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National Center on Accessing the General Curriculum

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Curriculum-Based Evaluations

Effective Classroom Practices Report

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Curriculum-Based Evaluations

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Introduction

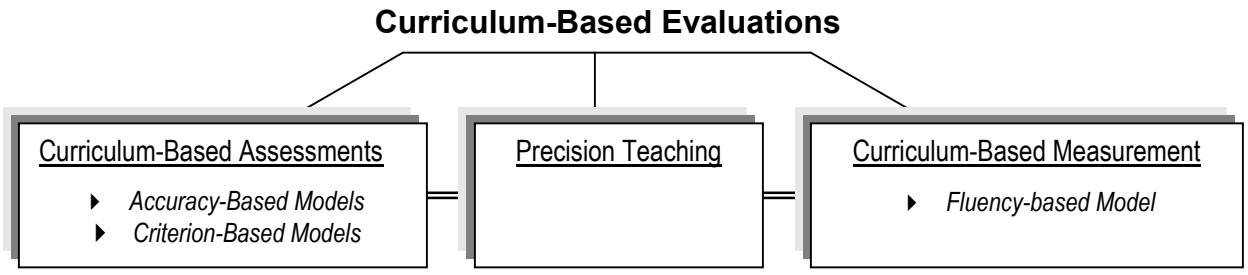
Academic assessment is a long-standing tradition in education. Assessment usually involves measurement of student progress for the purpose of informing. One level of informing is identification or eligibility decision-making, a second level is that of informing instruction. Traditional assessment instruments have limitations which restrict their application for instructional program planning. Alternative assessment procedures appearing in educational literature in the last 20 years are Curriculum-Based Evaluations (CBE). Whereas standardized commercial achievement tests measure broad curriculum areas and/or skills, CBE measures specific skills that are presently being taught in the classroom, usually in basic skills. Several approaches to CBE have been developed. Four common characteristics exist across these models:

1. The measurement procedures assess students directly using the materials in which they are being instructed. This involves sampling items from the curriculum.
2. Administration of each measure is generally brief in duration (typically 1-5 mins.)
3. The design is structured such that frequent and repeated measurement is possible and measures are sensitive to change.
4. Data are usually displayed graphically to allow monitoring of student performance.

Typically, CBE is used in the subject areas of math, reading and spelling, but has also been found effective in other areas. CBE can be used in general education as well as special education classroom settings. It became clear in the 1985 special issue publication of *Exceptional Children* journal that there are different approaches to assessing students using curriculum materials. The two most prominent features that differentiate the CBE models are (a) the purpose of the assessment, and (b) research support for testing procedures and decision-making.

Definition

Curriculum-Based Evaluations are best defined by Deno (1987) as "any set of measurement procedures that use direct observation and recording of a student's performance in a local curriculum as a basis for gathering information to make instructional decisions" (in Shinn, 1989; p. 62).



The Table below provides a brief description of types of Curriculum-Based Evaluations. The left hand column lists characteristics common to these measurement systems. Readers may use this table to make comparisons and contrast these evaluation tools.

Characteristics	Curriculum-Based Assessment (CBA)	Precision Teaching	Curriculum-Based Measurement (CBM)	DIBELS
Authors	Paolucchi-Whitcomb; Gickling; Blankenship; Idol-Maestas	Lindsley et al.	Deno et al.	
Sampling Plan	Items selected from the identified curriculum domain	Repeated measures based on fluency & accuracy	Items sampled from the identified curriculum domain & randomly selected for measure	Items are author selected and randomly sequenced for the 5 literacy subset measures
Application	Evaluation and instructional planning	Evaluation and instructional planning	Measures used to aid eligibility, placement and diagnosis. Provides *multi-referenced* data sources	Designed to identify literacy skills difficulties and provide teachers with information to reduce the risk of reading problems
Assessment Focus Areas	Basic skills: reading and math	Broad focus of measurement areas, basic skills, behavior, etc.	Basic skills: reading, spelling, math, written expression - Critical thinking skills	Assess early reading skills
Target grade level	Grades 1-6	Grades K-12	Grades K-8	Grades preschool, kindergarten, first, second and third grade
Development	Teacher made	Teacher made	Teacher made using guidelines	Sampling of items created by authors versus a curriculum of instruction
Scoring	Teacher scored	Teacher scored	Standardized administration & scoring. Some simultaneous administration and scoring	Standardized administration & scoring. Simultaneous administration and scoring. Fluency measures
Results/Display	Varies, teacher preference	Graphic display on semi-logarithmic charts	Uses *graphs* to display results. Guides *many* educational decisions	Graphically or numerically displayed to view individual, class or normative information
Response Mode	Students either answer out loud to teacher, write or select response	Production responses	Generates *production* responses	Production responses
Administration	Teacher administers test individually to each student	Teacher administers test individually to each student	Standardized administration and scoring procedures Produces *reliable* and *valid* data	Each measure from DIBELS is teacher administered for a 1 or 2 minute time period
Frequency	Multiple times to assess learning	Multiple measures	Is *repeated* over time. Long duration (weeks to a year)	Twice yearly (fall/winter, spring) to monitor literacy skills

Identifying Components/Features

Curriculum-Based Assessment

Accuracy-Based CBA

Gickling and several associates are noted to have pioneered the movement of tying assessment directly to the curriculum. The premise of this approach focuses on testing students on the relationship between what is known and what is unknown. The model is task analytic in nature, focusing on teacher analysis of the demands and linking back to instructional materials. The major focus of the assessment procedures is special education instructional planning. The developers' goal is to provide teachers with a level of specificity about student performance so as to pinpoint where to begin instructionally. Thus teachers are able to eliminate any instructional mismatch between learner skills and curriculum demands.

Criterion-Referenced Models

The work of Blankenship (1985) and Idol (1983) exemplifies this model of Curriculum-based assessment. Similar to Gickling's accuracy-based model, the primary purpose of these measures is to provide teachers with information for instructional considerations. As Blankenship (1985) stated "The essence of the approach is the linking of assessment to curriculum and instruction" (p. 234). The process for development and use of the measures begins by identifying/writing curriculum objectives. This is followed by selection of items from the curriculum to include in the measure. Then a performance level or criterion is established. Finally, students are tested for mastery of each objective. Measures have been researched and tested in the domains of math, reading, spelling, science, dictionary skills, direction following, and use of study skills. Specific measurement procedures and data collected vary depending on the academic area and objective evaluated. This model of CBA is primarily designed for continuous assessment of short-term objectives.

Precision Teaching

Ogden Lindsley developed Precision Teaching beginning in 1964. It is not typically referred to as CBA, but it has many of the same characteristics inherent to curriculum-based evaluations. Precision Teaching has its roots in free-operant conditioning laboratories. Free operant means that "students are free to respond at their own pace without having restraints placed on them by the limits of the materials or the instructional procedures of the teachers" (Lindsley, 1990b, p. 10). Precision teaching is best described as a tool for "basing educational decisions on changes in continuous self-monitored performance frequencies displayed on 'standard celeration charts'" (Lindsley, 1992a, p. 51). As such, it does not prescribe what should be taught or even how to teach it: Precision Teaching is not so much a method of instruction as it is a precise and systematic method of evaluating instructional tactics and curricula. Curriculum items are used for assessment in this approach also. There is a much broader focus on the subject areas tested using the Precision Teaching method. Areas such as independent living skills as well as social and academic behavior can be assessed. The guiding principles of Precision Teaching include, (a) the focus on directly observable behavior, (b) frequency as a measure of performance, (c) the standard celeration chart, and (d) the learner knows best.

