exposure to vocabulary items in context. They can also lower the threshold of difficulty: Students may be more likely to attempt to read an assigned text independently if they have already gotten a start in the text by listening to a more advanced reader read the first few pages aloud. Read-alouds can support other vocabulary-building activities such as guided discussion, vocabulary review, and wide reading.

Provide Regular In-Class Instruction and Review of Vocabulary Terms, Definitions

Present important new vocabulary terms in class, along with student-friendly definitions. Provide 'example sentences' to illustrate the use of the term. Assign students to write example sentences employing new vocabulary to illustrate their mastery of the terms.

Generate ‘Possible Sentences’

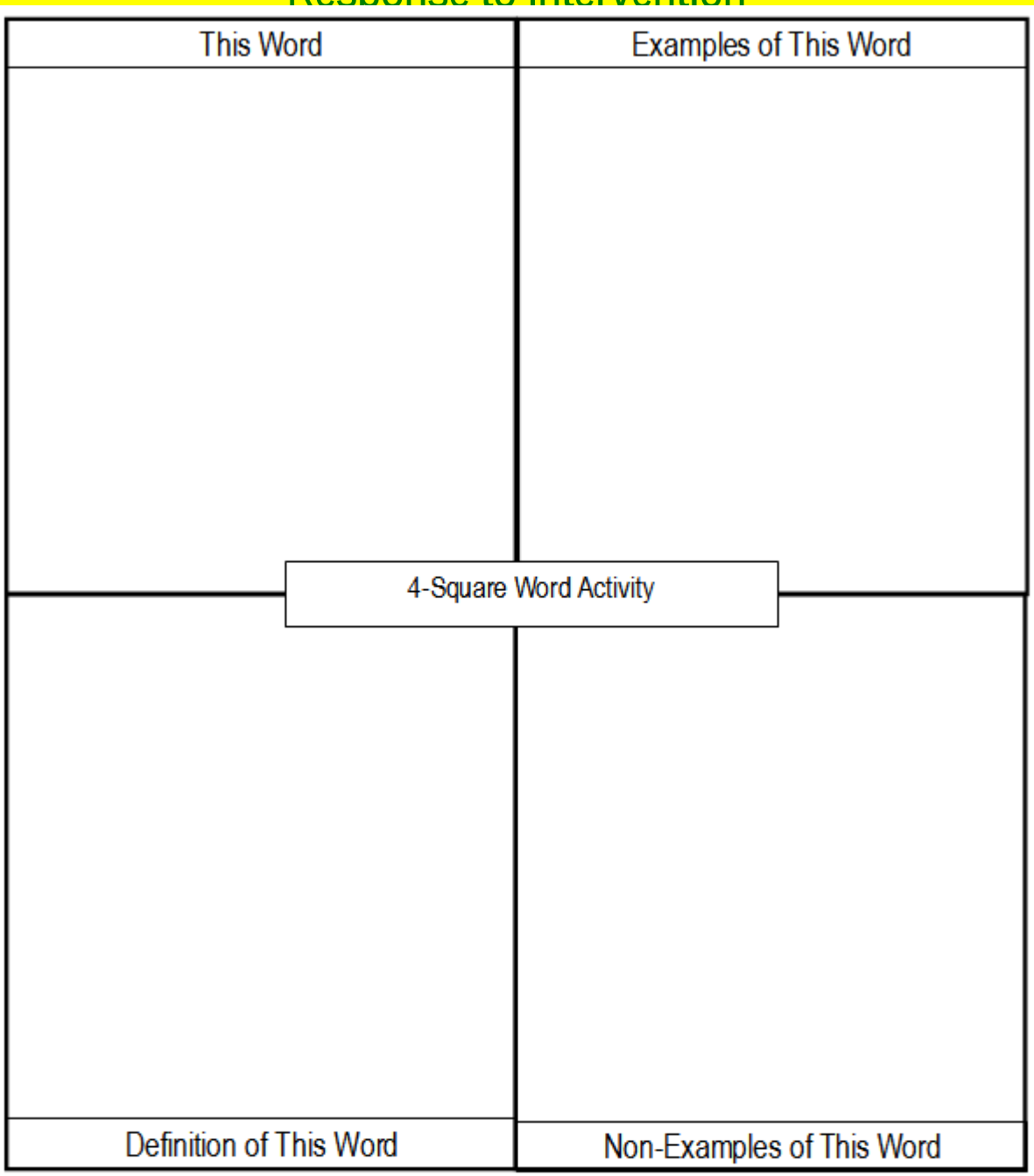
The teacher selects 6 to 8 challenging new vocabulary terms and 4 to 6 easier, more familiar vocabulary items relevant to the lesson. Introduce the vocabulary terms to the class. Have students write sentences that contain at least two words from the posted vocabulary list. Then write examples of student sentences on the board until all words from the list have been used. After the assigned reading, review the ‘possible sentences’ that were previously generated. Evaluate as a group whether, based on the passage, the sentence is ‘possible’ (true) in its current form. If needed, have the group recommend how to change the sentence to make it ‘possible’.

Enhance Vocabulary Instruction Through Use of Graphic Organizers or Displays: A Sampling

Teachers can use graphic displays to structure their vocabulary discussions and activities (Boardman et al., 2008; Fisher, 2007; Texas Reading Initiative, 2002).

4-Square Graphic Display

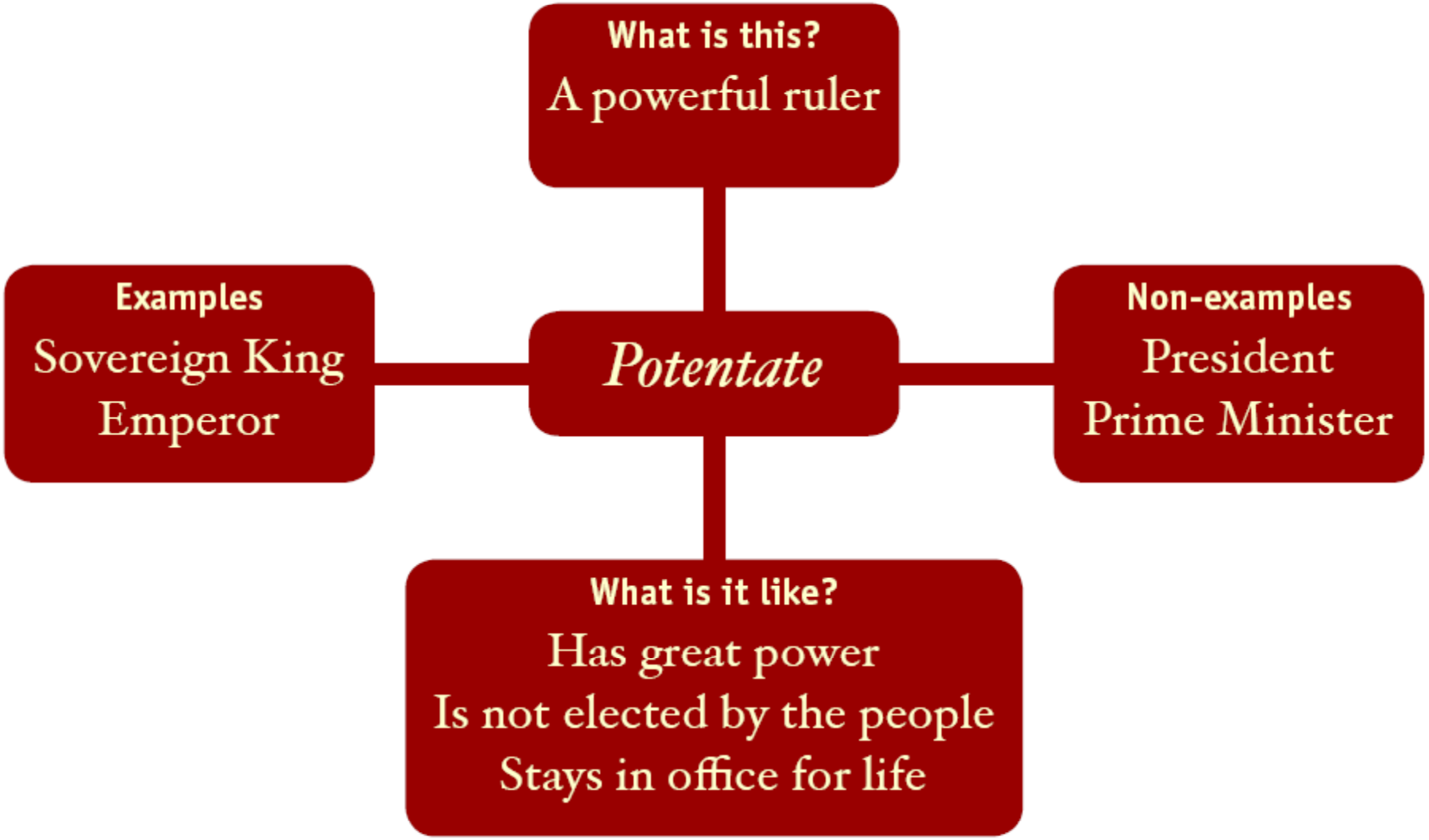
The student divides a page into four quadrants. In the upper left section, the student writes the target word. In the lower left section, the student writes the word definition. In the upper right section, the student generates a list of examples that illustrate the term, and in the lower right section, the student writes ‘non-examples’ (e.g., terms that are the opposite of the target vocabulary word).


This Word
Examples of This Word
4-Square Word Activity
Definition of This Word
Non-Examples of This Word

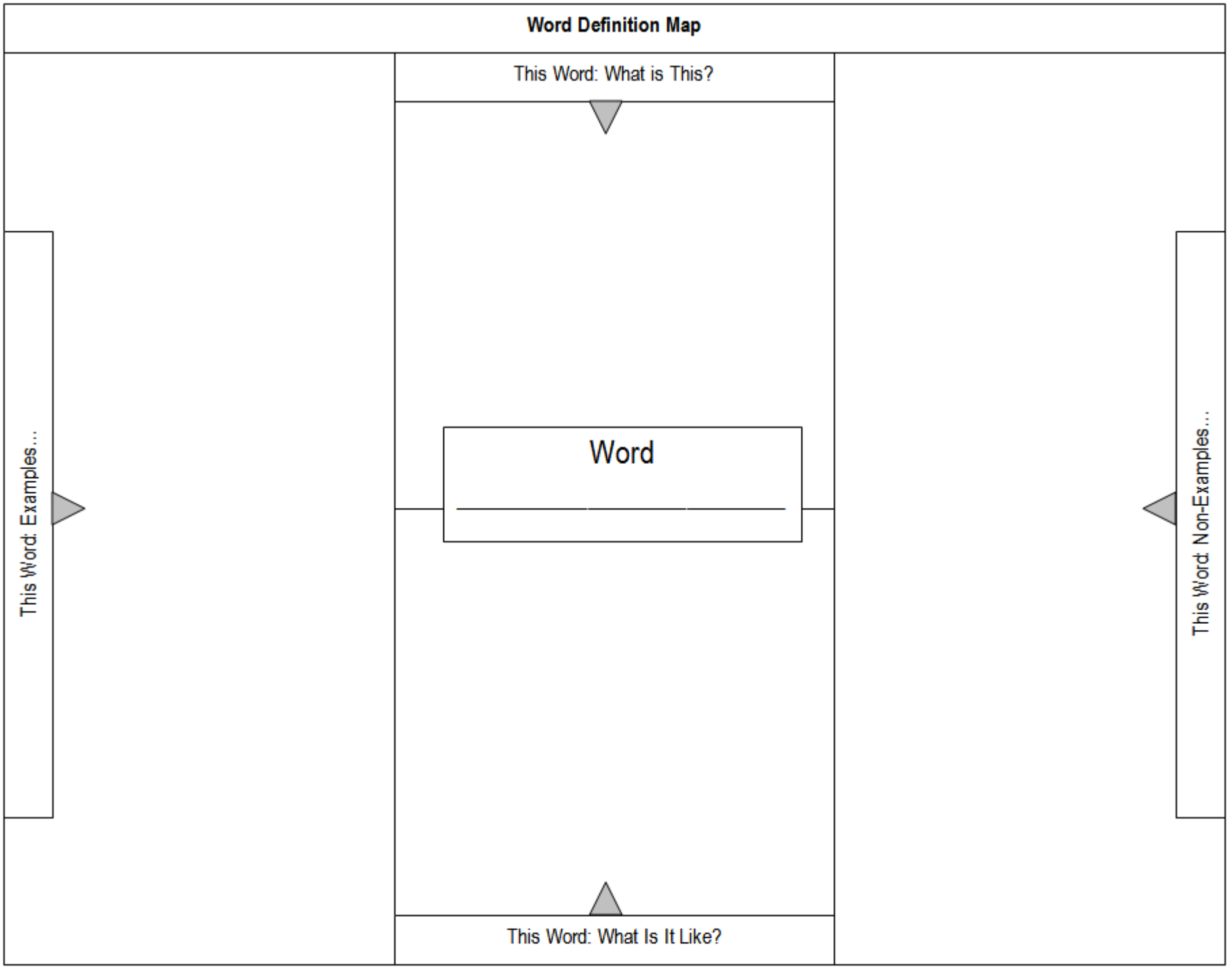
Semantic Word Definition Map

The graphic display contains sections in which the student writes the word, its definition ('what is this?'), additional details that extend its meaning ('What is it like?'), as well as a listing of examples and 'non-examples' (e.g., terms that are the opposite of the target vocabulary word).

Word Definition Map Example



Word Definition Map



Semantic Feature Analysis

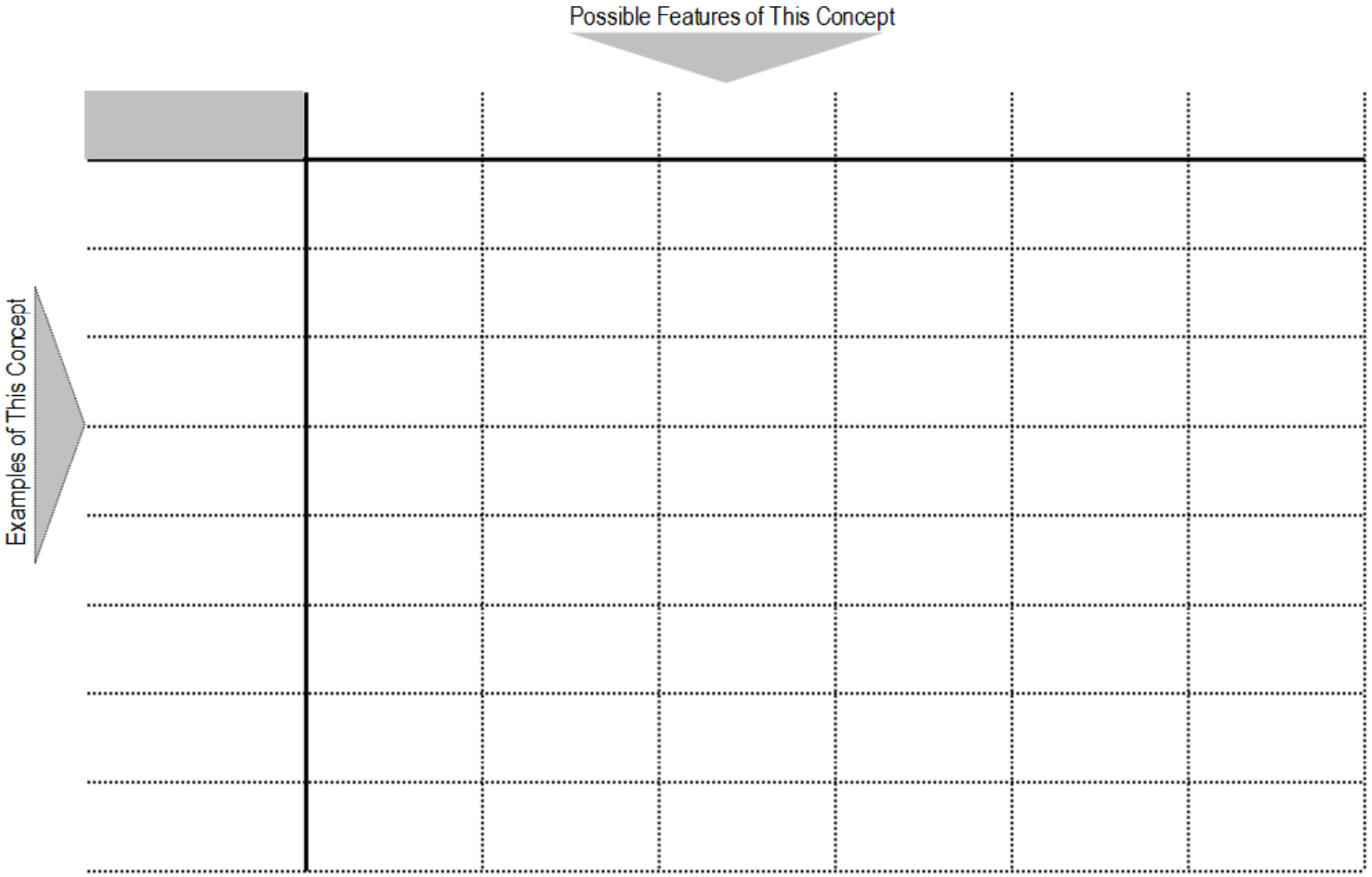
A target vocabulary term is selected for analysis in this grid-like graphic display. Possible features or properties of the term appear along the top margin, while examples of the term are listed ion the left margin. The student considers the vocabulary term and its definition. Then the student evaluates each example of the term to determine whether it does or does not match each possible term property or element.