Curriculum-Based Measurement

Deno, Mirkn, and colleagues at the University of Minnesota, Institute for research on Learning Disabilities (IRLD), studied potential measurement procedures of curricular measures beginning in the late '70s throughout the '80s and continue to this day. Curriculum-Based Measures (CBM) were developed to function as "academic thermometers" to monitor students' growth in basic academic skills domains. They are a set of simple, short-duration fluency measures most frequently applied to reading, spelling, written expression, and mathematics. Criteria that best describe CBM include that measures are: (a) tied to the curriculum of instruction, (b) of short duration to facilitate frequent administration, (c) focus on direct and repeated measures of student performance, (d) capable of development of multiple forms, (e) inexpensive to create and produce, and (f) sensitive to student achievement change over time (Marston, 1989). Additionally, CBM provides teachers with data that are useful for a number of educational purposes including eligibility determination, screening, and multi-referenced decision-making (i.e., individual, criterion and norm referencing). A significant characteristic of CBM is the development of measures that have high technically adequacy. Thus, the measures are devised with standard development, administration and scoring procedures to maintain high reliability and validity.

Dynamic Indicators of Basic Early Literacy Skills

Roland Good and Ruth Kaminski at the University of Oregon developed Dynamic Indicators of Basic Early Literacy Skills (DIBELS) to assess students' early literacy skills. Based on the research of early literacy, the authors developed measures to evaluate student mastery/knowledge of early indicators of reading acquisition. These tools include five measures to determine if a student is in need of additional instructional support. The first measure is Initial Sounds Fluency (ISF) where students are shown 12 pictures and are asked to identify the beginning sound. ISF is used primarily with kindergarteners as it measures the most basic literacy skills. Letter Naming Fluency (LNF) is the second measure in which students are given a page containing upper- and lower-case letters. Students have to name as many letters as they can. The third measure, Phoneme Segmentation Fluency (PSF) is one in which students hear distinct words and are asked to verbally produce the individual phonemes. The fourth measure is Nonsense Word Fluency (NWF) where students see written VC and CVC nonsense words. They are asked to verbally produce the individual sound of each letter or read the whole word. The fifth measure, DIBELS Oral Reading Fluency (ORF), consists of a standardized set of reading passages. Students are given one minute to read the passage out loud. Typically, students are tested once in the fall and once in the spring to determine what instructional modifications should be made based on the results of the measures.

Implications for Access to the General Curriculum

Many of these Curriculum-Based Evaluation systems had their beginnings in the special education domain. In some cases, research began specifically in the self-contained special education classroom. In others, the roots of the measurement system sprang from the desire to most appropriately integrate students with disabilities into the general education classroom. The tools described here under the name of Curriculum-Based Evaluations have all had important roles and made contributions in research and practice in the general education class.

Initially, these tools provided an alternative to standardized norm-referenced measures. In many cases, the use of the tools was to more accurately provide information to teachers at the eligibility and planning stages in special education. However, several forms of CBE have repeatedly been found as valuable tools for monitoring the progress of students in the curriculum of instruction, most often the general education curriculum (specifically, CBM and PT). Using the progress-monitoring device, teachers are able to formatively evaluate student performance in an academic skill area, specific to their curriculum of instruction. Formative evaluation allows teachers to evaluate the adequacy of skills development. If progress is deemed inadequate, interventions should be implemented. On the other hand, if students perform beyond expectations, or criteria, the teacher has the information to make curriculum adjustments and challenge the student in their appropriate level (zone of proximal development).

Evidence of Effectiveness

Decades of research have been conduced on the varying forms of Curriculum-Based Evaluations presented here, more than can be reported here. This section serves as an overall summary of research findings. As an illustration of application and acceptance, several states have mandated evaluations using CBA as a component of the pre-referral intervention process (e.g., Louisiana, Pennsylvania). Research has been conducted on the tools themselves with applications to both special and general education settings. In general, these measures have been most frequently applied and research for students with disabilities, regardless of placement.

Curriculum-based assessment

Other than in content validity, there is little evidence regarding the technical adequacy for accuracy-based CBA measures. This is most likely a result of the process prescribed by the authors—there is no standardized procedure. Gickling and Havertape state, "We prefer the data be collected and recorded systematically but do not have a preference about how this is to be done" (1981, p. 21).

Precision teaching

Lindsley and his colleagues have conducted thorough research on the implementation and usage of Precision Teaching. The majority of research studies surround the question of student change over time in specific areas related to fluency and accuracy. As with CBM, additional research has been conducted in which the tools of precision teaching have been used as dependent measure. One of the most widely cited successful applications of Precision Teaching was conducted in Montana during a four year span, in which teachers incorporated 20 to 30 minutes of daily Precision Teaching into a curriculum that was otherwise identical to other schools in the district. Students receiving the Precision Teaching advanced 19-40 percentile points higher on the Iowa Test of Basic Skills than control students (Binder & Watkins, 1990).

Curriculum-based measurement

Shinn estimated that over 150 articles have been published since 1988 on the evaluation system known as Curriculum-Based Measurement (1998). Initially, the focus of this research was on the technical adequacy and use of CBM as a viable and accurate tool for classroom teachers to measure long term objectives of students with and without

disabilities. Research has been conducted on applications of CBM in various settings, special and general education, as well as integrated settings. Many researchers have studied the potential of computer applications of CBM these include, computer development of multiple measures, computer scoring, and computer graphing of student performance. Similarly, application of CBM as a diagnostic tool has been studied to help teachers with error analysis and in overall teacher decision-making. More recently, CBM has been identified as dependent measure in research studies such as interventions, curriculum studies, and inclusion issues (Shinn, 1998).

Links to Learn More About…

Curriculum-Based Assessment & Curriculum-Based Measurement

CBA and CBM Compare and Contrast
www.teacherstoolkit.com/classroom1.htm
CBA and CBM are compared and contrasted on this Web site. This is a good site for educators who are new to Curriculum-Based Evaluation as basic differences between CBA and CBM are described. A few articles and books are referenced.

CBA Techniques
www.johnvenn.com/assessment.htm
The author of this site, John Venn, is a professor of education at the University of North Florida and is a good resource for teachers who are interested in implementing CBA in their classrooms. Venn lists in-class assessment and alternative grading strategies. He stresses how CBA techniques are quick, easy and that any teacher can use them.

CBM Manual for Teachers
www.interventioncentral.org/pdfdocs/cbaManual.pdf
This Web site was created by Jim Wright from Syracuse city schools. This manual was designed for use in a CBM teacher-training course. Wright covers many common questions about CBM and explains the answers. He uses a number of graphs to show students' progress over time.

Extended Reading, Writing and Mathematics
www.edprogress.com/
This Web site offers videos, reporting systems and assessment software to educators. The Extended Reading, Writing and Mathematics (ExRWM) off grade assessments are available for teachers to order.

National Consortium on Oral Reading Fluency (NC-ORF)
nc-orf.uoregon.edu/
NC-ORF is a joint effort between researchers at the University of Oregon, Texas A & M University and the Center for Applied Special Technology. A number of articles regarding improving students' verbal fluency are listed. Resources on how to graph, administer and score oral reading fluency are also available.