Semantic Feature Analysis Example

- VOCABULARY TERM: *TRANSPORTATION*

	two wheeled	four wheeled	one wheeled	foot powered	motor powered	on land	in the water	in the air
bicycle	+	–	–	+	–	+	–	–
car	–	+	–	–	+	+	–	–
unicycle	–	–	+	+	–	+	–	–
airplane								
boat								
hovercraft								
supersonic transport								
velocipede								

Semantic Feature Analysis for This Concept: _____



Comparison/Contrast (Venn) Diagram

Two terms are listed and defined. For each term, the student brainstorms qualities or properties or examples that illustrate the term's meaning. Then the student groups those qualities, properties, and examples into 3 sections:

A. items unique to Term 1
B. items unique to Term 2
C. items shared by both terms

Term 1 & Definition: _____

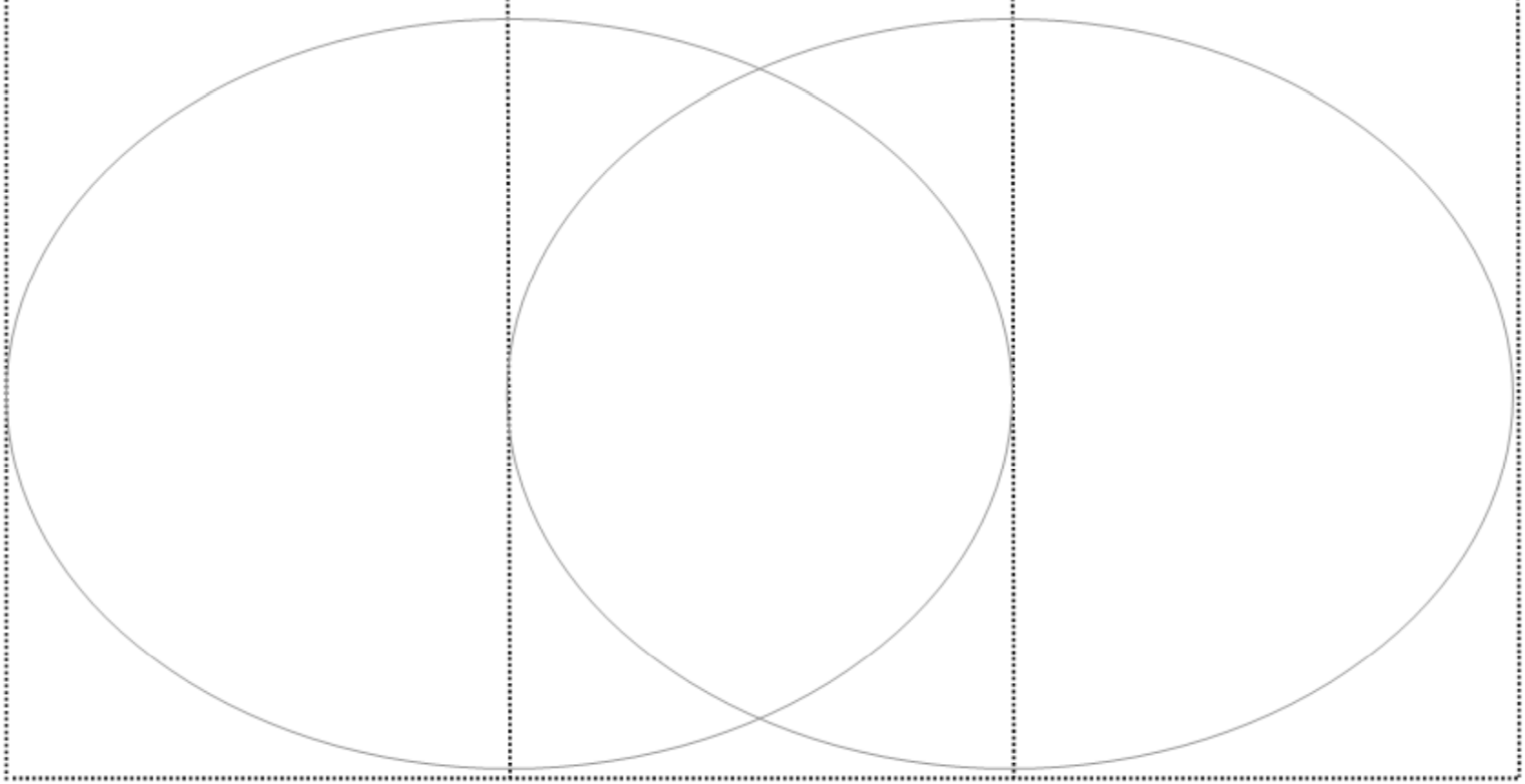
_____

Term 2 & Definition: _____

_____

Comparison/Contrast/Venn Diagram Display

Term 1: _____	Terms 1 & 2	Term 2: _____
Unique Qualities, Properties, Examples	**Shared** Qualities, Properties, Examples	Unique Qualities, Properties, Examples



Team Activity: Evaluate 'Academic & Content-Area Vocabulary' Strategies

- Review the 'Troubleshooting Tips' and 'Building Capacity' sections of the intervention write-up.
- Share your thoughts about how you would promote the use of these strategies in your classrooms.
- Devise at least ONE strategy to move forward in getting teachers to expand their skills in this intervention area.

RTI & Secondary Literacy: Extended Discussion (pp. 20-21)

Extended Discussions: Why This Instructional Goal is Important

Extended, guided group discussion is a powerful means to help students to learn vocabulary and advanced concepts. Discussion can also model for students various 'thinking processes' and cognitive strategies (Kamil et al. 2008, p. 22). To be effective, guided discussion should go beyond students answering a series of factual questions posed by the teacher: Quality discussions are typically open-ended and exploratory in nature, allowing for multiple points of view (Kamil et al., 2008).

When group discussion is used regularly and well in instruction, students show increased growth in literacy skills. Content-area teachers can use it to demonstrate the 'habits of mind' and patterns of thinking of experts in various their discipline: e.g., historians, mathematicians, chemists, engineers, literacy critics, etc.

Use a 'Standard Protocol' to Structure Extended Discussions

Good extended classwide discussions elicit a wide range of student opinions, subject individual viewpoints to critical scrutiny in a supportive manner, put forth alternative views, and bring closure by summarizing the main points of the discussion. Teachers can use a simple structure to effectively and reliably organize their discussions…

'Standard Protocol' Discussion Format

A. Pose questions to the class that require students to explain their positions and their reasoning .

B. When needed, 'think aloud' as the discussion leader to model good reasoning practices (e.g., taking a clear stand on a topic).

C. Supportively challenge student views by offering possible counter arguments.

D. Single out and mention examples of effective student reasoning.

E. Avoid being overly directive; the purpose of extended discussions is to more fully investigate and think about complex topics.

F. Sum up the general ground covered in the discussion and highlight the main ideas covered.

Team Activity: Evaluate 'Extended Discussion' Strategies

- Review the 'Troubleshooting Tips' and 'Building Capacity' sections of the intervention write-up.
- Share your thoughts about how you would promote the use of this strategy in your classrooms.
- Devise at least ONE strategy to move forward in getting teachers to expand their skills in this intervention area.

RTI & Secondary Literacy: Reading Comprehension

Reading Comprehension: Why This Instructional Goal is Important

Students require strong reading comprehension skills to succeed in challenging content-area classes.

At present, there is no clear evidence that any one reading comprehension instructional technique is clearly superior to others. In fact, it appears that students benefit from being taught **any** self-directed practice that prompts them to engage more actively in understanding the meaning of text (Kamil et al., 2008).

Assist Students in Setting 'Content Goals' for Reading

Students are more likely to be motivated to read--and to read more closely—if they have specific content-related reading goals in mind. At the start of a reading assignment, for example, the instructor has students state what questions they might seek to answer or what topics they would like to learn more about in their reading. The student or teacher writes down these questions. After students have completed the assignee reading, they review their original questions and share what they have learned (e.g., through discussion in large group or cooperative learning group, or even as a written assignment).

Characteristics of the Middle or High School Reader

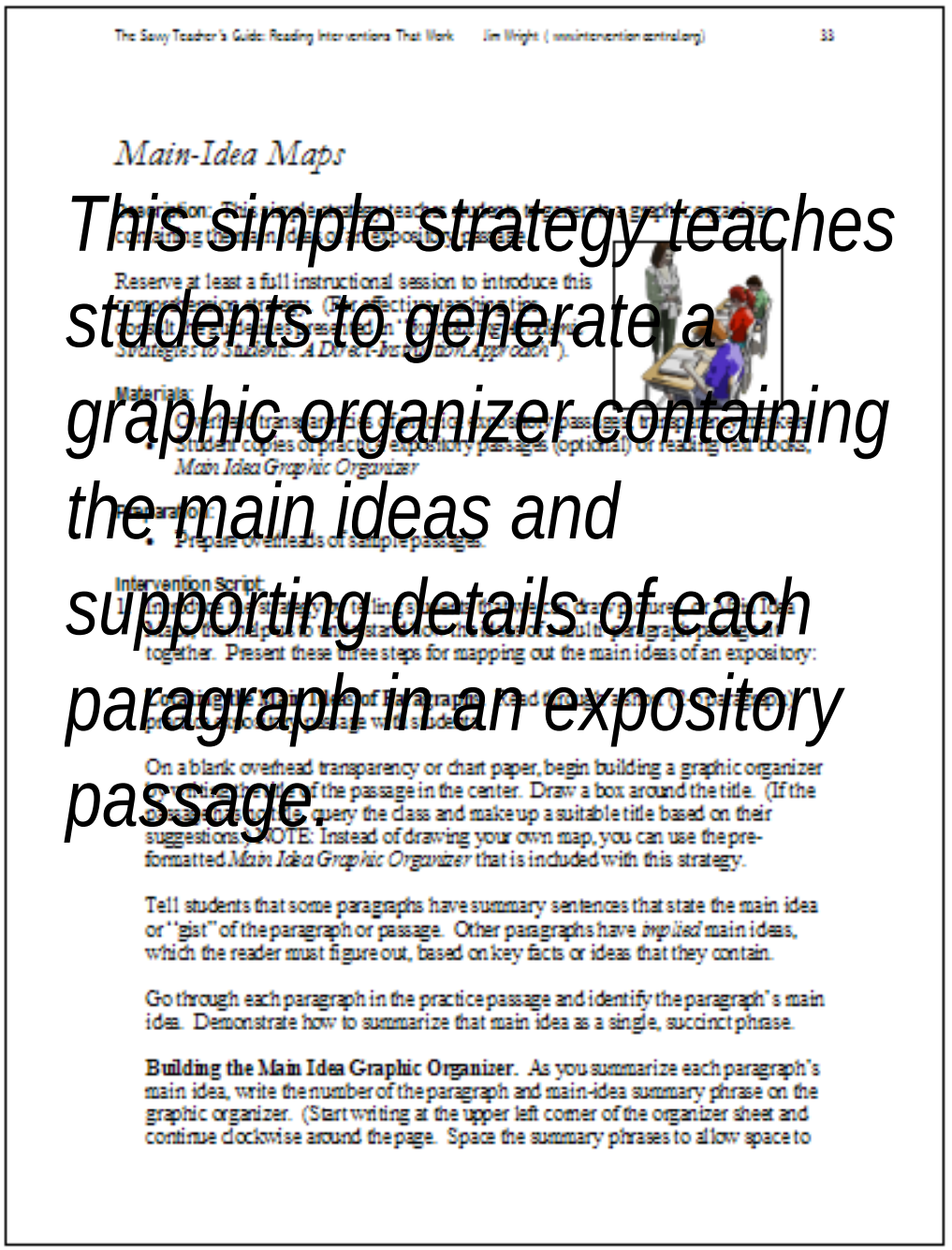
"…intermediate and secondary grade students who are not proficient with beginning reading skills most often have learned an array of "misrules" or ineffective reading tactics that need to be corrected or unlearned as they acquire advance reading skills. Thus, the content of corrective reading instruction can differ in important ways from beginning and even from remedial reading instruction..."

Source: Howell, K. W. (2008). Best practices in curriculum-based evaluation and advanced reading. In A. Thomas & J. Grimes (Eds.), Best practices in school psychology V (pp. 397-413).

Interventions for…*Improving Comprehension*

- 'Click or Clunk?' Self-Check
- Keywords: A Memorization Strategy
- Main Idea Maps
- Mental Imagery: Improving Text Recall
- Oral Recitation Lesson
- Prior Knowledge: Activating the 'Known'
- Question-Generation
- Reciprocal Teaching: A Reading Comprehension Package
- Story Map
- Text Lookback

Main Idea Maps (p.26)



The Savvy Teacher's Guide: Reading Interventions That Work Jim Wright (www.interventioncentral.org) 33

Main-Idea Maps

Reserve at least a full instructional session to introduce this

Materials:

- Student copies of practice expository passages (optional) or reading text books;
- *Main Idea Graphic Organizer*

Preparation:

- Prepare overheads of sample passages.

Intervention Script:

On a blank overhead transparency or chart paper, begin building a graphic organizer containing the title of the passage in the center. Draw a box around the title. (If the passage is untitled, query the class and make up a suitable title based on their suggestions.) NOTE: Instead of drawing your own map, you can use the pre-formatted *Main Idea Graphic Organizer* that is included with this strategy.

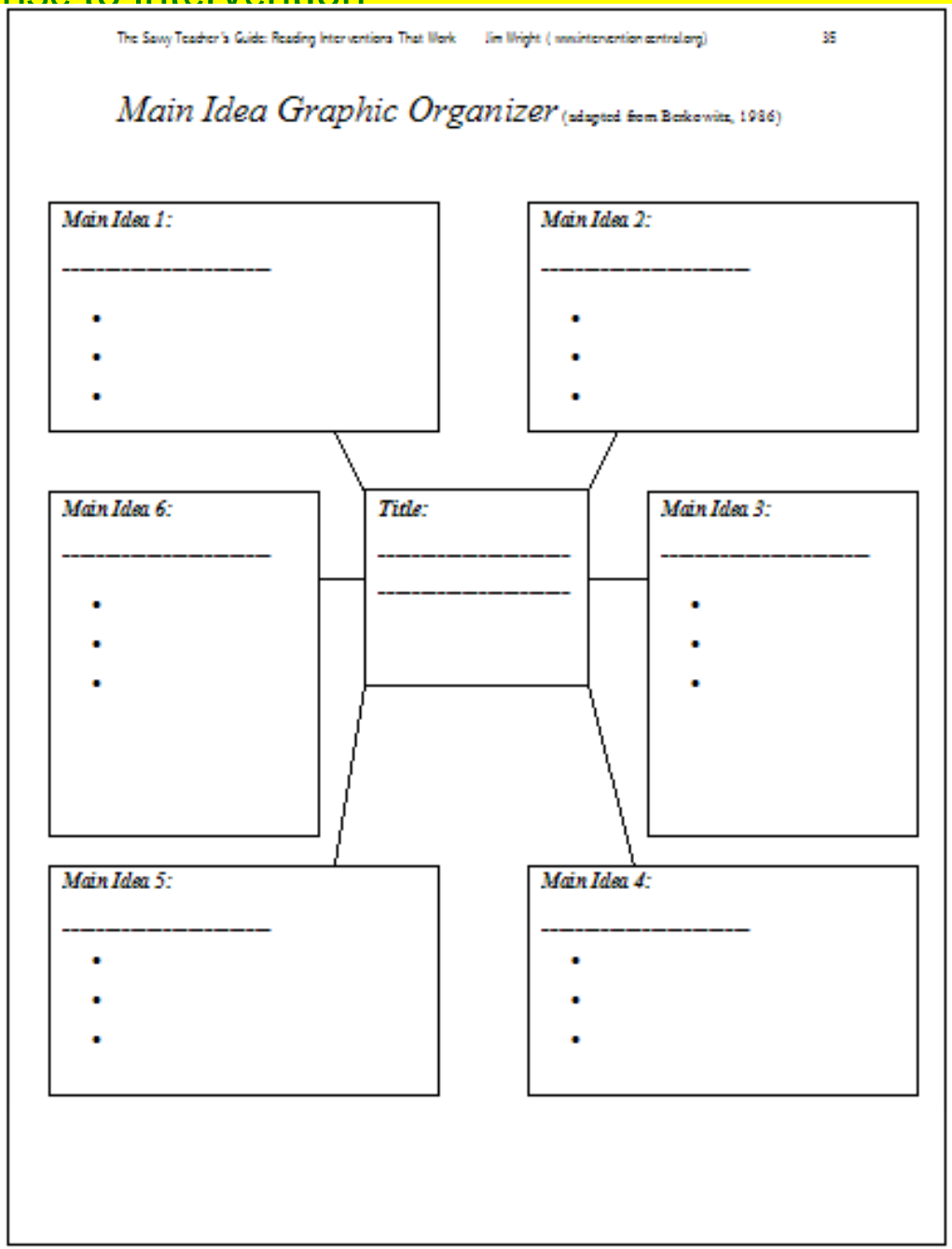
Tell students that some paragraphs have summary sentences that state the main idea or "gist" of the paragraph or passage. Other paragraphs have *implied* main ideas, which the reader must figure out, based on key facts or ideas that they contain.

Go through each paragraph in the practice passage and identify the paragraph's main idea. Demonstrate how to summarize that main idea as a single, succinct phrase.

Building the Main Idea Graphic Organizer. As you summarize each paragraph's main idea, write the number of the paragraph and main-idea summary phrase on the graphic organizer. (Start writing at the upper left corner of the organizer sheet and continue clockwise around the page. Space the summary phrases to allow space to

This simple strategy teaches students to generate a graphic organizer containing the main ideas and supporting details of each paragraph in an expository passage.

Main Idea Maps: Sample Graphic Organizer (p. 28)



The Savvy Teacher's Guide: Reading Interventions That Work Jim Wright (www.interventioncentral.org) 35

Main Idea Graphic Organizer (adapted from Berkowitz, 1986)

Main Idea 1:

Main Idea 2:

Main Idea 6:

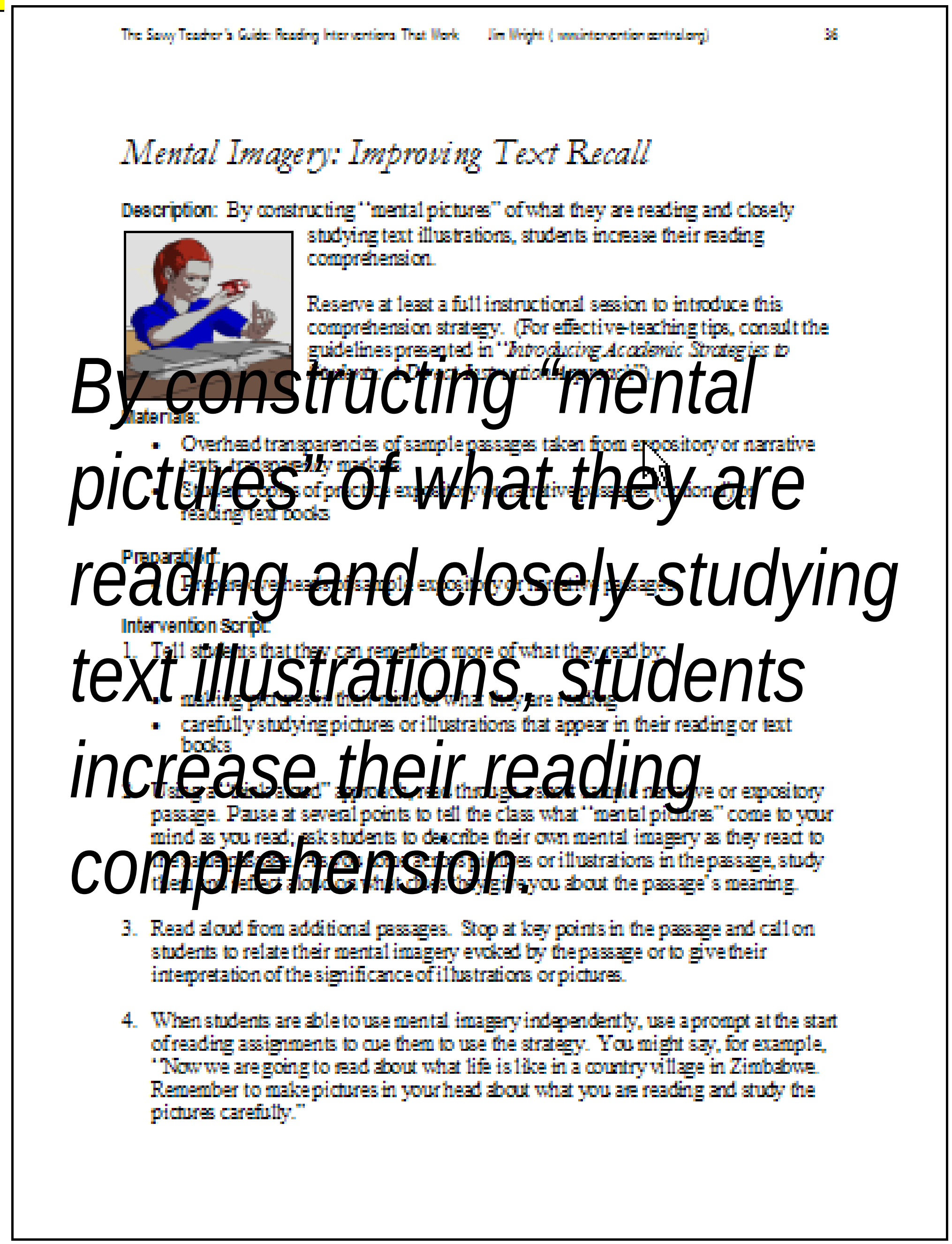
Title:

Main Idea 3:

Main Idea 5:

Main Idea 4:

Mental Imagery: Improving Text Recall (p.29)



Mental Imagery: Improving Text Recall

Description: By constructing "mental pictures" of what they are reading and closely studying text illustrations, students increase their reading comprehension.

Reserve at least a full instructional session to introduce this comprehension strategy. (For effective-teaching tips, consult the guidelines presented in "*Introducing Academic Strategies to Students: A Direct-Instruction Approach*").

Materials:

- Overhead transparencies of sample passages taken from expository or narrative texts, transparency markers
- Student copies of practice expository or narrative passages (optional) or reading text books

Preparation:

- Prepare overheads of sample expository or narrative passages.

Intervention Script:

1. Tell students that they can remember more of what they read by:
   - making pictures in their mind of what they are reading
   - carefully studying pictures or illustrations that appear in their reading or text books
2. Using a "think aloud" approach, read through a short sample narrative or expository passage. Pause at several points to tell the class what "mental pictures" come to your mind as you read; ask students to describe their own mental imagery as they react to [illegible] or illustrations in the passage, study [illegible] you about the passage's meaning.
3. Read aloud from additional passages. Stop at key points in the passage and call on students to relate their mental imagery evoked by the passage or to give their interpretation of the significance of illustrations or pictures.
4. When students are able to use mental imagery independently, use a prompt at the start of reading assignments to cue them to use the strategy. You might say, for example, "Now we are going to read about what life is like in a country village in Zimbabwe. Remember to make pictures in your head about what you are reading and study the pictures carefully."

By constructing "mental pictures" of what they are reading and closely studying text illustrations, students increase their reading comprehension.

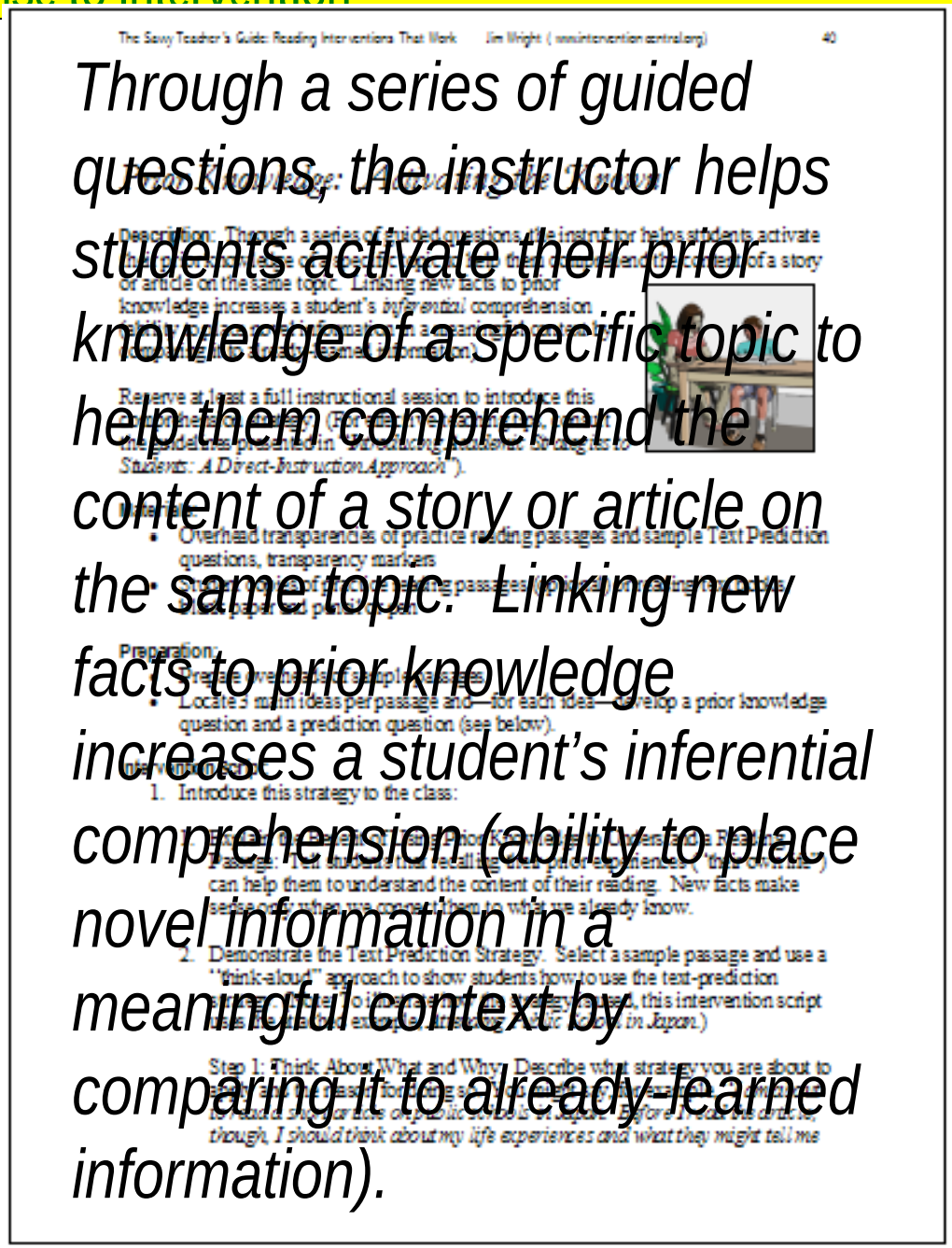
Characteristics of the Middle or High School Reader (Cont.)

"…because students who have trouble reading read less material (even if they have read for the same total amount of time), they will have encountered fewer words and ideas by the time they read the upper grades….

This limited pool of background (i.e., prior) knowledge will make it more difficult for them to learn new information from text, even if the reading problem is magically corrected over night. In many instances, this lack of prior/background knowledge is the most significant learning characteristic of this group of students." p. 400

Source: Howell, K. W. (2008). Best practices in curriculum-based evaluation and advanced reading. In A. Thomas & J. Grimes (Eds.), Best practices in school psychology V (pp. 397-413).

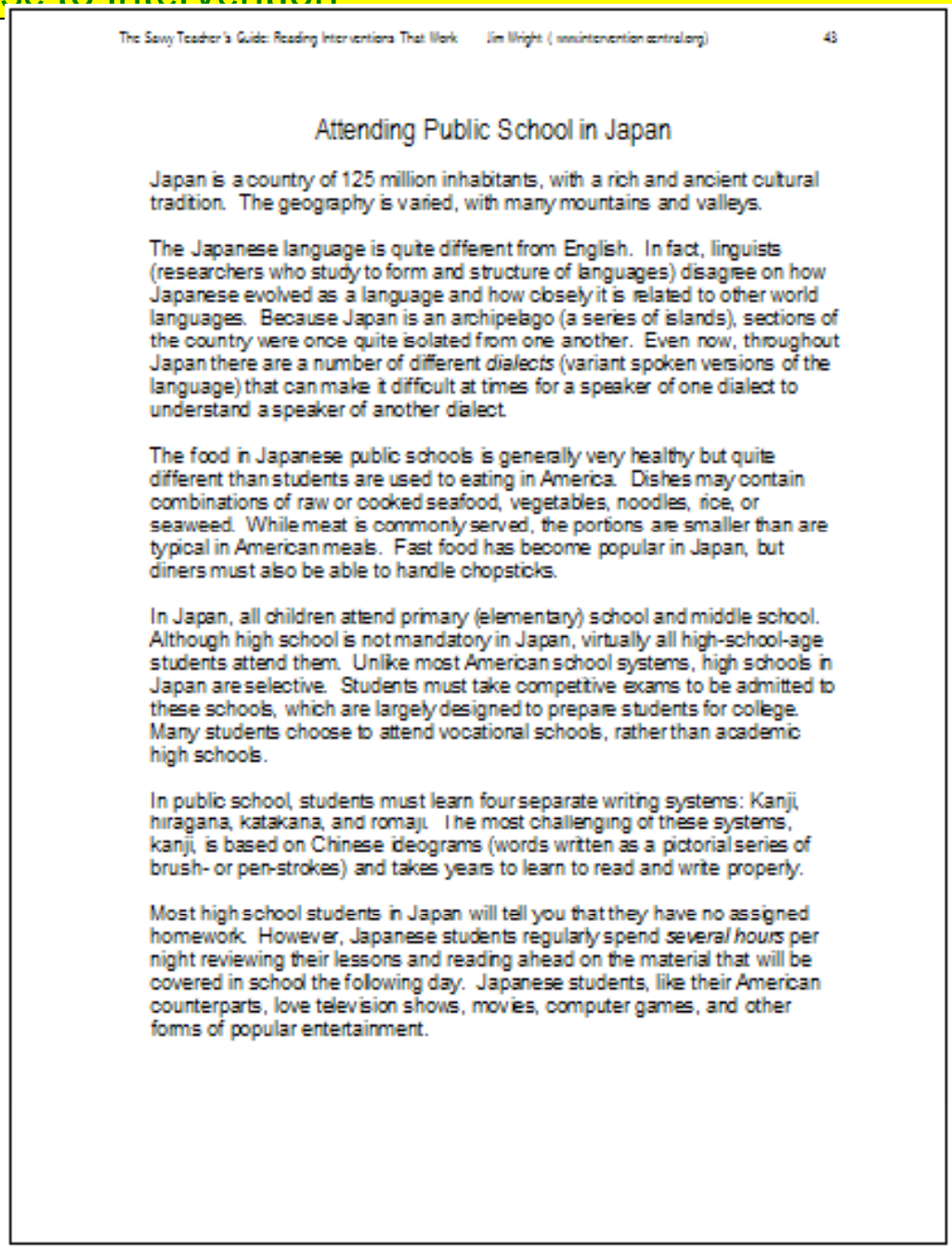
Prior Knowledge: Activating the 'Known' (p.31)



The Savvy Teacher's Guide: Reading Interventions That Work Jim Wright (www.interventioncentral.org) 40

Through a series of guided questions, the instructor helps students activate their prior knowledge of a specific topic to help them comprehend the content of a story or article on the same topic. Linking new facts to prior knowledge increases a student's inferential comprehension (ability to place novel information in a meaningful context by comparing it to already-learned information).

Activating Prior Knowledge: Student Exercise



Attending Public School in Japan

Japan is a country of 125 million inhabitants, with a rich and ancient cultural tradition. The geography is varied, with many mountains and valleys.

The Japanese language is quite different from English. In fact, linguists (researchers who study to form and structure of languages) disagree on how Japanese evolved as a language and how closely it is related to other world languages. Because Japan is an archipelago (a series of islands), sections of the country were once quite isolated from one another. Even now, throughout Japan there are a number of different *dialects* (variant spoken versions of the language) that can make it difficult at times for a speaker of one dialect to understand a speaker of another dialect.

The food in Japanese public schools is generally very healthy but quite different than students are used to eating in America. Dishes may contain combinations of raw or cooked seafood, vegetables, noodles, rice, or seaweed. While meat is commonly served, the portions are smaller than are typical in American meals. Fast food has become popular in Japan, but diners must also be able to handle chopsticks.

In Japan, all children attend primary (elementary) school and middle school. Although high school is not mandatory in Japan, virtually all high-school-age students attend them. Unlike most American school systems, high schools in Japan are selective. Students must take competitive exams to be admitted to these schools, which are largely designed to prepare students for college. Many students choose to attend vocational schools, rather than academic high schools.

In public school, students must learn four separate writing systems: Kanji, hiragana, katakana, and romaji. The most challenging of these systems, kanji, is based on Chinese ideograms (words written as a pictorial series of brush- or pen-strokes) and takes years to learn to read and write properly.

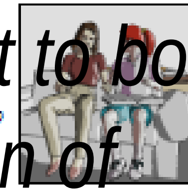
Most high school students in Japan will tell you that they have no assigned homework. However, Japanese students regularly spend *several hours* per night reviewing their lessons and reading ahead on the material that will be covered in school the following day. Japanese students, like their American counterparts, love television shows, movies, computer games, and other forms of popular entertainment.

Question Generation (p.35)

Students are taught to boost their comprehension of expository passages by (1) locating the main idea or key ideas in the passage and (2) generating questions based on that information.

Question-Generation

Description: Students are taught to boost their comprehension of expository passages by (1) locating the main idea or key ideas in the passage and (2) generating questions based on that information.



Materials:

- Overhead transparencies of practice reading passages, transparency markers
- Student copies of practice reading passages (optional) or reading/text books

Preparation:

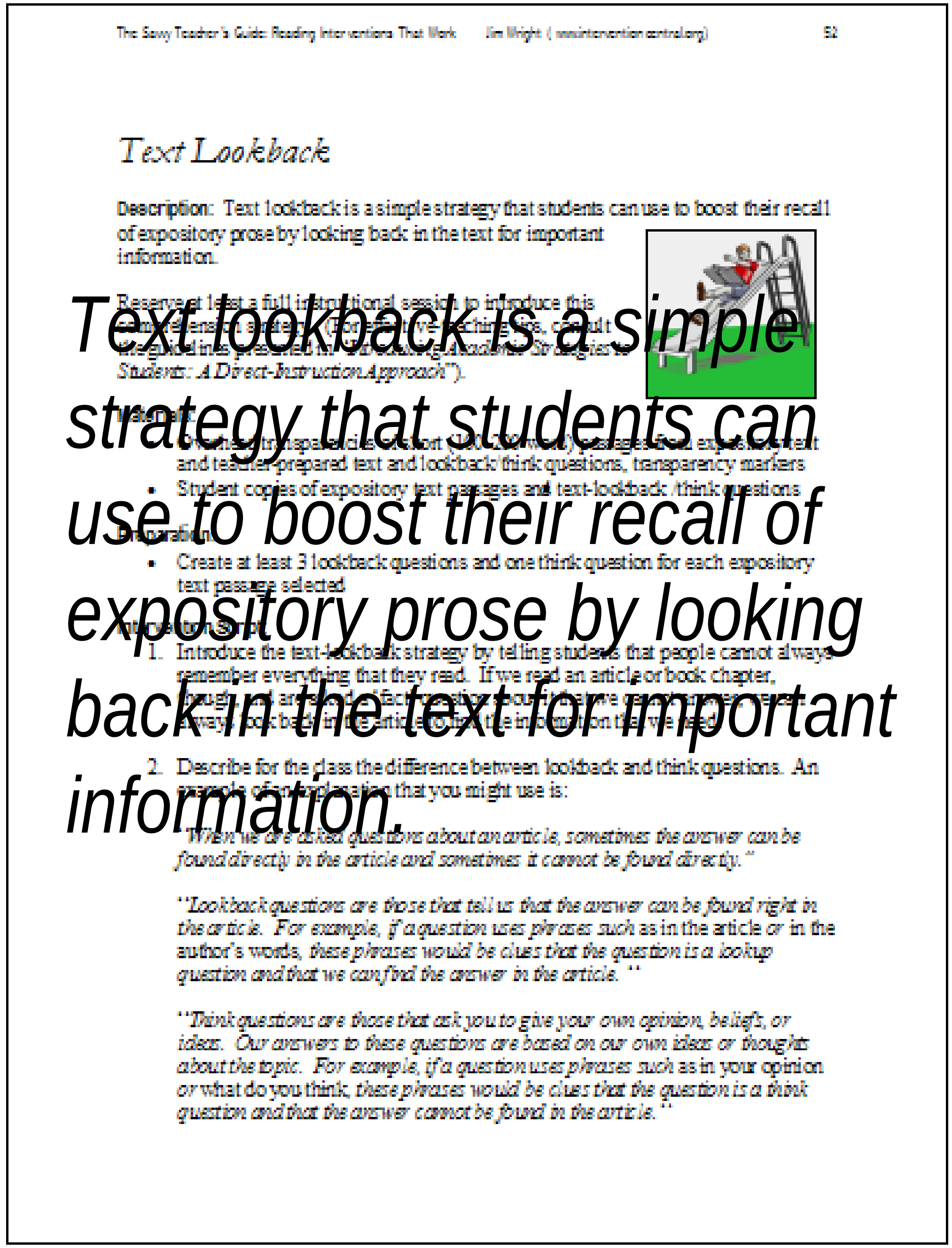
- Prepare overheads of sample passages.

C. Writing a "Gist" Sentence. Show students a passage with an implied main idea. Circle all key ideas or facts. Demonstrate how to write a "gist" sentence (one that is built from the identified key ideas and summarizes the paragraph's main idea). Emphasize that the reader may have link information from different sections of the passage to build a gist sentence. Have students practice this skill on additional practice passages.