Products Online
http://www.edformation.com/
This Web site offers a variety of products available for purchase including AIMSweb Benchmark, AIMSweb Progress Monitor, Standard Reading Assessment Passages and AIMSweb Training Materials. Software demonstrations for the AIMSweb Benchmark and Progress Monitor are available online.

Stanley Deno's Homepage from the University of Minnesota
www.education.umn.edu/EdPsych/Faculty/Deno.html
Deno explains how CBM works and testimonials from educators are used to illustrate how they have implemented CBM into their classrooms. Select recent publications from 1997 to the present are also referenced on this site.

The National Association of School Psychologists Web site
www.nasponline.org/publications/cq276cba.html
In this article the authors, Matthew K. Burns, Lara L. MacQuarrie and Donna T. Campbell, explain some fundamental differences between curriculum-based assessment and curriculum-based measurement. A number of articles on CBM/CBA are referenced.

About DIBELS

DIBELS Benchmark Assessment Paper
www.uoregon.edu/~rhgood/dibels_html/workshop/DIBELS_Handout_6.pdf
This is a DIBELS Benchmark Assessment Paper by Roland H. Good III and Cheri Cornachione. The authors discuss the big ideas in early literacy skills. A sample of schedules for assessment for kindergarten and first grade is provided. The authors explain the procedures for administering and scoring the measures. Many examples are included to help illustrate how these measures work in the classroom.

DIBELS—Official Site at the University of Oregon
dibels.uoregon.edu/index.php
This site provides a good introduction to DIBELS and explains reasons for using DIBELS in the classroom. DIBELS measures can be downloaded for free. There is a section labeled measures in which all five types of early literacy measures are discussed with regard to the levels and how to implement the measures in the classroom. Examples are given from grades kindergarten through third on how to use each specific measure.

Pilot Study Using DIBELS Measures
www.cpsboe.k12.oh.us/general/curriculum/earlylitrcy.html
The Cincinnati Public School District developed a pilot study where 400 teachers were trained in using DIBELS measures. This Web site describes how this district has successfully implemented DIBELS to improve early literacy. There are now 900 teachers in the district who are DIBELS–trained. Teachers are happy with the results and students are reported to have stronger reading skills. The scores on the Ohio 4th Grade Proficiency Test, taken in March 2001, were higher than the 2000 scores in all five subject areas.

Project Central
www.usf.edu/cbm/dibels.htm
Project Central offers training and measurement tools for academic success and assessment at the University of Central Florida. Various research studies in the effectiveness of DIBELS are presented. Some teachers in the central Florida area share their enthusiasm using DIBELS in their classrooms.

Roland Good at the University of Oregon
www.uoregon.edu/~rhgood/hmpage.htm
Roland Good is one of the leaders in the research and development of the DIBELS measurement structure. Various sites about early literacy skills are linked to this site including Early Childhood Research Institute on Measuring Growth and Development. The goal of this institute is to produce a measurement system to gauge the skills in children with disabilities. There is also a link to the DIBELS Web site at the University of Oregon.

About Precision Teaching

All About Precision Teaching
www.teonor.com
This site provides links to full-text articles on Precision Teaching. The man who developed Precision Teaching, Ogden Lindsley, has written a large number of these articles.

Athabasca University
http://psych.athabascau.ca/html/387/OpenModules/Lindsley/introa.html
This is the site for a psychology course on learning. A biography of Ogden Lindsley is provided, as is a brief history of Precision Teaching. Precision Teaching is defined and the guiding principles are discussed. Applications and exercises are helpful tools for educators who wish to employ PT in their classrooms.

Cambridge Center for Behavioral Studies
www.behavior.org/education/index.cfm
This is the Web site of Cambridge Center for Behavioral Studies in Concord, Massachusetts. The mission of this organization is to bring solutions from behavioral science to real-world challenges. The center is involved in finding successful teaching methods. Precision Teaching is one of the methods cited on this Web site. There are links to PT articles.

Implementation of Precision Teaching
www.haughtonlearningcenter.com/methods_subpage.html
The director of a program in CA, Elizabeth Haughton, has been a leader in PT for more than three decades. “Precision Teaching uses daily measures of each student’s performance on every skill being taught to make decisions about teaching effectiveness, and to assess the effects of program changes on individual learning.”

References

Bennet, D. E. & Davis, M. A., (2001). The development of a computer-based alternate assessment system. *Assessment for Effective Intervention*, *26(3),* 15-34.

The authors describe an alternate assessment system involving computerized software that helps teachers track student performance data. This system is used with students with moderate to severe disabilities.

Binder, C., & Watkins, C. L. (1990). Precision teaching and direct instruction: Measurably superior instructional technology in schools. Performance Improvement Quarterly, 3(4), 74-96.

Blankenship, C.S., (1985). Using curriculum-based assessment data to make instructional decisions. *Exceptional Children, 52,* 233-238.

This article, like the Deno '85 article, are part of a special issue of Exceptional Children devoted to Curriculum-Based Assessment. Blankenship describes the essential features of CBA and provides suggestions for development. She places a special emphasis on describing how teachers can use CBA for curriculum placement, materials, and instructional procedures.

Deno, S. L., (1985). Curriculum-based measurement: the emerging alternative. *Exceptional Children*, *52(3),* 219-232.

Deno introduces CBM as an alternative assessment approach that is both valid and reliable. He discusses the advantages and disadvantages of informal observation and also standardized commercial achievement tests.

Deno, S. L. (1992). The nature and development of curriculum-based measurement. *Preventing School Failure*, *36(2),* 5-10.

In this article, Deno describes the uses of CBM in the classroom. He discusses the disadvantages of commercial achievement tests. Deno also compares CBM to other curriculum-based assessment approaches and notes the distinctions between CBM and CBA.

Deno, S. L., (1997). Whether thou goest…perspectives on progress monitoring. In J. W. Lloyd, E. J. Kameenui, & D. Chard. (Eds.) *Issues in Educating Students with Disabilities.* Mahwah, N.J.: L. Erlbaum Assoc.

Deno explains that typically the primary function of assessment is to sort students into groups for decision making purposes. He thinks that the primary function of assessment should be to track individual growth. This article focuses on two progress monitoring approaches called mastery monitoring (progress measurement) and general outcome measurement (performance measurement).

Elliott, J., Lee, S. W., & Tollefson, N. (2001). A reliability and validity study of the dynamic indicators of basic early literacy skills-modified. *School Psychology Review, 30 (1)*, 33.

Kindergartners who were identified at-risk for reading failure were tested using the DIBELS techniques of the letter naming fluency and the sound naming fluency to assess their literacy level.

Foegen, A., Espin, C. A., Allinder, R. M., & Markell, M. A. (2001). Translating research into practice: preservice teachers' beliefs about curriculum-based measurement. *Journal of Special Education*, *34(1),* 226-236.

The authors conducted a study in which pre-service teachers were asked their opinions about the validity and utility of CBM. Subjects were shown one of two videotaped presentations on CBM. There were no significant differences between the two types of format, statistical or anecdotal. The subjects had more positive beliefs about the utility of CBM than of the utility of CBM.

Fuchs, L. S. & Fuchs, D. (1986). Effects of systematic formative evaluation: A meta-analysis. *Exceptional Children*, *53(3),* 199-208.

The authors describe an approach for formulating individualized educational programs called aptitude treatment interaction (ATI). Through a meta-analysis, it was found that using ATI significantly increased mildly handicapped students' school achievement.