D. Generating Questions. Tell students that careful readers often construct questions about what they are reading to help them learn. Put up a list of 'signal words' that can be used as question-starters: e.g., who, what, where,

Text Lookback (p.37)

Text lookback is a simple strategy that students can use to boost their recall of expository prose by looking back in the text for important information.



Reading Interventions: Activity

In your groups…

- Review the reading-related intervention ideas in your handout.

1. *Academic & Content-Area Vocabulary p. 12*
2. *Extended Classroom Discussion p. 20*
3. *Main Idea Maps p. 26*
4. *Mental Imagery p. 29*
5. *Activating the Known p.31*
6. *Question Generation p. 35*
7. *Text Lookback p. 37*

- Select at least **1** idea that you think that your school could use right away. What kind of classroom or building preparation would be required?

Promoting Student Reading Comprehension 'Fix-Up' Skills

Jim Wright
www.interventioncentral.org

INTERVENTION CENTRAL

Reading Comprehension 'Fix-Up' Skills: A Toolkit

Good readers continuously monitor their understanding of informational text. When necessary, they also take steps to improve their understanding of text through use of reading comprehension 'fix-up' skills.

Presented here are a series of fix-up skill strategies that can help struggling students to better understand difficult reading assignments…

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Core Instruction] **Providing Main Idea Practice through 'Partner Retell'** (Carnine & Carnine, 2004). Students in a group or class are assigned a text selection to read silently. Students are then paired off, with one student assigned the role of 'reteller' and the other appointed as 'listener'. The reteller recounts the main idea to the listener, who can comment or ask questions. The teacher then states the main idea to the class. Next, the reteller locates two key details from the reading that support the main idea and shares these with the listener. At the end of the activity, the teacher does a spot check by randomly calling on one or more students in the listener role and asking them to recap what information was shared by the reteller.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Accommodation] **Developing a Bank of Multiple Passages to Present Challenging Concepts** (Hedin & Conderman, 2010; Kamil et al., 2008; Texas Reading Initiative, 2002). The teacher notes which course concepts, cognitive strategies, or other information will likely present the greatest challenge to students. For these 'challenge' topics, the teacher selects alternative readings that present the same general information and review the same key vocabulary as the course text but that are more accessible to struggling readers (e.g., with selections written at an easier reading level or that use graphics to visually illustrate concepts). These alternative selections are organized into a bank that students can access as a source of 'wide reading' material.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Promoting Understanding & Building Endurance through Reading-Reflection Pauses** (Hedin & Conderman, 2010). The student decides on a reading interval (e.g., every four sentences; every 3 minutes; at the end of each paragraph). At the end of each interval, the student pauses briefly to recall the main points of the reading. If the student has questions or is uncertain about the content, the student rereads part or all of the section just read. This strategy is useful both for students who need to monitor their understanding as well as those who benefit from brief breaks when engaging in intensive reading as a means to build up endurance as attentive readers.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Identifying or Constructing Main Idea Sentences** (Davey & McBride, 1986; Rosenshine, Meister & Chapman, 1996). For each paragraph in an assigned reading, the student either (a) highlights the main idea sentence or (b) highlights key details and uses them to write a 'gist' sentence. The student then writes the main idea of that paragraph on an index card. On the other side of the card, the student writes a question whose answer is that paragraph's main idea sentence. This stack of 'main idea' cards becomes a useful tool to review assigned readings.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Restructuring Paragraphs with Main Idea First to Strengthen 'Rereads'** (Hedin & Conderman, 2010). The student highlights or creates a main idea sentence for each paragraph in the assigned reading. When rereading each paragraph of the selection, the student (1) reads the main idea sentence or student-generated 'gist' sentence first (irrespective of where that sentence actually falls in the paragraph); (2) reads the remainder of the paragraph, and (3) reflects on how the main idea relates to the paragraph content.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Summarizing Readings** (Boardman et al., 2008). The student is taught to summarize readings into main ideas and essential details--stripped of superfluous content. The act of summarizing longer readings can promote understanding and retention of content while the summarized text itself can be a useful study tool.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Linking Pronouns to Referents** (Hedin & Conderman, 2010). Some readers lose the connection between pronouns and the nouns that they refer to (known as 'referents')—especially when reading challenging text. The student is encouraged to circle pronouns in the reading, to explicitly identify each pronoun's referent, and (optionally) to write next to the pronoun the name of its referent. For example, the student may add the referent to a pronoun in this sentence from a biology text: *"The Cambrian Period is the first geological age that has large numbers of multi-celled organisms associated with **it** Cambrian Period."*

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- Student Strategy] **Apply Vocabulary 'Fix-Up' Skills for Unknown Words** (Klingner & Vaughn, 1999). When confronting an unknown word in a reading selection, the student applies the following vocabulary 'fix-up' skills:
  1. Read the sentence again.
  2. Read the sentences before and after the problem sentence for clues to the word's meaning.
  3. See if there are prefixes or suffixes in the word that can give clues to meaning.
  4. Break the word up by syllables and look for 'smaller words' within.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Compiling a Vocabulary Journal from Course Readings** (Hedin & Conderman, 2010). The student highlights new or unfamiliar vocabulary from course readings. The student writes each term into a vocabulary journal, using a standard 'sentence-stem' format: e.g., "*Mitosis* means…" or "A *chloroplast* is…". If the student is unable to generate a definition for a vocabulary term based on the course reading, he or she writes the term into the vocabulary journal without definition and then applies other strategies to define the term: e.g., look up the term in a dictionary; use Google to locate two examples of the term being used correctly in context; ask the instructor, etc.).

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Encouraging Student Use of Text Enhancements** (Hedin & Conderman, 2010). Text enhancements can be used to tag important vocabulary terms, key ideas, or other reading content. If working with photocopied material, the student can use a highlighter to note key ideas or vocabulary. Another enhancement strategy is the 'lasso and rope' technique—using a pen or pencil to circle a vocabulary term and then drawing a line that connects that term to its underlined definition. If working from a textbook, the student can cut sticky notes into strips. These strips can be inserted in the book as pointers to text of interest. They can also be used as temporary labels—e.g., for writing a vocabulary term and its definition.

Reading Comprehension 'Fix-Up' Skills: A Toolkit (Cont.)

- [Student Strategy] **Reading Actively Through Text Annotation** (Harris, 1990; Sarkisian et al., 2003). Students are likely to increase their retention of information when they interact actively with their reading by jotting comments in the margin of the text. Using photocopies, the student is taught to engage in an ongoing 'conversation' with the writer by recording a running series of brief comments in the margins of the text. The student may write annotations to record opinions about points raised by the writer, questions triggered by the reading, or unknown vocabulary words.

Team Activity: Promoting Student-Administered Interventions

At your table:

- Consider the ideas included in the Reading Comprehension Fix-Up Skills handout.
- What are some ideas that your school might consider to promote training students to administer their own interventions?

Secondary-Level Tier 1 Intervention: Case Examples

Jim Wright
www.interventioncentral.org

INTERVENTION CENTRAL

Classroom Intervention Planning Sheet

Teacher/Team: _____ Date: _____ Student: _____

Student Problem Definition #1: _____

Student Problem Definition #2: _____

[Optional] Person(s) assisting with intervention planning process: _____

Interventions: Essential Elements (Witt et al., 2004)

- Clear problem-definition(s)
- Baseline data
- Goal for improvement
- Progress-monitoring plan

Intervention Description	Intervention Delivery	Check-Up Date	Assessment Data
Describe each intervention that you plan to use to address the student's concern(s).	List key details about delivery of the intervention, such as:; (1) where & when the intervention will be used; (2) the adult-to-student ratio; (3) how frequently the intervention will take place; (4) the length of time each session of the intervention will last;.	Select a date when the data will be reviewed to evaluate the intervention.	Note what classroom data will be used to establish baseline , set a goal for improvement, and track the student's progress during this intervention.
			Type(s) of Data to Be Used: Baseline | Goal by Check-Up
			Type(s) of Data to Be Used: Baseline | Goal by Check-Up
			Type(s) of Data to Be Used: Baseline | Goal by Check-Up

Witt, J. C., VanDerHeyden, A. M., & Gilbertson, D. (2004). Troubleshooting behavioral interventions. A systematic process for finding and eliminating problems. *School Psychology Review, 33*, 363-383.

Tier 1 Case Example: Patricia:
Reading Comprehension

Case Example: Reading Comprehension

The Problem

- A student, Patricia, struggled in her social studies class, particularly in understanding the course readings. Her teacher, Ms. Cardamone, decided that the problem was significant enough that the student required some individualized support.

Case Example: Reading Comprehension

The Evidence

- *Student Interview*. Ms. Cardamone met with Patricia to ask her questions about her difficulties with social studies content and assignments. Patricia said that when she reads the course text and other assigned readings, she doesn't have difficulty with the vocabulary but often realizes after reading half a page that she hasn't really understood what she has read. Sometimes she has to reread a page several times and that can be frustrating.

Case Example: Reading Comprehension

The Evidence (Cont.)

- *Review of Records.* Past teacher report card comments suggest that Patricia has had difficulty with reading comprehension tasks in earlier grades. She had received help in middle school in the reading lab, although there was no record of what specific interventions were tried in that setting.
- *Input from Other Teachers*. Ms. Cardamone checked with other teachers who have Patricia in their classes. All expressed concern about Patricia's reading comprehension skills. The English teacher noted that Patricia appears to have difficulty pulling the main idea from a passage, which limits her ability to extract key information from texts and to review that information for tests.

Case Example: Reading Comprehension

The Intervention

- Ms. Cardamone decided, based on the evidence collected, that Patricia would benefit from training in identifying the main idea from a passage, rather than trying to retain all the information presented in the text. She selected two simple interventions: Question Generation and Text Lookback. She arranged to have Patricia meet with her during an open period to review these two strategies. During that meeting, Ms. Cardamone demonstrated how to use these strategies effectively with the social studies course text and other assigned readings.

Question Generation

Students are taught to boost their comprehension of expository passages by (1) locating the main idea or key ideas in the passage and (2) generating questions based on that information.

http://www.interventioncentral.org/htmdocs/interventions/rdngcompr/qgen.php

Text Lookback

Text lookback is a simple strategy that students can use to boost their recall of expository prose by identifying questions that require information from the text and then looking back in the text in a methodical manner to locate that information.

http://www.interventioncentral.org/htmdocs/interventions/rdngcompr/txtlkbk.php

Case Example: Reading Comprehension

Documentation and Goal-Setting

- Ms Cardamone filled out a Tier 1 intervention plan for the student. On the plan, she listed interventions to be used, a checkup date (4 instructional weeks), and data to be used to assess student progress.
- Data: Ms. Cardamone decided that she would rate the student's grasp of text content in two ways:
  - Student self-rating (1-3 scale; 1=don't understand; 3 = understand well)
  - Quiz grades.
- She collected baseline on both and set a goal for improvement.

Classroom Intervention Planning Sheet

TeacherTeam: _____Mrs. Cardamone_____ Date: ___11-4-2009_____ Student: ____Patricia A._____

Student Problem Definition #1: ___has difficulty summarizing and retaining key information from course readings____

Student Problem Definition #2: _____

Interventions: Essential Elements (Witt et al., 2004)

- Clear problem-definition(s)
- Baseline data
- Goal for improvement
- Progress-monitoring plan

Intervention Description Describe each intervention that you plan to use to address the student's concern(s).	**Intervention Delivery** List key details about delivery of the intervention, such as:; (1) where & when the intervention will be used; (2) the adult-to-student ratio; (3) how frequently the intervention will take place; (4) the length of time each session of the intervention will last;.	**Check-Up Date** Select a date when the data will be reviewed to evaluate the intervention.	**Assessment Data** Note what classroom data will be used to establish baseline , set a goal for improvement, and track the student's progress during this intervention.
Text Lookback (see attached script)	Meet with student during open period to demonstrate intervention.	4 instructional weeks	Type(s) of Data to Be Used: Student self-evaluation of reading comprehension using 3 pt rating scale: 1= did not understand rdng, 3 = did understand rdng/quiz grades Baseline: 1.4 self-eval rating/60 avg quiz grade Goal by Check-Up: 2.5 self-eval rating/75 avg quiz grade
Question Generation	Meet with student during open period to demonstrate intervention. Ask student to show note card collection periodically to verify that she is using the intervention.	4 instructional weeks	Type(s) of Data to Be Used: See above Baseline: Goal by Check-Up:

Case Example: Reading Comprehension

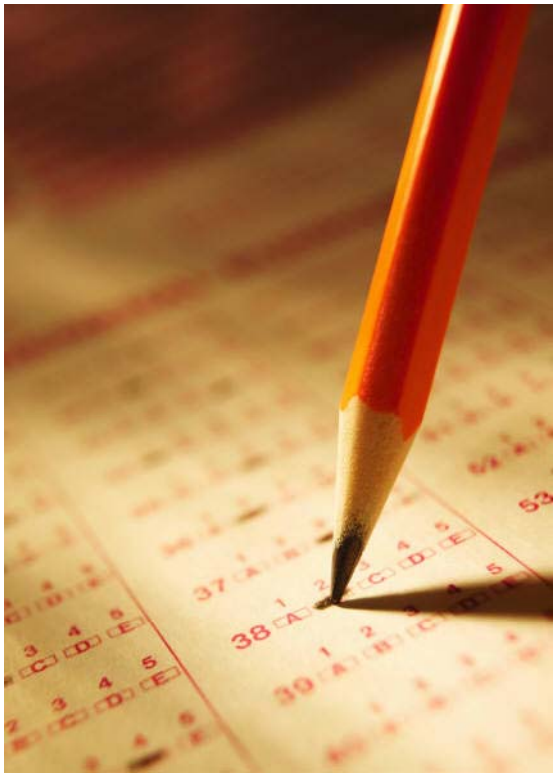
The Outcome

- When the intervention had been in place for 4 weeks, Ms. Cardamone noted that Patricia appeared to have a somewhat better grasp of course content and expressed a greater understanding of material from the text.
- She shared her intervention ideas with other teachers working with Patricia. Because Patricia's self-ratings of reading comprehension and quiz grades met the goals after 4 weeks, Ms. Cardamone decided to continue the intervention plan with the student without changes.

RTI for Secondary Schools: Reading Program 'Readiness Check'

Jim Wright
www.interventioncentral.org

INTERVENTION CENTRAL



INTERVENTION CENTRAL

RTI for Secondary Schools: Reading Program 'Readiness Check'

School: _____ Date: _____

Directions: Based on your knowledge of your middle or high school's current Tier 1 (classroom) general-education programs and Tier 2 (group-based supplemental reading) interventions, rate your building's 'RTI readiness' in reading. (NOTE: Items based on secondary reading framework presented by Howell, 2008).

Tier 1: Core Curriculum & Instruction

1. The school has identified consistent, effective strategies that all general-education teachers are to use to teach and review *topic-specific/technical vocabulary* ('brick words') to a diverse range of learners.

   ☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

2. The school has the capacity to provide targeted classroom instruction for students that have deficient study and organizational skills that impact their comprehension of course content.

   ☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

3. The school has the necessary supports to teach an appropriate range of *metacognitive* skills to a diverse range of learners to ensure full understanding of expository text. Those skills include creating a reading plan, carrying out that reading plan, evaluating one's understanding of what is being read, and reviewing what was read informally (e.g., thinking about the completed reading) or more formally (e.g., note-taking and review).

   ☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

4. The school uses textbooks and other curriculum materials that are '*considerately*' structured. Considerate structure is present when texts:
   - are logically and clearly organized, with an accessible writing style.
   - include introductory and concluding paragraphs.
   - contain paragraphs that each contain a topic sentence and adequate supporting detail
   - include adequate and well-worded organizational cues, including titles, headings, and subheadings
   - use appropriate visual aids such as illustrations or figures
   - include focus questions or objectives at the start of sections.

   ☐ Most texts use in the school are 'considerate' in format ☐ Some texts are 'considerate' in format ☐ Few texts are 'considerate' in format or the school lacks guidelines to judge the accessibility of texts adopted for students

Tier 2: Supplemental Group-Based Reading Instruction

5. The school has the capacity to place students with significant reading delays into appropriate Tier 2/supplemental small-group instruction. Intervention-group sizes are capped at 7 students.

   ☐ More than 7 students per group on average ☐ 7 students or fewer per group on average

6. Instruction for groups receiving Tier 2/supplemental reading instruction lasts at least 30 minutes per session and is scheduled for at least 4 days per week.

   ☐ Group sessions last less than 30 minutes per session or occur fewer than 4 times per week. ☐ Group sessions last at least 30 minutes per session and occur at least 4 times per week.

7. The programs or interventions used for Tier 2/supplemental reading groups are documented to be 'research-based'.

   ☐ The programs or interventions have limited or no information to support research-based status. ☐ The programs or interventions have adequate information to support research-based status. ☐ The programs or interventions have strong information to support research-based status.

8. Students receiving Tier 2/supplemental reading instruction have similar reading problems, allowing the instructor adequately to meet the instructional needs of all students with a single set of group-based reading interventions.

   ☐ Students in each reading group have a wide range of different reading needs. ☐ Students in each reading group have similar types of reading problems.

9. Tier 2/supplemental reading groups have the capacity to teach general *academic* vocabulary ('mortar words') to students with deficits in this area. Examples of general academic vocabulary include terms such as *hypothesis* and *terminology*.

   ☐ Tier 2 reading groups DO NOT have the capacity to teach general academic vocabulary. ☐ Tier 2 reading groups DO have the capacity to teach general academic vocabulary.

10. The school reviews student progress in Tier 2/supplemental group instruction frequently to determine when enrolled students can exit and when new students can enter.

    ☐ Tier 2 groups review their caseloads less frequently than each marking period. ☐ Tier 2 groups review their caseloads at least every marking period ☐ Tier 2 groups review their caseloads more frequently than every marking period.

RTI & Reading: Student Assessment

11. The school has general procedures in place to screen the entire student body to identify those students with significant reading delays who require Tier 2/supplemental reading instruction.

    ☐ YES ☐ PARTIALLY IMPLEMENTED ☐ NO.

12. The school has general procedures in place to screen the entire student body to identify those students who have deficient study and organizational skills that impact their comprehension of course content.

    ☐ YES ☐ PARTIALLY IMPLEMENTED ☐ NO.

13. The school has the capacity to collect information using the following methods to map out students' specific reading skills and deficits:

Reading Assessment Method	*Reading Skills Assessed*	*Capacity in Your School?*
Existing Data and Teacher Feedback (e.g., grades, student work products, teacher feedback on student work performance on reading-related assignments).	• General reading skills • Application of reading skills in the classroom	☐ YES ☐ NO.
Oral Reading Fluency (Curriculum-Based Measurement)	Reading fluency	☐ YES ☐ NO.
Vocabulary Matching (Curriculum-Based Measurement)	Topic-Specific Vocabulary	☐ YES ☐ NO.
Oral Retell	Comprehension	☐ YES ☐ NO.
Student Think-Aloud on Reading-Related Assignments	Efficient and appropriate application of reading strategies	☐ YES ☐ NO.

Reference

Howell, K. W. (2008). Best practices in curriculum-based evaluation and advanced reading. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology V* (pp. 397-413).

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 1: Core Curriculum & Instruction

Directions: Based on your knowledge of your middle or high school's current Tier 1 (classroom) general-education programs and Tier 2 (group-based supplemental reading) interventions, rate your building's 'RTI readiness' in reading. (NOTE: Items based on secondary reading framework presented by Howell, 2008).

Tier 1: Core Curriculum & Instruction

1. The school has identified consistent, effective strategies that all general-education teachers are to use to teach and review *topic-specific/technical vocabulary* ('brick words') to a diverse range of learners.

   ☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 1: Core Curriculum & Instruction

2. The school has the capacity to provide targeted classroom instruction for students that have deficient study and organizational skills that impact their comprehension of course content.

☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 1: Core Curriculum & Instruction

3. The school has the necessary supports to teach an appropriate range of *metacognitive* skills to a diverse range of learners to ensure full understanding of expository text. Those skills include creating a reading plan, carrying out that reading plan, evaluating one's understanding of what is being read, and reviewing what was read informally (e.g., thinking about the completed reading) or more formally (e.g., note-taking and review).

☐ YES ☐ PARTIAL IMPLEMENTATION ☐ NO.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 1: Core Curriculum & Instruction

4. The school uses textbooks and other curriculum materials that are '*considerately*' structured. Considerate structure is present when texts:
   - are logically and clearly organized, with an accessible writing style.
   - include introductory and concluding paragraphs.
   - contain paragraphs that each contain a topic sentence and adequate supporting detail
   - include adequate and well-worded organizational cues, including titles, headings, and subheadings
   - use appropriate visual aids such as illustrations or figures
   - include focus questions or objectives at the start of sections.

☐ Most texts use in the school are 'considerate' in format	☐ Some texts are 'considerate' in format	☐ Few texts are 'considerate' in format or the school lacks guidelines to judge the accessibility of texts adopted for students

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

5. The school has the capacity to place students with significant reading delays into appropriate Tier 2/supplemental small-group instruction. Intervention-group sizes are capped at 7 students.

☐ More than 7 students per group on average

☐ 7 students or fewer per group on average

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

6. Instruction for groups receiving Tier 2/supplemental reading instruction lasts at least 30 minutes per session and is scheduled for at least 4 days per week.

☐ Group sessions last less than 30 minutes per session or occur fewer than 4 times per week.

☐ Group sessions last at least 30 minutes per session and occur at least 4 times per week.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

7. The programs or interventions used for Tier 2/supplemental reading groups are documented to be 'research-based'.

☐ The programs or interventions have limited or no information to support research-based status.	☐ The programs or interventions have adequate information to support research-based status.	☐ The programs or interventions have strong information to support research-based status.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

8. Students receiving Tier 2/supplemental reading instruction have similar reading problems, allowing the instructor adequately to meet the instructional needs of all students with a single set of group-based reading interventions.

☐ Students in each reading group have a wide range of different reading needs.

☐ Students in each reading group have similar types of reading problems.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

9. Tier 2/supplemental reading groups have the capacity to teach general *academic* vocabulary ('mortar words') to students with deficits in this area. Examples of general academic vocabulary include terms such as *hypothesis* and *terminology*.

☐ Tier 2 reading groups DO NOT have the capacity to teach general academic vocabulary.

☐ Tier 2 reading groups DO have the capacity to teach general academic vocabulary.

RTI for Secondary Schools: Reading Program 'Readiness Check':

Tier 2: Supplemental Group-Based Reading Instruction

10. The school reviews student progress in Tier 2/supplemental group instruction frequently to determine when enrolled students can exit and when new students can enter.

- ☐ Tier 2 groups review their caseloads less frequently than each marking period.
- ☐ Tier 2 groups review their caseloads at least every marking period
- ☐ Tier 2 groups review their caseloads more frequently than every marking period.

RTI for Secondary Schools: Reading Program 'Readiness Check':

RTI & Reading: Student Assessment

11. The school has general procedures in place to screen the entire student body to identify those students with significant reading delays who require Tier 2/supplemental reading instruction.

☐ YES ☐ PARTIALLY IMPLEMENTED ☐ NO.

RTI for Elementary Schools: Reading Program 'Readiness Check':

RTI & Reading: Student Assessment

12. The school has general procedures in place to screen the entire student body to identify those students who have deficient study and organizational skills that impact their comprehension of course content.

☐ YES ☐ PARTIALLY IMPLEMENTED ☐ NO.

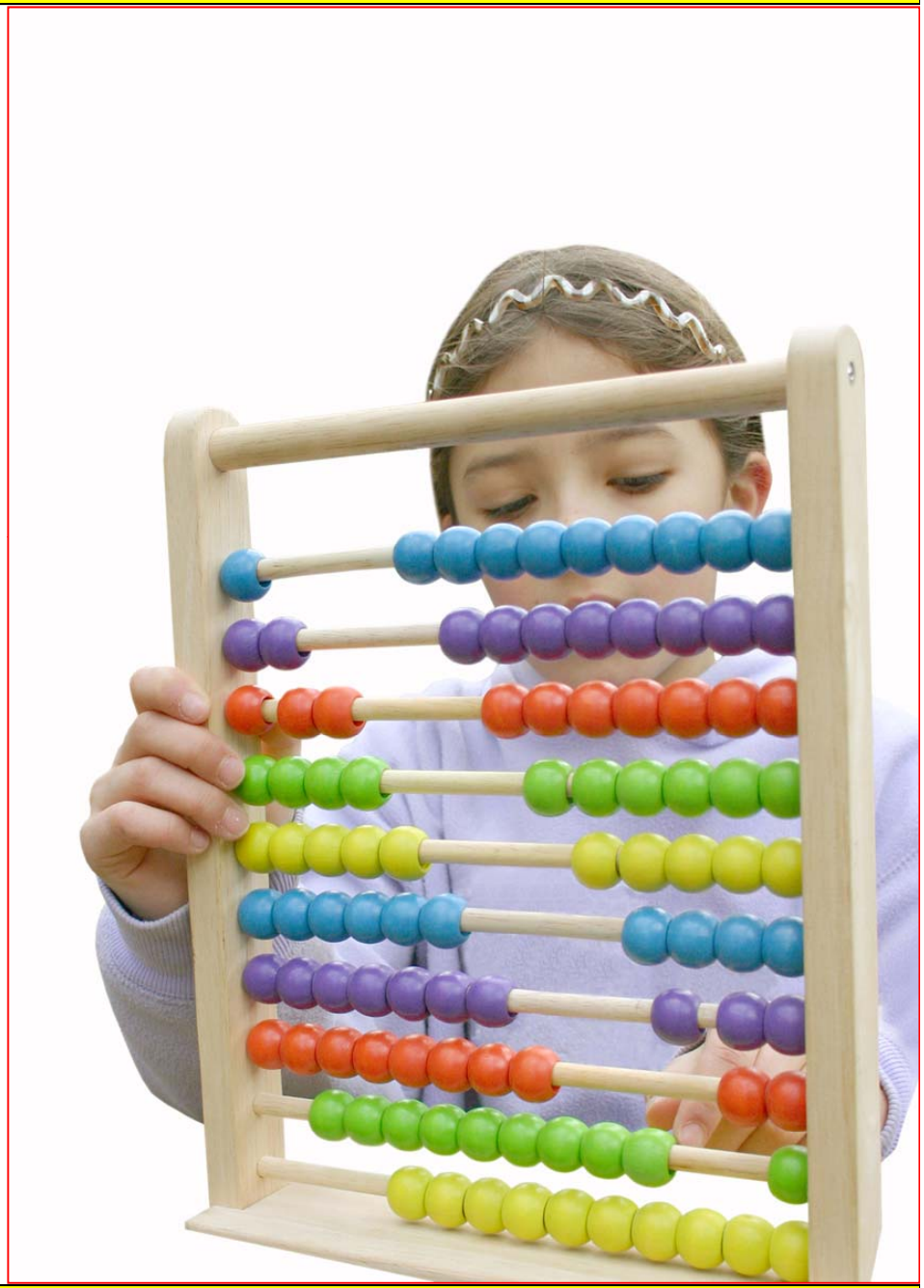
RTI for Secondary Schools: Reading Program 'Readiness Check':

RTI & Reading: Student Assessment

13. The school has the capacity to collect information using the following methods to map out students' specific reading skills and deficits:

Reading Assessment Method	***Reading Skills Assessed***	***Capacity in Your School?***
Existing Data and Teacher Feedback (e.g., grades, student work products, teacher feedback on student work performance on reading-related assignments).	• General reading skills • Application of reading skills in the classroom	☐ YES ☐ NO.
Oral Reading Fluency (Curriculum-Based Measurement)	Reading fluency	☐ YES ☐ NO.
Vocabulary Matching (Curriculum-Based Measurement)	Topic-Specific Vocabulary	☐ YES ☐ NO.
Oral Retell	Comprehension	☐ YES ☐ NO.
Student Think-Aloud on Reading-Related Assignments	Efficient and appropriate application of reading strategies	☐ YES ☐ NO.

3. Math Instruction & Interventions



Response to Intervention

ED.gov U. S. Department of Education
Promoting educational excellence for all Americans

Search ED.gov » GO
Advanced Search

Students | Parents | Teachers | Administrators

About ED

- Overview
- Contacts
- Offices
- **Boards & Commissions**
  - Boards & Commissions
- Initiatives
- Publications
- ED Performance & Accountability
- Jobs

- About ED
- Budget
- Press Room
- Publications
- Teaching Resources

- Answers
- Contact
- Help
- Online Services
- Recursos en español
- State Information
- Web Survey

BOARDS & COMMISSIONS

National Mathematics Advisory Panel

National Mathematics Advisory Panel Releases Final Report

On March 13, 2008, the National Mathematics Advisory Panel presented its Final Report to the President of the United States and the Secretary of Education. Copies of these ground-breaking reports, rich with information for parents, teachers, policy makers, the research community, and others, are provided below.

Foundations for Success: Report of the National Mathematics Advisory Panel

Final Report PDF (851 KB) | Word (1 MB)

Draft Task Group Reports

- Conceptual Knowledge and Skills Word (1.3 MB)
- Learning Processes Word (7.9 MB)
- Instructional Practices Word (2.9 MB)
- Teachers Word (1.2 MB)
- Assessment Word (876 KB)

Draft Subcommittee Reports

- Standards of Evidence PDF (68 KB) | Word (276 KB)
- Instructional Materials Word (958 KB)
- National Survey of Algebra Teachers for the National Math Panel PDF (4.1 MB) | Word (3.2 MB)

Fact Sheet

Paper copies of these reports may be ordered at EDPubs.ed.gov.

If you need any of these documents in an alternative format, please contact the National Math Panel at NationalMathPanel@ed.gov.

NoChild LeftBehind

Related Topics:

No Related Topics Found

National Mathematics Advisory Panel Report 13 March 2008

Math Advisory Panel Report at:

http://www.ed.gov/mathpanel

2008 National Math Advisory Panel Report: Recommendations

- "The areas to be studied in mathematics from pre-kindergarten through eighth grade should be streamlined and a well-defined set of the most important topics should be emphasized in the early grades. Any approach that revisits topics year after year without bringing them to closure should be avoided."
- "Proficiency with whole numbers, fractions, and certain aspects of geometry and measurement are the foundations for algebra. Of these, knowledge of fractions is the most important foundational skill not developed among American students."
- "Conceptual understanding, computational and procedural fluency, and problem solving skills are equally important and mutually reinforce each other. Debates regarding the relative importance of each of these components of mathematics are misguided."
- "Students should develop immediate recall of arithmetic facts to free the "working memory" for solving more complex problems."

Source: National Math Panel Fact Sheet. (March 2008). Retrieved on March 14, 2008, from http://www.ed.gov/about/bdscomm/list/mathpanel/report/final-factsheet.html

An RTI Challenge: Limited Research to Support Evidence-Based Math Interventions

"… in contrast to reading, core math programs that are supported by research, or that have been constructed according to clear research-based principles, are not easy to identify. Not only have exemplary core programs not been identified, but also there are no tools available that we know of that will help schools analyze core math programs to determine their alignment with clear research-based principles." p. 459

Source: Clarke, B., Baker, S., & Chard, D. (2008). Best practices in mathematics assessment and intervention with elementary students. In A. Thomas & J. Grimes (Eds.), Best practices in school psychology V (pp. 453-463).

Profile of Students With Significant Math Difficulties

1. **Spatial organization.** The student commits errors such as misaligning numbers in columns in a multiplication problem or confusing directionality in a subtraction problem (and subtracting the original number—minuend—from the figure to be subtracted (subtrahend).
2. **Visual detail.** The student misreads a mathematical sign or leaves out a decimal or dollar sign in the answer.
3. **Procedural errors.** The student skips or adds a step in a computation sequence. Or the student misapplies a learned rule from one arithmetic procedure when completing another, different arithmetic procedure.
4. **Inability to 'shift psychological set'.** The student does not shift from one operation type (e.g., addition) to another (e.g., multiplication) when warranted.
5. **Graphomotor.** The student's poor handwriting can cause him or her to misread handwritten numbers, leading to errors in computation.
6. **Memory.** The student fails to remember a specific math fact needed to solve a problem. (The student may KNOW the math fact but not be able to recall it at 'point of performance'.)
7. **Judgment and reasoning.** The student comes up with solutions to problems that are clearly unreasonable. However, the student is not able adequately to evaluate those responses to gauge whether they actually make sense in context.

Source: Rourke, B. P. (1993). Arithmetic disabilities, specific & otherwise: A neuropsychological perspective. *Journal of Learning Disabilities,* 26, 214-226.

Who is At Risk for Poor Math Performance?: A Proactive Stance

"…we use the term mathematics difficulties rather than mathematics disabilities. Children who exhibit mathematics difficulties include those performing in the low average range (e.g., at or below the 35th percentile) as well as those performing well below average…Using higher percentile cutoffs increases the likelihood that young children who go on to have serious math problems will be picked up in the screening." p. 295

Source: *Gersten, R., Jordan, N. C., & Flojo, J. R. (2005). Early identification and interventions for students with mathematics difficulties. Journal of Learning Disabilities, 38, 293-304.*

Profile of Students with Math Difficulties

(Kroesbergen & Van Luit, 2003)

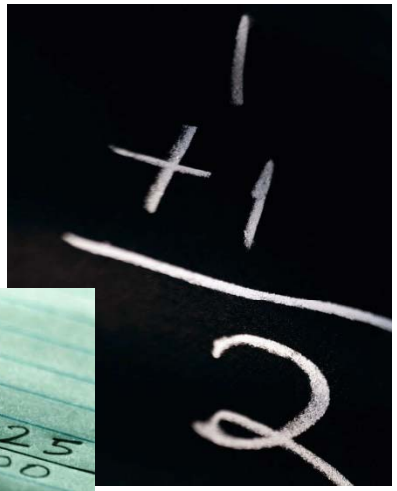
[Although the group of students with difficulties in learning math is very heterogeneous], in general, these students have memory deficits leading to difficulties in the acquisition and remembering of math knowledge.

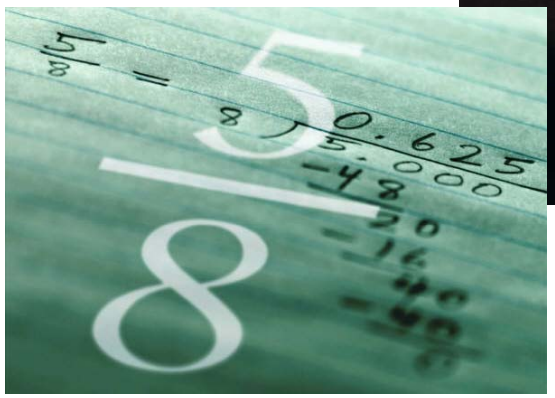
Moreover, they often show inadequate use of strategies for solving math tasks, caused by problems with the acquisition and the application of both cognitive and metacognitive strategies.

Because of these problems, they also show deficits in generalization and transfer of learned knowledge to new and unknown tasks.

Source: Kroesbergen, E., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special educational needs. Remedial and Special Education, 24, 97-114..

The Elements of Mathematical Proficiency: What the Experts Say…





5 Strands of Mathematical Proficiency

1. Understanding
2. Computing
3. Applying
4. Reasoning
5. Engagement

Source: *National Research Council. (2002). Helping children learn mathematics. Mathematics Learning Study Committee, J. Kilpatrick & J. Swafford, Editors, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.*

5 Big Ideas in Beginning Reading

1. Phonemic Awareness
2. Alphabetic Principle
3. Fluency with Text
4. Vocabulary
5. Comprehension

Source: Big ideas in beginning reading. University of Oregon. Retrieved September 23, 2007, from http://reading.uoregon.edu/index.php

Five Strands of Mathematical Proficiency

1. *Understanding: Comprehending mathematical concepts, operations, and relations--knowing what mathematical symbols, diagrams, and procedures mean.*

2. *Computing: Carrying out mathematical procedures, such as adding, subtracting, multiplying, and dividing numbers flexibly, accurately, efficiently, and appropriately.*

3. *Applying: Being able to formulate problems mathematically and to devise strategies for solving them using concepts and procedures appropriately.*

Source: *National Research Council. (2002). Helping children learn mathematics. Mathematics Learning Study Committee, J. Kilpatrick & J. Swafford, Editors, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.*

Five Strands of Mathematical Proficiency (Cont.)