Fuchs, L. S., Fuchs, D., Hamlett, C. L., Phillips, N. B., & Bentz, J. (1994). Classwide curriculum-based measurement: helping general educators meet the challenge of student diversity. *Exceptional Children*, *60(6),* 518-537.

This purpose of this study was to examine how effective CBM is in a general education mathematics class. The participants in the study were divided into three groups: CBM with classwide reports that summarize information and provide recommendations for instruction, CBM with reports but without recommendations and the control group (no CBM). The results show that the teachers who received reports and instructional recommendations had the students with the highest achievement.

Fuchs, L. S. & Fuchs, D. (1999). Monitoring student progress toward the development of reading competence: a review of three forms of classroom-based assessment. *School Psychology Review*, *28(4),* 659-671.

The authors review three types of alternate classroom-based assessment used in monitoring student progress toward becoming competent readers. These types of classroom-based assessment include mastery measurement, CBM and DIBELS. The strengths and limitation of each type are discussed in detail.

Gickling, E. E., & Thompson, V. P. (1985). A personal view of curriculum-based assessment. *Exceptional Children*, *52(3),* 205-218.

Gickling and Thompson look at the advantages of using CBA as an alternate to traditional assessment methods. The authors discuss limitations of standardized testing. The three central themes of CBA include the following: curriculum provides the most basic and meaningful avenue for classroom assessment; curriculum places explicit demands upon the learner; and curriculum must be controlled if academic success is to be achieved.

Green, S. K. (2001). Use of CBM oral reading in the general education classroom. *Assessment for Effective Intervention*, *26(3),* 1-13.

Green examined the results of a fourth grade teacher's implementation of CBM in her general education classroom. In this study, oral reading performance was measured monthly and students and parents were notified on the student's progress. Three key elements were identified in the teacher's use of CBM; standardization, reduced time requirements and qualitative inferences.

Good, R. H. & Kaminski, R. A. (1996). Assessment for instructional decisions: Toward a proactive/prevention model of decision-making for early literacy skills. *School Psychology Quarterly, 11 (4),* 326-336.

Good and Kaminski provide a case study to illustrate how DIBELS is used to monitor student progress. Two measures, phonemic segmentation fluency and onset recognition fluency, are explained in great detail. The authors describe how the problem-solving model is used with the DIBELS model.

Gunn, B., Biglan, A., Smolkowski, K., & Ary, D. (2000). The efficacy of supplemental instruction in decoding skills for Hispanic and non-Hispanic students in early elementary school. *The Journal of Special Education, 34 (2),* 90-103.

This study measured oral reading fluency in 256 students in kindergarten, first and second grades. One group received supplemental reading instruction and the other group did not. The students were assessed in the fall of the first year of the study and also in the spring of the first and second year. In the spring of the first year, the students who received supplemental instruction performed better on word attack skills than the students in the control group. In the spring of the second year, the students in the supplemental instruction group performed better on word attack, word identification, oral reading fluency, vocabulary and reading comprehension.

Howell, K. W. & Nolet, V. (2000). Tools for assessment. In *Curriculum-Based Evaluation, Teaching and Decision Making. 3rd Ed.* Scarborough, Ontario: Wadsworth/Thompson Learning.

The editors describe how CBM is used in the curriculum-based evaluation process. CBM box plots and report cards are provided along with instruction for interpreting these data.

Idol-Maestas, L. (1983). *Special educator's consultation handbook.* Rockville, MD: Aspen.

Kaminski, R. A. & Good, R. H. (1998). Assessing early literacy skills in a problem-solving model: Dynamic indicators of basic early literacy skills. In M. R. Shinn (Ed.) Advanced Applications of Curriculum-Based Measurement. New York, NY: The Guilford Press.

In this chapter, Kaminski and Good explain some advances in early literacy intervention. They stress that applying the problem-solving model to DIBELS is integral to the assessment process. Kaminski and Good recognize six fundamental differences between DIBELS and CBM.

Lindsley, O. R. (1990b). Precision teaching: By teachers for children. *Teaching Exceptional Children*, 22(3), 10-15.

Lindsley's article is the leading article in a special issue of Teaching Exceptional Children. The creator and author presents the four founding policies of precision teaching. He then provides the reader with several contributions by teachers as to how they have implemented and used the results of the evaluation procedure, and as a result become for effective teachers.

Marston, D. B., (1989).A curriculum-based measurement approach to assessing academic performance: What it is and why do it. In M.R.Shinn *Curriculum-Based Measurement: Assessing Special Children.* New York, NY: The Guilford Press

Doug Marston has created this chapter in which clear explanations of Curriculum-Based Measurement is provided. Marston explains alternative testing models based on the curriculum. Additionally, the author addresses the issues of technical adequacy in assessments and the failures of traditional systems of evaluating student performance.

Shapiro, E. S. (1992). Use of Gickling's model of curriculum-based assessment to improve reading in elementary age students. *School Psychology Review*, *21(1),* 168-176.

Shapiro discusses Gickling's model of CBA in relation to improving reading skills in elementary school students. Four case examples of elementary school students are presented to illustrate how CBA and the folding-in technique increase these students' level of reading.

Shinn, M. R. & Bamonto, S. (1998). Advanced applications of curriculum-based measurement: "Big ideas" and avoiding confusion. In M. R. Shinn. (Ed.) Advanced Applications of Curriculum-Based Measurement. New York, NY: The Guilford Press.

Shinn and Bamonto have written the initial chapter in the text and provide valuable background and historical information regarding Curriculum-Based Measurement. They address the components of the measurement system, big ideas about CBM as a dynamic indicator of progress, and a summary of important research that led to the development of CBM as it is used today. Research is ongoing as CBM continues to develop.

Shinn, M. & Marston, D. (1985). Differentiating mildly handicapped, low-achieving, and regular education students: a curriculum-based approach. *RASE*, *6(2),* 31-38.

Shinn and Marston conducted a study of fourth, fifth and sixth graders in special education classes, Chapter 1 classes and regular education classes. They discuss how students are identified for eligibility to receive special education services and examine the students' academic performance between the three groups.

Shinn, M. Baker, S., Habedank, L., & Good, R. H. (1993). The effects of classroom reading performance data on general education teachers' and parents' attitudes about reintegration. *Exceptionality*, *4(4),* 205-228.

The students in this study were given CBM in oral reading and maze scores. The authors evaluate teachers and parents attitudes regarding reintegration of special education children into the regular education classroom. Special education teachers also rated each student's readiness to reintegrate into the regular education classroom.

Smith, S. B., Baker, S., & Oudeans, M. K. (2001). Making a difference in the classroom with early literacy instruction. *Teaching Exceptional Children, 33 (6),* 8-14.

There has been a considerable amount of research on developing early literacy, but there have not been many effective methods to help students develop literacy skills. Smith, Baker and Oudeans state that two themes must be present in a classroom for change to take place. The first theme is that the teacher should acquire a deep instructional understanding of the rationale for the changes that are being considered. The second theme is there should be a school-based assessment system that provides frequent information on how well the children are learning.

Thurlow, M. L., House, A. L., Scott, D. L., & Ysseldyke, J. E. (2000). Students with disabilities in large-scale assessments: state participation and accommodation policies. *Journal of Special Education*, *34(3),* 154-163.

The authors review state policies regarding accommodations in large-scale assessments that are available to students with disabilities. It was found that states typically offer more accommodation on criterion-referenced tests than norm-referenced tests.

Tindal, G. (1989). Curriculum-based measurement. In J. L. Graden, J. E. Zins, & M. J.Curtis (Eds.) *Alternative Educational Delivery Systems: Enhancing Instructional Options for All Students*.