4. ***Reasoning:*** *Using logic to explain and justify a solution to a problem or to extend from something known to something less known.*

5. ***Engaging:*** *Seeing mathematics as sensible, useful, and doable—if you work at it—and being willing to do the work.*

Source: *National Research Council. (2002). Helping children learn mathematics. Mathematics Learning Study Committee, J. Kilpatrick & J. Swafford, Editors, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.*

Table Activity: Evaluate Your School's Math Proficiency…

- *As a group, review the National Research Council 'Strands of Math Proficiency'.*
- *Which strand do you feel that your school / curriculum does the best job of helping students to attain proficiency?*
- *Which strand do you feel that your school / curriculum should put the greatest effort to figure out how to help students to attain proficiency?*
- *Be prepared to share your results.*

Five Strands of Mathematical Proficiency (NRC, 2002)

1. ***Understanding:*** *Comprehending mathematical concepts, operations, and relations--knowing what mathematical symbols, diagrams, and procedures mean.*
2. ***Computing:*** *Carrying out mathematical procedures, such as adding, subtracting, multiplying, and dividing numbers flexibly, accurately, efficiently, and appropriately.*
3. ***Applying:*** *Being able to formulate problems mathematically and to devise strategies for solving them using concepts and procedures appropriately.*
4. ***Reasoning:*** *Using logic to explain and justify a solution to a problem or to extend from something known to something less known.*
5. ***Engaging:*** *Seeing mathematics as sensible, useful, and doable—if you work at it—and being willing to do the work.*

Three General Levels of Math Skill Development

(Kroesbergen & Van Luit, 2003)

As students move from lower to higher grades, they move through levels of acquisition of math skills, to include:

- Number sense
- Basic math operations (i.e., addition, subtraction, multiplication, division)
- Problem-solving skills: “The solution of both verbal and nonverbal problems through the application of previously acquired information” (Kroesbergen & Van Luit, 2003, p. 98)

Source: Kroesbergen, E., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special educational needs. Remedial and Special Education, 24, 97-114..

Development of 'Number Sense'

What is 'Number Sense'?

(Clarke & Shinn, 2004)

"… the ability to understand the meaning of numbers and define different relationships among numbers.

Children with number sense can recognize the relative size of numbers, use referents for measuring objects and events, and think and work with numbers in a flexible manner that treats numbers as a sensible system." p. 236

Source: Clarke, B., & Shinn, M. (2004). A preliminary investigation into the identification and development of early mathematics curriculum-based measurement. School Psychology Review, 33, 234–248.

What Are Stages of 'Number Sense'?

(Berch, 2005, p. 336)

1. **Innate Number Sense.** Children appear to possess 'hard-wired' ability (neurological 'foundation structures') to acquire number sense. Children's innate capabilities appear also to include the ability to 'represent general amounts', not specific quantities. This innate number sense seems to be characterized by skills at estimation ('approximate numerical judgments') and a counting system that can be described loosely as '1, 2, 3, 4, … a lot'.
2. **Acquired Number Sense.** Young students learn through indirect and direct instruction to count specific objects beyond four and to internalize a number line as a mental representation of those precise number values.

Source: Berch, D. B. (2005). Making sense of number sense: Implications for children with mathematical disabilities. *Journal of Learning Disabilities, 38*, 333-339...

Task Analysis of Number Sense & Operations

(Methe & Riley-Tillman, 2008)

"Knowing the fundamental subject matter of early mathematics is critical, given the relatively young stage of its development and application…, as well as the large numbers of students at risk for failure in mathematics. Evidence from the Early Childhood Longitudinal Study confirms the Matthew effect phenomenon, where students with early skills continue to prosper over the course of their education while children who struggle at kindergarten entry tend to experience great degrees of problems in mathematics. Given that assessment is the core of effective problem solving in foundational subject matter, much less is known about the specific building blocks and pinpoint subskills that lead to a numeric literacy, early numeracy, or number sense…" p. 30

Source: *Methe, S. A., & Riley-Tillman, T. C. (2008). An informed approach to selecting and designing early mathematics interventions. School Psychology Forum: Research into Practice, 2, 29-41.*

Task Analysis of Number Sense & Operations

(Methe & Riley-Tillman, 2008)

1. Counting
2. **Comparing and Ordering**: Ability to compare relative amounts e.g., more or less than; ordinal numbers: e.g., first, second, third)
3. **Equal partitioning:** Dividing larger set of objects into 'equal parts'
4. **Composing and decomposing**: Able to create different subgroupings of larger sets (for example, stating that a group of 10 objects can be broken down into 6 objects and 4 objects or 3 objects and 7 objects)
5. **Grouping and place value:** "abstractly grouping objects into sets of 10" (p. 32) in base-10 counting system.
6. **Adding to/taking away**: Ability to add and subtract amounts from sets "by using accurate strategies that do not rely on laborious enumeration, counting, or equal partitioning." P. 32

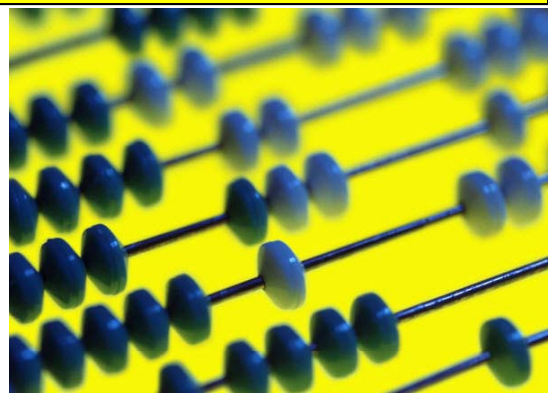
Source: *Methe, S. A., & Riley-Tillman, T. C. (2008). An informed approach to selecting and designing early mathematics interventions. School Psychology Forum: Research into Practice, 2, 29-41.*

Children's Understanding of Counting Rules

The development of children's counting ability depends upon the development of:

- **One-to-one correspondence:** "one and only one word tag, e.g., 'one,' 'two,' is assigned to each counted object".
- **Stable order:** "the order of the word tags must be invariant across counted sets".
- **Cardinality:** "the value of the final word tag represents the quantity of items in the counted set".
- **Abstraction:** "objects of any kind can be collected together and counted".
- **Order irrelevance:** "items within a given set can be tagged in any sequence".

Source: Geary, D. C. (2004). Mathematics and learning disabilities. *Journal of Learning Disabilities, 37*, 4-15.



Math Computation: Building Fluency

Jim Wright
www.interventioncentral.org

Benefits of Automaticity of 'Arithmetic Combinations'

(Gersten, Jordan, & Flojo, 2005)

- There is a strong correlation between poor retrieval of arithmetic combinations ('math facts') and global math delays
- Automatic recall of arithmetic combinations frees up student 'cognitive capacity' to allow for understanding of higher-level problem-solving
- By internalizing numbers as mental constructs, students can manipulate those numbers in their head, allowing for the intuitive understanding of arithmetic properties, such as *associative property* and *commutative property*

Source: *Gersten, R., Jordan, N. C., & Flojo, J. R. (2005). Early identification and interventions for students with mathematics difficulties. Journal of Learning Disabilities, 38, 293-304.*

Math Skills: Importance of Fluency in Basic Math Operations

"[A key step in math education is] to learn the four basic mathematical operations (i.e., addition, subtraction, multiplication, and division). Knowledge of these operations and a capacity to perform mental arithmetic play an important role in the development of children's later math skills. Most children with math learning difficulties are unable to master the four basic operations before leaving elementary school and, thus, need special attention to acquire the skills. A … category of interventions is therefore aimed at the acquisition and automatization of basic math skills."

Source: *Kroesbergen, E., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special educational needs. Remedial and Special Education, 24, 97-114.*

How Do We Reach Low-Performing Math Students?: Instructional Recommendations

Important elements of math instruction for low-performing students:

- "Providing teachers and students with data on student performance"
- "Using peers as tutors or instructional guides"
- "Providing clear, specific feedback to parents on their children's mathematics success"
- "Using principles of explicit instruction in teaching math concepts and procedures." p. 51

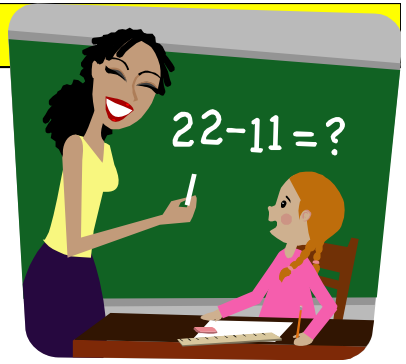
Source: Baker, S., Gersten, R., & Lee, D. (2002).A synthesis of empirical research on teaching mathematics to low-achieving students. *The Elementary School Journal, 103*(1), 51-73..

Team Activity: How Do Schools Implement Strategies to Reach Low-Performing Math Students?

At your table, review the instructional recommendations (Baker et al., 2002) for low-performing math students. How can your school promote implementation of these recommendations?

1. "Providing teachers and students with data on student performance"
2. "Using peers as tutors or instructional guides"
3. "Providing clear, specific feedback to parents on their children's mathematics success"
4. "Using principles of explicit instruction in teaching math concepts and procedures."

Big Ideas: Learn Unit p. 3 (Heward, 1996)



The three essential elements of effective student learning include:

1. Academic Opportunity to Respond. The student is presented with a meaningful opportunity to respond to an academic task. A question posed by the teacher, a math word problem, and a spelling item on an educational computer 'Word Gobbler' game could all be considered academic opportunities to respond.
2. Active Student Response. The student answers the item, solves the problem presented, or completes the academic task. Answering the teacher's question, computing the answer to a math word problem (and showing all work), and typing in the correct spelling of an item when playing an educational computer game are all examples of active student responding.
3. Performance Feedback. The student receives timely feedback about whether his or her response is correct—often with praise and encouragement. A teacher exclaiming 'Right! Good job!' when a student gives an response in class, a student using an answer key to check her answer to a math word problem, and a computer message that says 'Congratulations! You get 2 points for correctly spelling this word!" are all examples of performance feedback.

Source: Heward, W.L. (1996). Three low-tech strategies for increasing the frequency of active student response during group instruction. In R. Gardner, D. M.S ainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman,& T. A. Grossi (Eds.), Behavior analysis in education: Focus on measurably superior instruction (pp.283-320). Pacific Grove, CA:Brooks/Cole.

Math Intervention: Tier I or II: Elementary & Secondary: *Self-Administered Arithmetic Combination Drills With Performance Self-Monitoring & Incentives (p. 55)*

1. The student is given a math computation worksheet of a specific problem type, along with an answer key [Academic Opportunity to Respond].
2. The student consults his or her performance chart and notes previous performance. The student is encouraged to try to 'beat' his or her most recent score.
3. The student is given a pre-selected amount of time (e.g., 5 minutes) to complete as many problems as possible. The student sets a timer and works on the computation sheet until the timer rings. [Active Student Responding]
4. The student checks his or her work, giving credit for each ***correct digit*** (digit of correct value appearing in the correct place-position in the answer). [Performance Feedback]
5. The student records the day's score of TOTAL number of correct digits on his or her personal performance chart.
6. The student receives praise or a reward if he or she exceeds the most recently posted number of correct digits.

Application of 'Learn Unit' framework from : *Heward, W.L. (1996). Three low-tech strategies for increasing the frequency of active student response during group instruction. In R. Gardner, D. M.S ainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman,& T. A. Grossi (Eds.), Behavior analysis in education: Focus on measurably superior instruction (pp.283-320). Pacific Grove, CA:Brooks/Cole.*

Self-Administered Arithmetic Combination Drills: Examples of Student Worksheet and Answer Key

Curriculum-Based Assessment Mathematics
Single-Skill Computation Probe: Student Copy

Student: Date: _____

8 x6	3 x8	2 x3
9 x5	6 x5	1 x3
3 x8	3 x7	2 x4

www.interventioncentral.org

Curriculum-Based Assessment Mathematics
Single-Skill Computation Probe: Examiner Copy

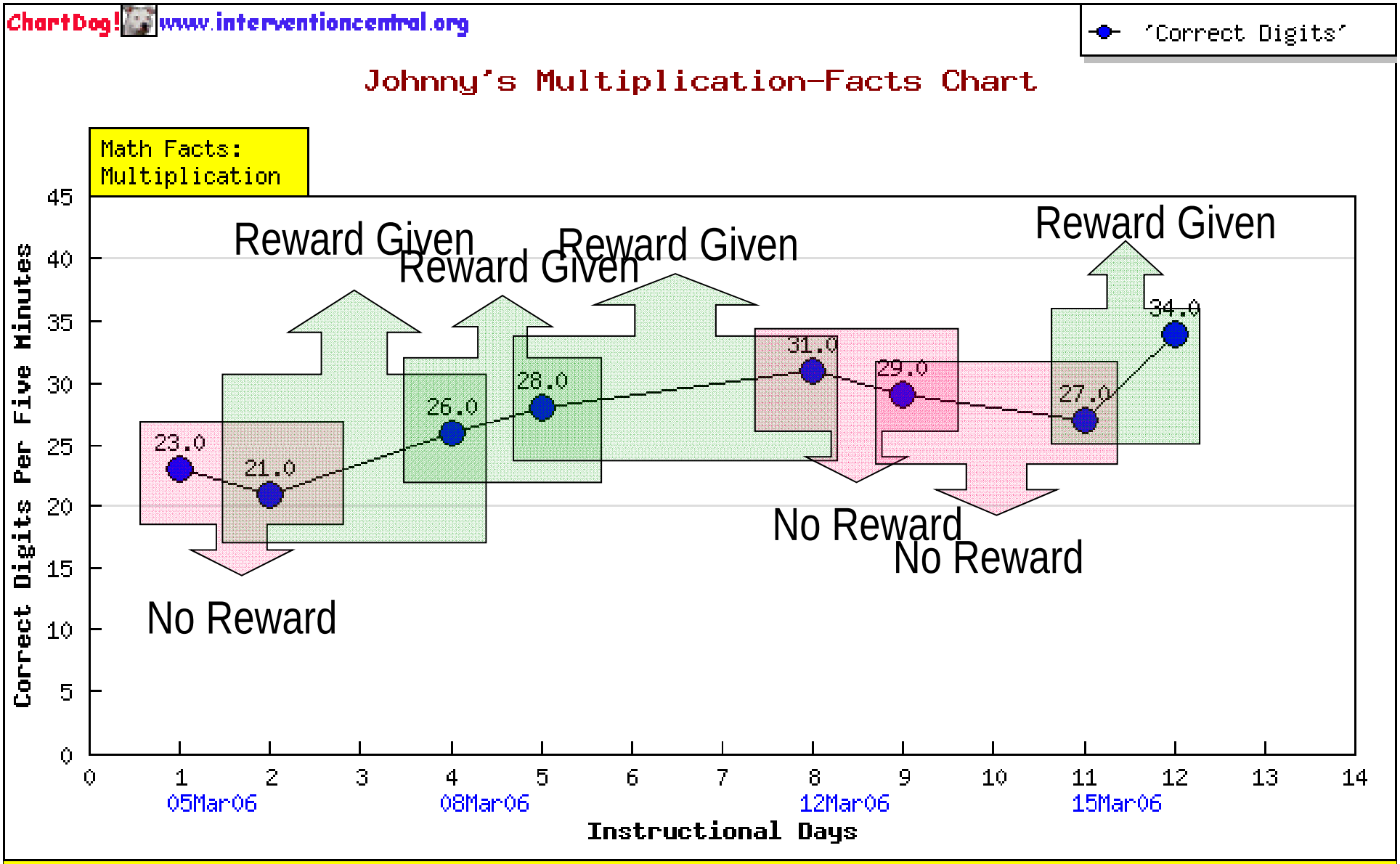
MULTIPLICATION: Multiplication facts: 0 to 9

item 1: 2 Cr/2 Co total 8 x 6 = 48	item 2: 2 Cr/4 Co total 3 x 8 = 24	item 3: 1 Cr/5 Co total 2 x 3 = 6
item 4: 2 Cr/7 Co total 9 x 5 = 45	item 5: 2 Cr/9 Co total 6 x 5 = 30	item 6: 1 Cr/10 Co total 1 x 3 = 3
item 7: 2 Cr/12 Co total 3 x 8 = 24	item 8: 2 Cr/14 Co total 3 x 7 = 21	item 9: 1 Cr/15 Co total 2 x 4 = 8

www.interventioncentral.org
Click for Student Worksheet

Worksheets created using Math Worksheet Generator. Available online at:
http://www.interventioncentral.org/htmdocs/tools/mathprobe/addsing.php

Self-Administered Arithmetic Combination Drills…



Cover-Copy-Compare:

Math Computational Fluency-Building Intervention

The student is given sheet with correctly completed math problems in left column and index card.

For each problem, the student:

- studies the model
- covers the model with index card
- copies the problem from memory
- solves the problem
- uncovers the correctly completed model to check answer

Source: *Skinner, C.H., Turco, T.L., Beatty, K.L., & Rasavage, C. (1989). Cover, copy, and compare: A method for increasing multiplication performance. School Psychology Review, 18, 412-420.*

Math Computation: Problem Interspersal Technique p. 50

- The teacher first identifies the range of 'challenging' problem-types (number problems appropriately matched to the student's current instructional level) that are to appear on the worksheet.
- Then the teacher creates a series of 'easy' problems that the students can complete very quickly (e.g., adding or subtracting two 1-digit numbers). The teacher next prepares a series of student math computation worksheets with 'easy' computation problems interspersed at a fixed rate among the 'challenging' problems.
- If the student is expected to complete the worksheet independently, 'challenging' and 'easy' problems should be interspersed at a 1:1 ratio (that is, every 'challenging' problem in the worksheet is preceded and/or followed by an 'easy' problem).
- If the student is to have the problems read aloud and then asked to solve the problems mentally and write down only the answer, the items should appear on the worksheet at a ratio of 3 'challenging' problems for every 'easy' one (that is, every 3 'challenging' problems are preceded and/or followed by an 'easy' one).

Source: *Hawkins, J., Skinner, C. H., & Oliver, R. (2005). The effects of task demands and additive interspersal ratios on fifth-grade students' mathematics accuracy. School Psychology Review, 34, 543-555..*

Peer Tutoring in Math Computation with Constant Time Delay

Peer Tutoring in Math Computation with Constant Time Delay

- DESCRIPTION: This intervention employs students as reciprocal peer tutors to target acquisition of basic math facts (math computation) using constant time delay (Menesses & Gresham, 2009; Telecsan, Slaton, & Stevens, 1999). Each tutoring 'session' is brief and includes its own progress-monitoring component--making this a convenient and time-efficient math intervention for busy classrooms.

Peer Tutoring in Math Computation with Constant Time Delay

MATERIALS:

Student Packet: A work folder is created for each tutor pair. The folder contains:

- ❑ 10 math fact cards with equations written on the front and correct answer appearing on the back. NOTE: The set of cards is replenished and updated regularly as tutoring pairs master their math facts.
- ❑ Progress-monitoring form for each student.
- ❑ Pencils.

Peer Tutoring in Math Computation with Constant Time Delay

PREPARATION: To prepare for the tutoring program, the teacher selects students to participate and trains them to serve as tutors.