This book chapter describes the characteristics of four different types of curriculum-based evaluation, which include the Illinois/Vermont Approach, the University of Washington Approach, the University of Nevada Approach and the University of Minnesota Approach. This is a benchmark paper on CBM and CBA. Different uses of CBM/CBA are also discussed.

Tindal, G. & Germann, G. (1985). Models of direct measurement in the determination of eligibility, monitoring of student progress, and evaluation of program effects. *B. C. Journal of Special Education*, *9(4),* 365-382.

Two different measurement-evaluation systems, Precision Teaching and Data Based Program Modification are compared in this article. Determination of eligibility, monitoring student progress and evaluation of program effects are discussed in regards to each system.

Ysseldyke, J. & Olsen, K. (1992). The nature and development of curriculum-based measurement. *Preventing School Failure, 65(2)*, 175-185.

Ysseldyke and Olsen describe different forms of alternate assessment and how teachers can implement them in the classroom. The authors discuss four methods to collect data: observation, recollection, record review and testing.

National Center on Accessing the General Curriculum

NCAC

Differentiated Instruction

Effective Classroom Practices Report

This report was written with support from the National Center on Accessing the General Curriculum (NCAC), a cooperative agreement between CAST and the U.S. Department of Education, Office of Special Education Programs (OSEP), Cooperative Agreement No. H324H990004. The opinions expressed herein do not necessarily reflect the policy or position of the U.S. Department of Education, Office of Special Education Programs, and no official endorsement by the Department should be inferred.

IDEAs that Work
U.S. Office of Special Education Programs

Differentiated Instruction

By Tracey Hall, Ph.D., Senior Research Scientist, NCAC

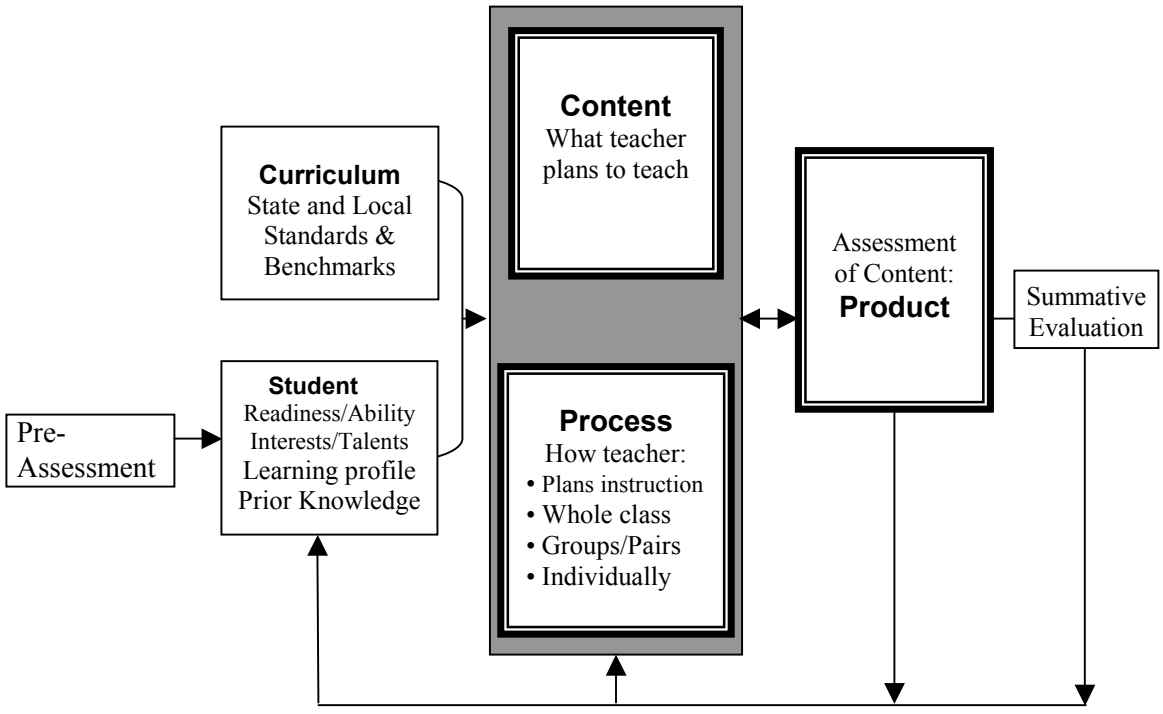
Introduction

Not all students are alike. Based on this knowledge, differentiated instruction applies an approach to teaching and learning so that students have multiple options for taking in information and making sense of ideas. The model of differentiated instruction requires teachers to be flexible in their approach to teaching and adjusting the curriculum and presentation of information to learners rather than expecting students to modify themselves for the curriculum. Classroom teaching is a blend of whole-class, group and individual instruction. Differentiated Instruction is a teaching theory based on the premise that instructional approaches should vary and be adapted in relation to individual and diverse students in classrooms.

Definition

To differentiate instruction is to recognize students varying background knowledge, readiness, language, preferences in learning, interests, and to react responsively. Differentiated instruction is a process to approach teaching and learning for students of differing abilities in the same class. The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is, and assisting in the learning process.

Learning Cycle and Decision Factors Used in Planning and Implementing Differentiated Instruction



(adapted from Oaksford, L. & Jones, L. , 2001)

Identifying Components/Features

According to the authors, several key elements guide differentiation in the education environment. Tomlinson (2001) identifies three elements of the curriculum that can be differentiated: Content, Process, and Products. Additionally, several guidelines are noted to help educators form an understanding and develop ideas around differentiating instruction.

Content

- *Several elements and materials are used to support instructional content*. These include acts, concepts, generalizations or principles, attitudes, and skills. The variation seen in a differentiated classroom is most frequently the manner in which students gain access to important learning. Access to the content is seen as key.

- *Align tasks and objectives to learning goals.* Designers of differentiated instruction determine as essential the alignment of tasks with instructional goals and objectives. Goals are most frequently assessed by many high-stakes tests at the state level and frequently administered standardized measures. Objectives are frequently written in incremental steps resulting in a continuum of skills-building tasks. An objectives-driven menu makes it easier to find the next instructional step for learners entering at varying levels.

- *Instruction is concept-focused and principle-driven.* The instructional concepts should be broad based and not focused on minute details or unlimited facts. Teachers must focus on the concepts, principles and skills that students should learn. The content of instruction should address the same concepts with all students but be adjusted by degree of complexity for the diversity of learners in the classroom.

Process

- *Flexible grouping is consistently used.* Strategies for flexible grouping are essential. Learners are expected to interact and work together as they develop knowledge of new content. Teachers may conduct whole-class introductory discussions of content big ideas followed by small group or pair work. Student groups may be coached from within or by the teacher to complete assigned tasks. Grouping of students is not fixed. Based on the content, project, and on-going evaluations, grouping and regrouping must be a dynamic process as one of the foundations of differentiated instruction.

- *Classroom management benefits students and teachers*. Teachers must consider organization and instructional delivery strategies to effectively operate a classroom using differentiated instruction. Carol Tomlinson (2001) identifies 17 key strategies for teachers to successfully meet the challenge of designing and managing differentiated instruction in her text How to Differentiate Instruction in Mixed-Ability Classrooms, Chapter 7.

Products

- *Initial and on-going assessment of student readiness and growth are essential.* Meaningful pre-assessment naturally leads to functional and successful differentiation. Assessments may be formal or informal, including interviews, surveys, performance assessments, and more formal evaluation procedures. Incorporating pre and on-going assessment informs teachers to better provide a menu of approaches, choices, and scaffolds for the varying needs, interests and abilities that exist in classrooms of diverse students.
- *Students are active and responsible explorers.* Teacher's respect that each task put before the learner will be interesting, engaging, and accessible to essential understanding and skills. Each child should feel challenged most of the time.
- *Vary expectations and requirements for student responses.* Items to which students respond may be differentiated for students to demonstrate or express their knowledge and understanding. A well-designed student product allows varied means of expression, alternative procedures, and provides varying degrees of difficulty, types of evaluation, and scoring.

Guidelines that make differentiation possible for teachers to attain**:**

- *Clarify key concepts and generalizations* to ensure that all learners gain powerful understandings that serve as the foundation for future learning. Teachers are encouraged to identify essential concepts and instructional foci to ensure all learners comprehend.
- *Use assessment as a teaching tool to extend versus merely measure instruction*. Assessment should occur before, during, and following the instructional episode, and help to pose questions regarding student needs and optimal learning.
- *Emphasize critical and creative thinking* as a goal in lesson design. The tasks, activities, and procedures for students should require that students understand and apply meaning. Instruction may require supports, additional motivation, varied tasks, materials, or equipment for different students in the classroom.
- *Engaging all learners is essential.* Teachers are encouraged to strive for development of lessons that are engaging and motivating for a diverse class of students. Vary tasks within instruction as well as across students. In other words, and entire session for students should not consist of all drill and practice, or any single structure or activity.
- *Provide a balance between teacher-assigned and student-selected tasks.* A balanced working structure is optimal in a differentiated classroom. Based on pre-assessment information, the balance will vary from class-to-class as well as lesson-to-lesson. Teachers should assure that students have choices in their learning.

Evidence of Effectiveness

Differentiation is recognized to be a compilation of many theories and practices. Based on this review of the literature of differentiated instruction, the "package" itself is lacking empirical validation. There is an acknowledged and decided gap in the literature in this area and future research is warranted.

According to the proponents of differentiation, the principles and guidelines are rooted in years of educational theory and research. For example, differentiated instruction adopts the concept of "readiness". That is the difficulty of skills taught should be slightly in advance of the child's current level of mastery. This is grounded in the work of Lev Vygotsky (1978), and the zone of proximal development (ZPD), the range at which learning takes place. The classroom research by Fisher at al.(1980), strongly supports the ZPD concept. The researchers found that in classrooms where individuals were performing at a level of about 80% accuracy, students learned more and felt better about themselves and the subject area under study (Fisher, 1980 in Tomlinson, 2000).

Other practices noted as central to differentiation have been validated in the effective teaching research conduced from the mid 1980's to the present. These practices include effective management procedures, grouping students for instruction, and engaging learners (Ellis and Worthington, 1994).

While no empirical validation of differentiated instruction as a package was found for this review, there are a generous number of testimonials and classroom examples authors of several publications and Web sites provide while describing differentiated instruction. Tomlinson reports individual cases of settings in which the full model of differentiation was very promising. Teachers using differentiation have written about improvements in their classrooms. (See the links to learn more about differentiated instruction).

Applications to General Education Classroom Settings

The design and development of differentiated instruction as a model began in the general education classroom. The initial application came to practice for students considered gifted who perhaps were not sufficiently challenged by the content provided in the general classroom setting. As classrooms have become more diverse with the introduction of inclusion of students with disabilities, and the reality of diversity in public schools, differentiated instruction has been applied at all levels for students of all abilities.

Many authors of publications about differentiated instruction strongly recommend that teachers adapt the practices slowly, perhaps one content area at a time. Additionally, these experts agree that teachers should work together to develop ideas and menus of options for students together to share the creative load. As noted previously, studies on the package of differentiated instruction are lacking. However, proponents note that reports of the full model of differentiation are promising.

Links to Learn More About Differentiated Instruction

Guild, P.B., and Garger, S (1998). What Is Differentiated Instruction? *Marching to Different Drummers* 2nd Ed. (ASCD, p.2)
http://www.ascd.org/pdi/demo/diffinstr/differentiated1.html

Initially published in 1985, *Marching to Different Drummers* was one of the first sources to pull together information on what was a newly-flourishing topic in education. Part I defines style and looks at the history of style research; Part II describes applications of style in seven areas; Part III identifies common questions and discusses implementation and staff development.

Tomlinson, C.A., (2000). Differentiation of instruction in the elementary grades. ERIC Digest. ERIC_NO: ED443572.
http://ericir.syr.edu/plweb-cgi/obtain.pl

To meet the needs of diverse student populations, many teachers differentiate instruction. This digest describes differentiated instruction, discusses the reasons for differentiated instruction, what makes it successful, and suggests how teachers may begin implementation.

Tomlinson, C.A., (1995). Differentiating instruction for advanced learners in the mixed-ability middle school classroom. ERIC Digest E536.
http://www.ed.gov/databases/ERIC_Digests/ed389141.html

The ability to differentiate instruction for middle school aged learners is a challenge. Responding to the diverse students needs found in inclusive, mixed-ability classrooms is particularly difficult. This digest provides an overview of some key principles for differentiating instruction, with an emphasis on the learning needs of academically advanced students.

Tomlinson, C.A., & Allan, S. D., (2000). Leadership for differentiating schools and classrooms. Association for Supervision and Curriculum Development.
http://www.ascd.org/readingroom/books/tonlinson00book.html

This Web site contains two chapters from Tomlinson's recent publication: *Leadership for differentiating schools and classrooms*, Association for Supervision and Curriculum Development. This book is designed for those in leadership positions to learn about differentiated instruction.

Web Article: Mapping a route toward differentiated instruction.
http://www.ascd.org/pdi/demo/diffinstr/tomlinson2.html

Carol Ann Tomlinson, an Associate Professor of Educational Leadership, Foundations and Policy at the Curry School of Education, University of Virginia, Charlottesville, VA provides an article entitled; Mapping a route toward differentiated instruction. Educational Leadership, 57,1.

Willis, S. & Mann, L., (2000). Differentiating instruction: Finding manageable ways to meet individual needs (Excerpt). Curriculum Update.
http://www.ascd.org/readingroom/cupdate/200/1win.html

Based on the concept that "one size does not fit all" the authors describe the teaching philosophy of differentiated instruction. More teachers are determined to reach all learners, to challenge students who may be identified as gifted as well as students who lag behind grade level. This article excerpt describes the essential components of differentiated instruction beginning with three aspects of curriculum: content, process and products.

The Association for Supervision and Curriculum Development (ASCD) Web site
www.ascd.org/pdi/demo/diffinstr/differentiated1.html

A site by ASCD (2000) which discusses differentiated instruction. Page links to other pages with examples from a high school* and elementary school*, key characteristics of a differentiated classroom, benefits, related readings, discussion, and related links to explore. *might be good to look at for case story ideas

Educational Leadership Research Link
www.ascd.org/readingroom/edlead/0009/holloway.html

This Web site, provided by Educational Leadership, links the reader to a brief summary of an article by Holloway. The author has provided a bulleted summary regarding the principles and theories that drive differentiated instruction.