Select Student Participants. Students being considered for the reciprocal peer tutor program should at minimum meet these criteria (Telecsan, Slaton, & Stevens, 1999, Menesses & Gresham, 2009):

- ❑ Is able and willing to follow directions;
- ❑ Shows generally appropriate classroom behavior;
- ❑ Can attend to a lesson or learning activity for at least 20 minutes.

Peer Tutoring in Math Computation with Constant Time Delay

Select Student Participants (Cont.). Students being considered for the reciprocal peer tutor program should at minimum meet these criteria (Telecsan, Slaton, & Stevens, 1999, Menesses & Gresham, 2009):

- Is able to name all numbers from 0 to 18 (if tutoring in addition or subtraction math facts) and name all numbers from 0 to 81 (if tutoring in multiplication or division math facts).
- Can correctly read aloud a sampling of 10 math-facts (equation plus answer) that will be used in the tutoring sessions. (NOTE: The student does not need to have memorized or otherwise mastered these math facts to participate—just be able to read them aloud from cards without errors).
- [To document a deficit in math computation] When given a two-minute math computation probe to complete independently, computes **fewer** than 20 correct digits (Grades 1-3) or **fewer** than 40 correct digits (Grades 4 and up) (Deno & Mirkin, 1977).

Peer Tutoring in Math Computation: Teacher Nomination Form

Reciprocal Peer Tutoring in Math Computation: Teacher Nomination Form

Teacher: _____ Classroom: _____ Date: _____

Directions: Select students in your class that you believe would benefit from participation in a peer tutoring program to boost math computation skills. Write the names of your student nominees in the space provided below. Remember, students who are considered for the peer tutoring program should—*at minimum*—meet these criteria:

- Show generally appropriate classroom behaviors and follow directions.
- Can pay attention to a lesson or learning activity for at least 20 minutes.
- Are able to wait appropriately to hear the correct answer from the tutor if the student does not know the answer.
- When given a two-minute math computation probe to complete independently, computes **fewer** than 20 correct digits (Grades 1-3) or **fewer** than 40 correct digits (Grades 4 and up) (Deno & Mirkin, 1977).
- Can name all numbers from 0 to 18 (if tutoring in addition or subtraction math facts) and name all numbers from 0 to 81 (if tutoring in multiplication or division math facts).
- Can correctly read aloud a sampling of 10 math-facts (equation plus answer) that will be used in the tutoring sessions. (NOTE: The student does not need to have memorized or otherwise mastered these math facts to participate—just be able to read them aloud from cards without errors).

Number	Student Name	NOTES
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Peer Tutoring in Math Computation with Constant Time Delay

Tutoring Activity. Each tutoring 'session' last for 3 minutes. The tutor:

- *Presents Cards*. The tutor presents each card to the tutee for 3 seconds.
- *Provides Tutor Feedback*. [When the tutee responds correctly] The tutor acknowledges the correct answer and presents the next card.

  [When the tutee does not respond within 3 seconds or responds incorrectly] The tutor states the correct answer and has the tutee repeat the correct answer. The tutor then presents the next card.
- *Provides Praise*. The tutor praises the tutee immediately following correct answers.
- *Shuffles Cards*. When the tutor and tutee have reviewed all of the math-fact carts, the tutor shuffles them before again presenting cards.

Peer Tutoring in Math Computation with Constant Time Delay

Progress-Monitoring Activity. The tutor concludes each 3-minute tutoring session by assessing the number of math facts mastered by the tutee. The tutor follows this sequence:

- *Presents Cards.* The tutor presents each card to the tutee for 3 seconds.
- *Remains Silent*. The tutor does not provide performance feedback or praise to the tutee, or otherwise talk during the assessment phase.
- *Sorts Cards*. Based on the tutee's responses, the tutor sorts the math-fact cards into 'correct' and 'incorrect' piles.
- *Counts Cards and Records Totals*. The tutor counts the number of cards in the 'correct' and 'incorrect' piles and records the totals on the tutee's progress-monitoring chart.

Peer Tutoring in Math Computation with Constant Time Delay

Tutoring Integrity Checks. As the student pairs complete the tutoring activities, the supervising adult monitors the integrity with which the intervention is carried out. At the conclusion of the tutoring session, the adult gives feedback to the student pairs, praising successful implementation and providing corrective feedback to students as needed. NOTE: Teachers can use the attached form *Peer Tutoring in Math Computation with Constant Time Delay: Integrity Checklist* to conduct integrity checks of the intervention and student progress-monitoring components of the math peer tutoring.

Peer Tutoring in Math Computation: Intervention Integrity Sheet: (Part 1: Tutoring Activity)

Peer Tutoring in Math Computation with Constant Time Delay: Integrity Checklist			
Tutoring Session: Intervention Phase			
Directions: Observe the tutor and tutee for a full intervention session. Use this checklist to record whether each of the key steps of the intervention were correctly followed.			
Correctly Carried Out?	Step	Tutor Action	NOTES
__Y__N	1.	**Promptly Initiates Session.** At the start of the timer, the tutor immediately presents the first math-fact card.	
__Y__N	2.	**Presents Cards.** The tutor presents each card to the tutee for 3 seconds.	
__Y__N	3.	**Provides Tutor Feedback.** [When the tutee responds correctly] The tutor acknowledges the correct answer and presents the next card. [When the tutee does not respond within 3 seconds or responds incorrectly] The tutor states the correct answer and has the tutee repeat the correct answer. The tutor then presents the next card.	
__Y__N	4.	**Provides Praise.** The tutor praises the tutee immediately following correct answers.	
__Y__N	5.	**Shuffles Cards.** When the tutor and tutee have reviewed all of the math-fact cards, the tutor shuffles them before again presenting cards.	
__Y__N	6.	**Continues to the Timer.** The tutor continues to presents math-fact cards for tutee response until the timer rings.	

Peer Tutoring in Math Computation: Intervention Integrity Sheet (Part 2: Progress-Monitoring)

Tutoring Session: Assessment Phase			
Directions: Observe the tutor and tutee during the progress-monitoring phase of the session. Use this checklist to record whether each of the key steps of the assessment were correctly followed.			
Correctly Carried Out?	Step	Tutor Action	NOTES
__Y__N	1.	**Presents Cards.** The tutor presents each card to the tutee for 3 seconds.	
__Y__N	2.	**Remains Silent.** The tutor does not provide performance feedback or praise to the tutee, or otherwise talk during the assessment phase.	
__Y__N	3.	**Sorts Cards.** The tutor sorts cards into 'correct' and 'incorrect' piles based on the tutee's responses.	
__Y__N	4.	**Counts Cards and Records Totals.** The tutor counts the number of cards in the 'correct' and 'incorrect' piles and records the totals on the tutee's progress-monitoring chart.	

Peer Tutoring in Math Computation: Score Sheet

Math Tutoring: Score Sheet

Tutor 'Coach': _____ Tutee 'Player': _____

Directions to the Tutor: Write down the number of math-fact cards that your partner answered *correctly* and the number answered *incorrectly*.		
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:
Date:	Cards Correct:	Cards Incorrect:

Team Activity: Peer Tutoring in Math Computation with Constant Time Delay

Elementary Groups: At your table:

- Discuss how you might use or adapt this math computation tutoring intervention in your school.

Secondary Groups: At your table:

- Discuss the concept of 'math computation fluency'. How important is it to provide students in interventions in this skill? How might your school deliver math computation interventions?

Additional Math Interventions

Jim Wright
www.interventioncentral.org

Math Review: Incremental Rehearsal of 'Math Facts' p. 48

Step 1: The tutor writes down on a series of index cards the math facts that the student needs to learn. The problems are written without the answers.

4 x 5 =__	2 x 6 =__	5 x 5 =__
3 x 2 =__	3 x 8 =__	5 x 3 =__
6 x 5 =__	9 x 2 =__	3 x 6 =__
8 x 2 =__	4 x 7 =__	8 x 4 =__
9 x 7 =__	7 x 6 =__	3 x 5 =__

Math Review: Incremental Rehearsal of 'Math Facts'

Step 2: The tutor reviews the 'math fact' cards with the student. Any card that the student can answer within 2 seconds is sorted into the 'KNOWN' pile. Any card that the student cannot answer within two seconds—or answers incorrectly—is sorted into the 'UNKNOWN' pile.

'KNOWN' Facts		'UNKNOWN' Facts
4 x 5 =__	2 x 6 =__	3 x 8 =__
3 x 2 =__	5 x 3 =__	9 x 2 =__
3 x 6 =__	8 x 4 =__	5 x 5 =__
6 x 5 =__	4 x 7 =__	8 x 2 =__
9 x 7 =__	7 x 6 =__	3 x 5 =__

Math Review: Incremental Rehearsal of ‘Math Facts’

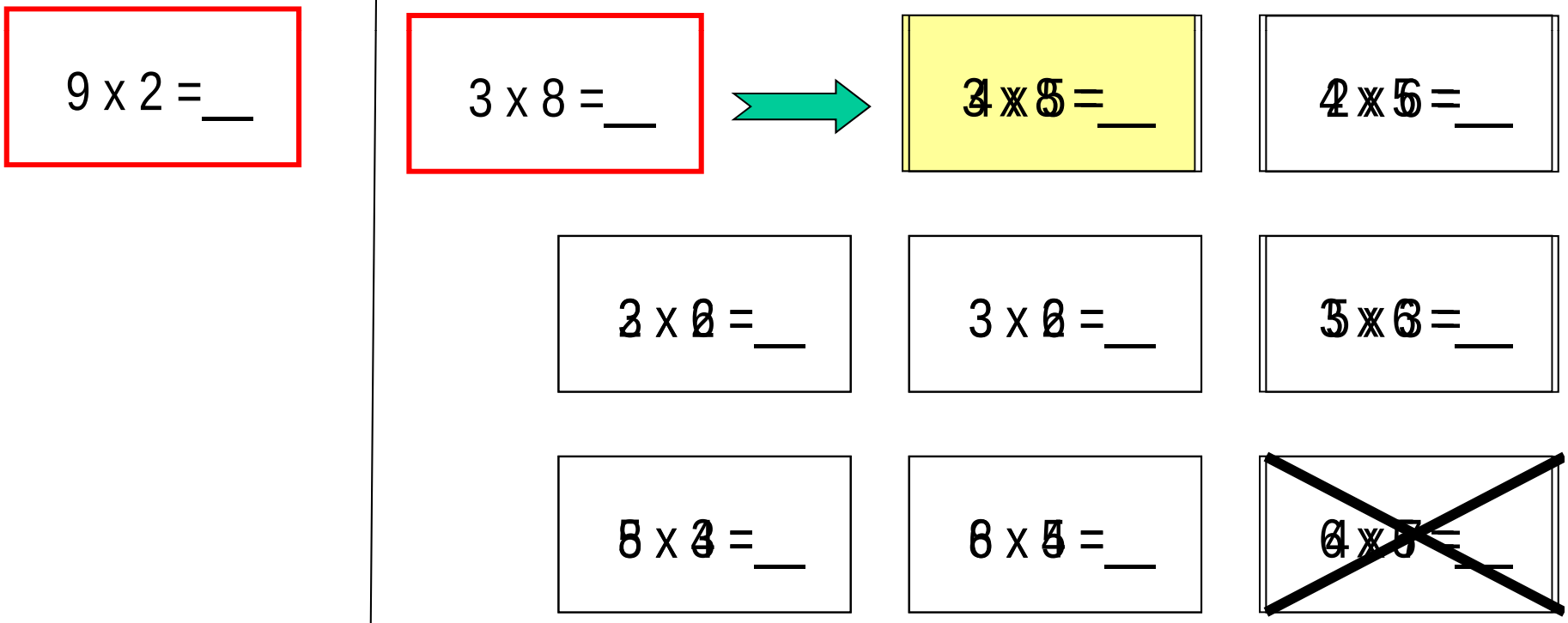
Step 3: [illegible] review deck contains a total of one ‘unknown’ and nine ‘known’ math facts (a ratio of 90 percent ‘known’ to 10 percent ‘unknown’ material)

[illegible] the answer, then prompts the student to read off the same unknown problem and provide the correct answer.

3 x 8 =__	4 x 5 =__	2 x 6 =__
3 x 2 =__	3 x 6 =__	5 x 3 =__
8 x 4 =__	6 x 5 =__	4 x 7 =__

Math Review: Incremental Rehearsal of 'Math Facts'

Step 4: At this point, the last 'learned' math fact (the 'known' math fact) is added to the student's review deck (placed back into the original pile of 'unknown' problems) and the previously 'unknown' math fact is treated as the first. Daily review sessions are discontinued when the student answers all 'unknown' math facts correctly three times.



Interpreting Math Graphics: A Reading Comprehension Intervention p. 52

Housing Bubble Graphic: New York Times

23 September 2007

Housing Price Index = 171 in 2005

Housing Price Index = 100 in 1987

Classroom Challenges in Interpreting Math Graphics

When encountering math graphics, students may :

- expect the answer to be easily accessible when in fact the graphic may expect the reader to interpret and draw conclusions
- be inattentive to details of the graphic
- treat irrelevant data as 'relevant'
- not pay close attention to questions before turning to graphics to find the answer
- fail to use their prior knowledge both to extend the information on the graphic and to act as a possible 'check' on the information that it presents.

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Using Question-Answer Relationships (QARs) to Interpret Information from Math Graphics

Students can be more savvy interpreters of graphics in applied math problems by applying the Question-Answer Relationship (QAR) strategy. Four Kinds of QAR Questions:

- RIGHT THERE questions are fact-based and can be found in a single sentence, often accompanied by 'clue' words that also appear in the question.
- THINK AND SEARCH questions can be answered by information in the text but require the scanning of text and making connections between different pieces of factual information.
- AUTHOR AND YOU questions require that students take information or opinions that appear in the text and combine them with the reader's own experiences or opinions to formulate an answer.
- ON MY OWN questions are based on the students' own experiences and do not require knowledge of the text to answer.

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Using Question-Answer Relationships (QARs) to Interpret Information from Math Graphics: 4-Step Teaching Sequence

1. DISTINGUISHING DIFFERENT KINDS OF GRAPHICS. Students are taught to differentiate between common types of graphics: e.g., table (grid with information contained in cells), chart (boxes with possible connecting lines or arrows), picture (figure with labels), line graph, bar graph.

   Students note significant differences between the various graphics, while the teacher records those observations on a wall chart. Next students are given examples of graphics and asked to identify which general kind of graphic each is.

   Finally, students are assigned to go on a 'graphics hunt', locating graphics in magazines and newspapers, labeling them, and bringing to class to review.

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Using Question-Answer Relationships (QARs) to Interpret Information from Math Graphics: 4-Step Teaching Sequence

2. INTERPRETING INFORMATION IN GRAPHICS. Students are paired off, with stronger students matched with less strong ones. The teacher spends at least one session presenting students with examples from each of the graphics categories.

   The presentation sequence is ordered so that students begin with examples of the most concrete graphics and move toward the more abstract: Pictures > tables > bar graphs > charts > line graphs.

   At each session, student pairs examine graphics and discuss questions such as: “What information does this graphic present? What are strengths of this graphic for presenting data? What are possible weaknesses?”

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Using Question-Answer Relationships (QARs) to Interpret Information from Math Graphics: 4-Step Teaching Sequence

3. LINKING THE USE OF QARS TO GRAPHICS. Students are given a series of data questions and correct answers, with each question accompanied by a graphic that contains information needed to formulate the answer.

   Students are also each given index cards with titles and descriptions of each of the 4 QAR questions: RIGHT THERE, THINK AND SEARCH, AUTHOR AND YOU, ON MY OWN.

   Working in small groups and then individually, students read the questions, study the matching graphics, and 'verify' the answers as correct. They then identify the type question being asked using their QAR index cards.

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Using Question-Answer Relationships (QARs) to Interpret Information from Math Graphics: 4-Step Teaching Sequence

4. USING QARS WITH GRAPHICS INDEPENDENTLY. When students are ready to use the QAR strategy independently to read graphics, they are given a laminated card as a reference with 6 steps to follow:

   A. Read the question,

   B. Review the graphic,

   C. Reread the question,

   D. Choose a QAR,

   E. Answer the question, and

   F. Locate the answer derived from the graphic in the answer choices offered.

   Students are strongly encouraged NOT to read the answer choices offered until they have first derived their own answer, so that those choices don't short-circuit their inquiry.

Source: *Mesmer, H.A.E., & Hutchins, E.J. (2002). Using QARs with charts and graphs. The Reading Teacher, 56, 21–27.*

Developing Student Metacognitive Abilities

Importance of Metacognitive Strategy Use…

"Metacognitive processes focus on self-awareness of cognitive knowledge that is presumed to be necessary for effective problem solving, and they direct and regulate cognitive processes and strategies during problem solving…That is, successful problem solvers, consciously or unconsciously (depending on task demands), use self-instruction, self-questioning, and self-monitoring to gain access to strategic knowledge, guide execution of strategies, and regulate use of strategies and problem-solving performance." p. 231

Source: *Montague, M. (1992). The effects of cognitive and metacognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities.* Journal of Learning Disabilities, 25*, 230-248.*

Elements of Metacognitive Processes

"**Self-instruction** helps students to identify and direct the problem-solving strategies prior to execution. **Self-questioning** promotes internal dialogue for systematically analyzing problem information and regulating execution of cognitive strategies. **Self-monitoring** promotes appropriate use of specific strategies and encourages students to monitor general performance. [Emphasis added]." p. 231

Source: *Montague, M. (1992). The effects of cognitive and metacognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities.* Journal of Learning Disabilities, 25, *230-248.*

Combining Cognitive & Metacognitive Strategies to Assist Students With Mathematical Problem Solving p. 57

Solving an advanced math problem independently requires the coordination of a number of complex skills. The following strategies combine both cognitive and metacognitive elements (Montague, 1992; Montague & Dietz, 2009). First, the student is taught a 7-step process for attacking a math word problem (cognitive strategy). Second, the instructor trains the student to use a three-part self-coaching routine for each of the seven problem-solving steps (metacognitive strategy).