Holloway, J.H., (2000). Preparing Teachers for Differentiated Instruction.
***Educational Leadership,* 58 (1).**
http://web.uvic.ca/~jdurkin/edd401su/Differentiated.html

This site is from an education course by Dr. John Durkin. It includes a diagram with suggestions for approaches to differentiated instruction. It also includes a listing of what differentiated instruction is and is not, rules of thumb on how to instruct, and management strategies.

Theroux, P. (2001). Enhance Learning with Technology. Differential Instruction.
www.cssd.ab.ca/tech/oth/learn/differentiating.htm

Theroux provides a thorough site on differential instruction for a Canadian school district. Provides links to teacher attitudes, learning strategies, teacher resources, integrating technology, integrating outcomes, exploring projects, sample lesson plans*, planning projects, thinking skills, developing Web pages, assessing, and tutorials.

Web Site: for Teachers, Administrators, and Higher Education
www.teach-nology.com/litined/dif_instruction/

This web site is designed for educators and uses technology to inform teachers about current practices, literature, the law in education, as well as professional development. Additionally, links to articles including research on educational practices including links to information on differentiated instruction are included.

References

Ellis, E. S. and Worthington, L. A. (1994). *Research synthesis on effective teaching principles and the design of quality tools for educators*. University of Oregon: Technical Report No. 5 National Center to Improve the Tools of Educators.

Effective teaching and by extension effective learning has been a focus of both current and historical and educational reform movements. With a focus on quality teaching, the authors have reviewed and consolidated empirically supported effective teaching principles derived from research and identified 10 principles that characterize what we know about effective teaching.

Oaksford, L. & Jones, L., 2001. Differentiated instruction abstract. Tallahassee, FL: Leon County Schools.

The authors are teachers in the Leon County Schools in Florida. They have written a summary about the implementation of Differentiated Instruction in their schools. They emphasize the importance of content, process and product when executing these practices. With other teachers and administrators in the district, they developed an implementation guide and obtained professional development seminars to put differentiated instruction in place in their schools.

Pettig, K. L., (2000). On the road to differentiated. *Education Leadership, 8,* 1, 14-18.

The author offers advice and input about implementation of differentiated instruction. A school district Coordinator in New York State, Pettig provides practical and practiced strategies for teachers and schools considering adopting the principles of differentiated instruction. This district had five years of experience with differentiated instruction when the article was written.

Reis. S. M., Kaplan, S. N, Tomlinson, C. A., Westbert, K.L, Callahan, C. M., & Cooper, C. R., (1998). How the brain learns, A response: Equal does not mean identical**.** *Educational Leadershop, 56*, 3.

The authors provide a response to an Educational Leadership article from March of 1998, in which the concept of de-tracking is introduced as a solution to high-academic standards for high school students. These authors put forth a compelling argument to raise student achievement. Students with different abilities, interests, and levels of motivation should be offered differentiated instruction that meets their individual needs

Sizer, T. R. *(*2001). No two are quite alike: Personalized learning. *Educational Leadership 57* (1).

In this article, Sizer presents the rationale and logistics of "personalizing" instruction to meet the needs of students in classrooms of today. He addresses the leadership needs to personalize instruction and facing the concept knowing that adaptations to personalize or differentiate instruction will be in continual flux.

Tomlinson, C. A. (2001). *How to differentiate instruction in mixed-ability classrooms*. (2nd Ed.) Alexandria, VA: ASCD.

Carol Ann Tomlinson has developed this 14-chapter text to define and describe Differentiated Instruction. Tomlinson suggests that it is feasible to prepare teachers to address the wide diversity of students in today's classrooms along with the realities of curricula and standards imposed on schools. She believes that there is room for both equity and excellence in classrooms and to teach well, teachers should attend to individual differences.

Tomlinson, C.A., & Allan, S. D. (2000). *Leadership for differentiating schools and classrooms*. Alexandria, VA: ASCD.

The authors show how school leaders can encourage and support growth in classrooms. Information is provided and explanations are provided on how school leaders can support the development of responsive, personalized, and differentiated classrooms. Tomlinson and Allan illustrate how school administrators and leaders can encourage and support differentiated instruction for the diversity of students in our classrooms today.

National Center on Accessing the General Curriculum

NCAC

Explicit Instruction

Effective Classroom Practices Report

This report was written with support from the National Center on Accessing the General Curriculum (NCAC), a cooperative agreement between CAST and the U.S. Department of Education, Office of Special Education Programs (OSEP), Cooperative Agreement No. H324H990004. The opinions expressed herein do not necessarily reflect the policy or position of the U.S. Department of Education, Office of Special Education Programs, and no official endorsement by the Department should be inferred.

IDEAs that Work
U.S. Office of Special Education Programs

Explicit Instruction

By Tracey Hall, Ph.D., Senior Research Scientist, NCAC

Introduction

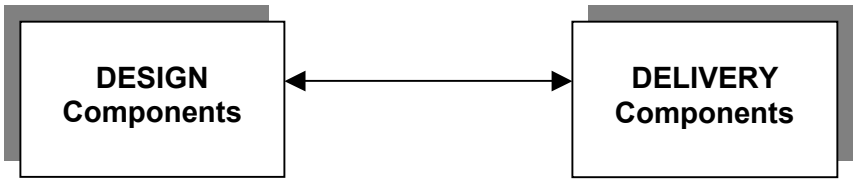
The teaching practice of explicit instruction has been available to classroom teachers since the late 1960s. Substantial research has been conducted on components and the complete instructional "package". As with many teaching practices, there are varying degrees of adaptation and acceptance. The effective teaching practices research identified most–if not all–of the components of explicit instruction as essential for positive student outcomes (e.g., Rosenshine & Stevens, 1986; Ellis & Worthington, 1995).

Definition

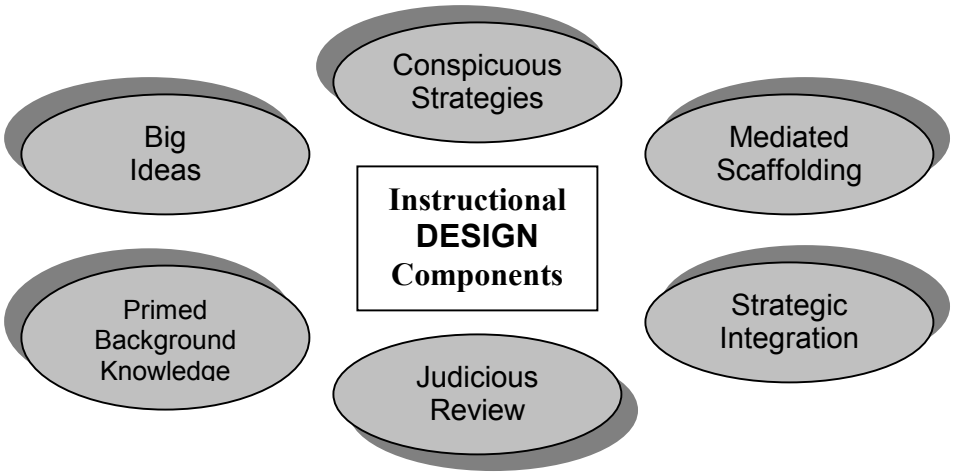
Explicit instruction is a systematic instructional approach that includes set of delivery and design procedures derived from effective schools research merged with behavior analysis. There are two essential components to well designed explicit instruction: (a) visible *delivery* features are group instruction with a high level of teacher and student interactions, and (b) the less observable, *instructional design principles* and assumptions that make up the content and strategies to be taught.