Cognitive Portion of Combined Problem Solving Approach

In the cognitive part of this multi-strategy intervention, the student learns an explicit series of steps to analyze and solve a math problem. Those steps include:

1. Reading the problem. The student reads the problem carefully, noting and attempting to clear up any areas of uncertainly or confusion (e.g., unknown vocabulary terms).
2. Paraphrasing the problem. The student restates the problem in his or her own words.
3. 'Drawing' the problem. The student creates a drawing of the problem, creating a visual representation of the word problem.
4. Creating a plan to solve the problem. The student decides on the best way to solve the problem and develops a plan to do so.
5. Predicting/Estimating the answer. The student estimates or predicts what the answer to the problem will be. The student may compute a quick approximation of the answer, using rounding or other shortcuts.
6. Computing the answer. The student follows the plan developed earlier to compute the answer to the problem.
7. Checking the answer. The student methodically checks the calculations for each step of the problem. The student also compares the actual answer to the estimated answer calculated in a previous step to ensure that there is general agreement between the two values.

Metacognitive Portion of Combined Problem Solving Approach

The metacognitive component of the intervention is a three-part routine that follows a sequence of 'Say', 'Ask, 'Check'. For each of the 7 problem-solving steps reviewed above:

- The student first self-instructs by stating, or 'saying', the purpose of the step ('Say').
- The student next self-questions by 'asking' what he or she intends to do to complete the step ('Ask').
- The student concludes the step by self-monitoring, or 'checking', the successful completion of the step ('Check').

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
1. **Read the problem.**	**'Say' (Self-Instruction) Target:** *The student reads and studies the problem carefully before proceeding.* ***'Ask' (Self-Question) Target:*** *Does the student fully understand the problem?* ***'Check' (Self-Monitor) Target:*** *Proceed only if the problem is understood.*	**Say:** "I will read the problem. I will reread the problem if I don't understand it." **Ask:** "Now that I have read the problem, do I fully understand it?" **Check:** "I understand the problem and will move forward."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
2. **Paraphrase the problem.**	**'Say' (Self-Instruction) Target:** *The student restates the problem in order to demonstrate understanding.* ***'Ask' (Self-Question) Target:*** *Is the student able to paraphrase the problem?* ***'Check' (Self-Monitor) Target:*** *Ensure that any highlighted key words are relevant to the question.*	**Say:** "I will highlight key words and phrases that relate to the problem question." "I will restate the problem in my own words." **Ask:** "Did I highlight the most important words or phrases in the problem?" **Check:** "I found the key words or phrases that will help to solve the problem."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
3. **'Draw' the problem.**	**'Say' (Self-Instruction) Target:** *The student creates a drawing of the problem to consolidate understanding.* ***'Ask' (Self-Question) Target:*** *Is there a match between the drawing and the problem?* ***'Check' (Self-Monitor) Target:*** *The drawing includes in visual form the key elements of the math problem.*	**Say:** "I will draw a diagram of the problem." **Ask:** "Does my drawing represent the problem?" **Check:** "The drawing contains the essential parts of the problem."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
4. **Create a plan to solve the problem.**	**'Say' (Self-Instruction) Target:** *The student generates a plan to solve the problem.* ***'Ask' (Self-Question) Target:*** *What plan will help the student to solve this problem?* ***'Check' (Self-Monitor) Target:*** *The plan is appropriate to solve the problem.*	**Say:** "I will make a plan to solve the problem." **Ask:** "What is the first step of this plan? What is the next step of the plan?" **Check:** "My plan has the right steps to solve the problem."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
5. **Predict/ estimate the Answer.**	**'Say' (Self-Instruction) Target:** *The student uses estimation or other strategies to predict or estimate the answer.* ***'Ask' (Self-Question) Target:*** *What estimating technique will the student use to predict the answer?* ***'Check' (Self-Monitor) Target:*** *The predicted/estimated answer used all of the essential problem information.*	**Say:** "I will estimate what the answer will be." **Ask:** "What numbers in the problem should be used in my estimation?" **Check:** "I did not skip any important information in my estimation."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
6. **Compute the answer.**	**'Say' (Self-Instruction) Target:** *The student follows the plan to compute the solution to the problem.* ***'Ask' (Self-Question) Target:*** *Does the answer agree with the estimate?* ***'Check' (Self-Monitor) Target:*** *The steps in the plan were followed and the operations completed in the correct order.*	**Say:** "I will compute the answer to the problem." **Ask:** "Does my answer sound right?" "Is my answer close to my estimate?" **Check:** "I carried out all of the operations in the correct order to solve this problem."

Combined Cognitive & Metacognitive Elements of Strategy

Table 1: 'Say-Ask-Check' Metacognitive Prompts Tied to a Word-Problem Cognitive Strategy (Montague, 1992)		
Cognitive Strategy Step	Metacognitive 'Say-Ask-Check' Prompt Targets	Sample Metacognitive 'Say-Ask-Check' Prompts
7. **Check the answer.**	**'Say' (Self-Instruction) Target:** *The student reviews the computation steps to verify the answer.* ***'Ask' (Self-Question) Target:*** *Did the student check all the steps in solving the problem and are all computations correct?* ***'Check' (Self-Monitor) Target:*** *The problem solution appears to have been done correctly.*	**Say:** "I will check the steps of my answer." **Ask:** "Did I go through each step in my answer and check my work?" **Check:** ""

Applied Problems: Pop Quiz

7-Step Problem-Solving:Process

1. Reading the problem.
2. Paraphrasing the problem.
3. 'Drawing' the problem.
4. Creating a plan to solve the problem.
5. Predicting/Estimating the answer.
6. Computing the answer.
7. Checking the answer.

Q: "To move their armies, the Romans built over 50,000 miles of roads. Imagine driving all those miles! Now imagine driving those miles in the first gasoline-driven car that has only three wheels and could reach a top speed of about 10 miles per hour.

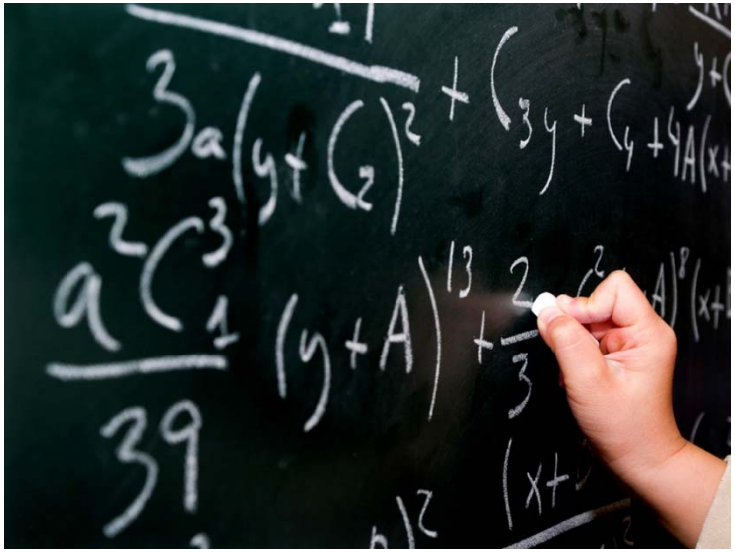
For safety's sake, let's bring along a spare tire. As you drive the 50,000 miles, you rotate the spare with the other tires so that all four tires wear the same amount of wear. Can you figure out how many miles of wear each tire accumulates?"

Directions: As a team, read the following problem. At your tables, apply the 7-step problem-solving (cognitive) strategy to complete the problem. As you complete each step of the problem, apply the 'Say-Ask-Check' metacognitive sequence. Try to complete the entire 7 steps within the time allocated for this exercise.

A: "Since the four wheels of the three-wheeled car share the journey equally, simply take three-fourths of the total distance (50,000 miles) and you'll get 37,500 miles for each tire."

Source: The Math Forum @ Drexel: Critical Thinking Puzzles/Spare My Brain. Retrieved from http://mathforum.org/k12/k12puzzles/critical.thinking/puzz2.html

Defining Goals & Challenges in Applied Math



Potential 'Blockers' of Higher-Level Math Problem-Solving: A Sampler

- Limited reading skills
- Failure to master--or develop automaticity in– basic math operations
- Lack of knowledge of specialized math vocabulary (e.g., 'quotient')
- Lack of familiarity with the specialized use of known words (e.g., 'product')
- Inability to interpret specialized math symbols (e.g., '4 < 2')
- Difficulty 'extracting' underlying math operations from word/story problems
- Difficulty identifying and ignoring extraneous information included in word/story problems

Math Intervention Ideas for Higher-Level Math Problems

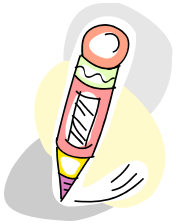
Jim Wright
www.interventioncentral.org

Applied Problems

Applied Math Problems: Rationale

- Applied math problems (also known as 'story' or 'word' problems) are traditional tools for having students apply math concepts and operations to 'real-world' settings.

Applied Problems: Encourage Students to 'Draw' the Problem



Making a drawing of an applied, or 'word', problem is one easy heuristic tool that students can use to help them to find the solution and clarify misunderstandings.

- The teacher hands out a worksheet containing at least six word problems. The teacher explains to students that making a picture of a word problem sometimes makes that problem clearer and easier to solve.
- The teacher and students then independently create drawings of each of the problems on the worksheet. Next, the students show their drawings for each problem, explaining each drawing and how it relates to the word problem. The teacher also participates, explaining his or her drawings to the class or group.
- Then students are directed independently to make drawings as an intermediate problem-solving step when they are faced with challenging word problems. NOTE: This strategy appears to be more effective when used in later, rather than earlier, elementary grades.

Source: *Hawkins, J., Skinner, C. H., & Oliver, R. (2005). The effects of task demands and additive interspersal ratios on fifth-grade students' mathematics accuracy. School Psychology Review, 34, 543-555..*

Applied Problems: Individualized Self-Correction Checklists

Students can improve their accuracy on particular types of word and number problems by using an 'individualized self-instruction checklist' that reminds them to pay attention to their own specific error patterns.

- The teacher meets with the student. Together they analyze common error patterns that the student tends to commit on a particular problem type (e.g., 'On addition problems that require carrying, I don't always remember to carry the number from the previously added column.').
- For each type of error identified, the student and teacher together describe the appropriate step to take to prevent the error from occurring (e.g., 'When adding each column, make sure to carry numbers when needed.').
- These self-check items are compiled into a single checklist. Students are then encouraged to use their individualized self-instruction checklist whenever they work independently on their number or word problems.

Source: *Pólya, G. (1945). How to solve it. Princeton University Press: Princeton, N.J.*

Secondary Group-Based Math Intervention Example

'Standard Protocol' Group-Based Treatments: Strengths & Limits in Secondary Settings

- Research indicates that students do well in targeted small-group interventions (4-6 students) when the intervention 'treatment' is closely matched to those students' academic needs (Burns & Gibbons, 2008).
- However, in secondary schools:
  1. students are sometimes grouped for remediation by convenience rather than by presenting need. Teachers instruct across a broad range of student skills, diluting the positive impact of the intervention.
  2. students often present with a unique profile of concerns that does not lend itself to placement in a group intervention.

Source: Burns, M. K., & Gibbons, K. A. (2008). Implementing response-to-intervention in elementary and secondary schools: Procedures to assure scientific-based practices. New York: Routledge.

Caution About Secondary Standard-Protocol ('Group-Based') Interventions: Avoid the 'Homework Help' Trap

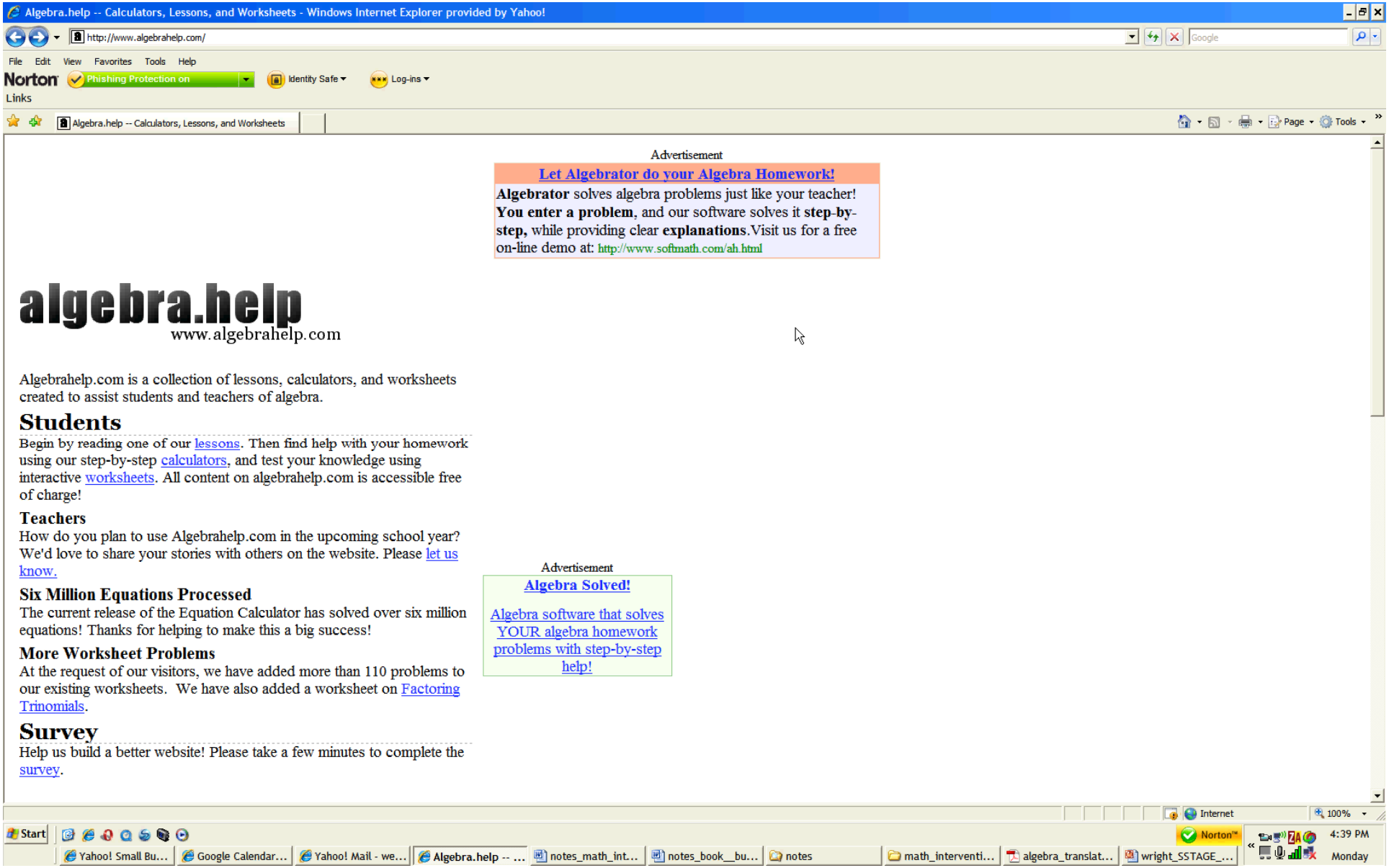
- Group-based or standard-protocol interventions are an efficient method for certified teachers to deliver targeted academic support to students (Burns & Gibbons, 2008).
- However, students should be matched to specific research-based interventions that address their specific needs.
- RTI intervention support in secondary schools should not take the form of unfocused 'homework help'.

Math Mentors: Training Students to Independently Use On-Line Math-Help Resources

1. Math mentors are recruited (school personnel, adult volunteers, student teachers, peer tutors) who have a good working knowledge of algebra.
2. The school meets with each math mentor to verify mentor's algebra knowledge.
3. The school trains math mentors in 30-minute tutoring protocol, to include:
   A. Requiring that students keep a math journal detailing questions from notes and homework.
   B. Holding the student accountable to bring journal, questions to tutoring session.
   C. Ensuring that a minimum of 25 minutes of 30 minute session are spent on tutoring.
4. Mentors are introduced to online algebra resources (e.g., www.algebrahelp.com, www.math.com) and encouraged to browse them and become familiar with the site content and navigation.

Math Mentors: Training Students to Independently Use On-Line Math-Help Resources

5. Mentors are trained during 'math mentor' sessions to:
   A. Examine student math journal
   B. Answer student algebra questions
   C. Direct the student to go online to algebra tutorial websites while mentor supervises. Student is to find the section(s) of the websites that answer their questions.
6. As the student shows increased confidence with algebra and with navigation of the math-help websites, the mentor directs the student to:
   A. Note math homework questions in the math journal
   B. Attempt to find answers independently on math-help websites
   C. Note in the journal any successful or unsuccessful attempts to independently get answers online
   D. Bring journal and remaining questions to next mentoring meeting.


Algebra.help -- Calculators, Lessons, and Worksheets - Windows Internet Explorer provided by Yahoo!
http://www.algebrahelp.com/
File Edit View Favorites Tools Help
Norton Phishing Protection on
Identity Safe
Log-ins
Links
Algebra.help -- Calculators, Lessons, and Worksheets
Page
Tools
Advertisement
Let Algebrator do your Algebra Homework!
Algebrator solves algebra problems just like your teacher! You enter a problem, and our software solves it step-by-step, while providing clear explanations.Visit us for a free on-line demo at: http://www.softmath.com/ah.html
algebra.help
www.algebrahelp.com
Algebrahelp.com is a collection of lessons, calculators, and worksheets created to assist students and teachers of algebra.
Students
Begin by reading one of our lessons. Then find help with your homework using our step-by-step calculators, and test your knowledge using interactive worksheets. All content on algebrahelp.com is accessible free of charge!
Teachers
How do you plan to use Algebrahelp.com in the upcoming school year? We'd love to share your stories with others on the website. Please let us know.
Six Million Equations Processed
The current release of the Equation Calculator has solved over six million equations! Thanks for helping to make this a big success!
More Worksheet Problems
At the request of our visitors, we have added more than 110 problems to our existing worksheets. We have also added a worksheet on Factoring Trinomials.
Survey
Help us build a better website! Please take a few minutes to complete the survey.
Advertisement
Algebra Solved!
Algebra software that solves YOUR algebra homework problems with step-by-step help!
Internet
100%
Start
Yahoo! Small Bu...
Google Calendar...
Yahoo! Mail - we...
Algebra.help -- ...
notes_math_int...
notes_book__bu...
notes
math_interventi...
algebra_translat...
wright_SSTAGE_...
Norton
4:39 PM
Monday

Group Activity: *RTI: Reading & Math: Next Steps*

At your tables:

- Review the content discussed today in the workshop.
- What are the key 2-3 next steps that you plan to take to make the best use of these ideas and resources in the coming school year?

Key Workshop Content

1. Big ideas in academic interventions
2. Reading fluency strategies
3. Reading comprehension strategies
4. Math computation fluency strategies
5. Math word problem strategies
6. Internet resources (e.g., HELPS program, Maze generator, math worksheet generator, FL Center for Reading Research, Free-Read.net)