Identifying Components

Explicit instruction consists of essential:



Standard Instructional Design Components
Essential to All Explicit Instructional Episodes



Big Ideas

Big ideas function as the keys that unlock content for the range of diverse learners. Those concepts, principles or heuristics facilitate the most efficient and broadest acquisition of knowledge. Teaching using big ideas is one promising means of striking a reasonable balance between unending objectives and no objectives at all.

Conspicuous Strategies

People accomplished at complex tasks apply strategies to solve problems. Empirical evidence suggests that all students in general, and diverse learners in particular, benefit from having good strategies made conspicuous for them. This paired with great care taken to ensure that the strategies are well-designed result in widely transferable knowledge of their application.

Mediated Scaffolding

This temporary support/guidance is provided to students in the form of steps, tasks, materials, and personal support during initial learning that reduces the task complexity by structuring it into manageable chunks to increase successful task completion. The degree of scaffolding changes with the abilities of the learner, the goals of instruction, and the complexities of the task. Gradual and planful removal of the scaffolds occurs as the learner becomes more successful and independent at task completion. Thus, the purpose of scaffolding is to allow all students to become successful in independent activities. There are at least two distinct methods to scaffold instruction; teacher assistance and design of the examples used in teaching.

Strategic Integration

An instructional design component, strategic integration, combines essential information in ways that result in new and more complex knowledge. Characteristics of strategic instruction include: a) curriculum design that offers the learner an opportunity to successfully integrate several big ideas, b) content learned must be applicable to multiple contexts, and c) potentially confusing concepts and facts should be integrated once mastered. The strategic integration of content in the curriculum can help students learn when to use specific knowledge beyond classroom application.

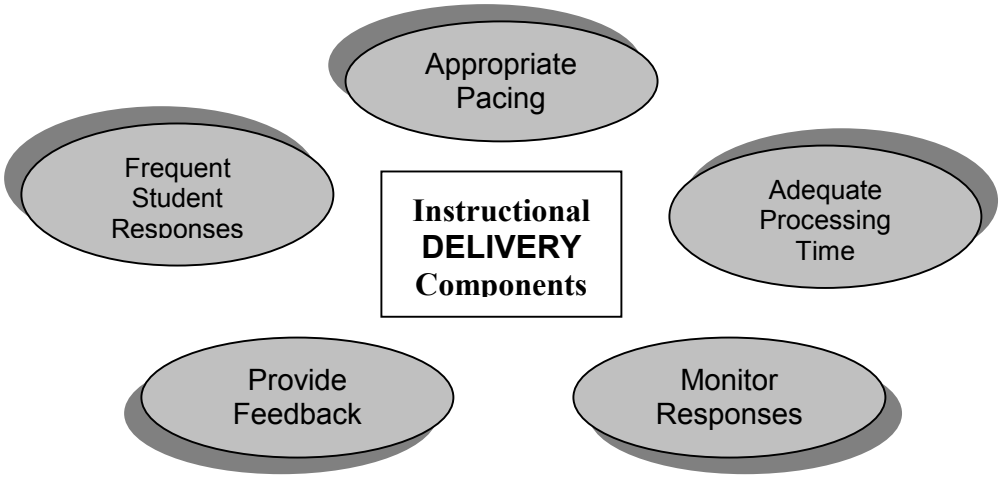
Judicious Review

Effective review promotes transfer of learning by requiring application of content at different times and in different contexts. Educators cannot assume that once a skill is presented and "in" the learner's repertoire that the skill or knowledge will be maintained. Planned review is essential to ensure that students maintain conceptual and procedural "grasp" of important skills and knowledge (Big Ideas). Judicious review requires that the teacher select information that is useful and essential. Additionally, review should be distributed, cumulative, and varied. Requirements for review will vary from learner to learner. To ensure sufficient judicious review for all learners, teachers must regularly monitor progress of the students to inform continued instruction and needed review activities. Review that is distributed over time, as opposed to massed in one learning activity/unit, contributes to long-term retention and problem solving.

Primed Background Knowledge

Acquisition of new skills and knowledge depends largely upon a) the knowledge the learner brings to the task, b) the accuracy of that information, and c) the degree to which the learner can access and use that information. Priming background knowledge is designed to strategically cultivate success by addressing the memory and strategy deficits learners may bring to the new task. The functions of priming background knowledge are to increase the likelihood that students will be successful on new tasks by making explicit the critical features, and to motivate learners to access knowledge they have in place.

Standard Instructional Delivery Components
Essential to All Explicit Instructional Episodes



Require frequent student responses

When students actively participate in their learning, they achieve greater success. The teacher must elicit student responses several times per minute, for example ask students to say, write, or do something. Highly interactive instructional procedures keep students actively engaged, provide students with adequate practice, and help them achieve greater success.

Appropriate instructional pacing

Pacing is the rate of instructional presentations and response solicitations. The pace of instruction is influenced by many variables such as task complexity or difficulty, relative newness of the task, and individual student differences. When tasks are presented at a brisk pace, three benefits to instruction are accomplished: (a) students are provided with more information, (b) students are engaged in the instructional activity, and (c) behavior problems are minimized (students stay on-task when instruction is appropriately paced).

Provide adequate processing time

Think time (adequate processing time) is the amount of time between the moment a task is presented and when the learner is asked to respond. Time to pause and think should *vary* based on the difficulty of the task relative to the student(s). If a task is relatively new, the amount of time allocated to think and formulate a response should be greater than that of a task that is familiar and in the learners' repertoire.

Monitor responses

This is an essential teacher skill to ensure that all learners are mastering the skills the teacher is presenting. Watching and listening to student responses provides the teacher with key instructional information. Adjustments may be made *during* instruction. Teachers should be constantly scanning the classroom as students respond in any mode.

Provide feedback for correct and incorrect responses

Students should receive immediate feedback to both correct and incorrect responses. Corrective feedback needs to be instructional and not accommodating. Feedback to reinforce correct responses should be specific. Feedback should not interfere with the timing of the next question/response interaction of the teacher and student. Feedback that does not meet these criteria can interrupt the instructional episode and disrupt the learner's ability to recall.

Implications for Access to the General Curriculum

"Declarative, procedural and conditional knowledge are necessary ingredients for strategic behavior. Students can learn about these features of reading through direct instruction as well as by practice. Part of a teacher's job is to explicate strategies for reading so that students will perceive them as useful and sensible." (Paris, S. G. l986 p. 17).

Programs using explicit instruction have been researched extensively across classrooms by grade (preschool through adult) and by ability (special and general education settings) since the mid-1960s. General education classrooms in these studies were most often typical settings, with diverse students, including students at-risk for academic failure, economically disadvantaged students, and students with disabilities. Additionally, applications of explicit instruction incorporate the range of school content areas including reading (decoding and comprehension), mathematics, language arts, history/social studies, science, health, art and music education.

One of the most visible implementations of Direct Instruction in public schools is Wesley Elementary in Houston, TX. When the school began implementation of instruction using direct instruction, fifth grade students were almost two years below grade level. After four years of implementation, the third, fourth and fifth grade students were performing 1 to 1.5 years *above* grade level. All students scored above the 80^{th} percentile in both reading and mathematics on the district evaluation. Wesley School continues these effective practices school-wide and continues to have exemplary scores on district, state, and national assessment.

It has been thought that teaching using explicit instruction is most beneficial for low performing students and students in special education. However, the results from extensive research repeatedly indicate that *all* students benefit from well-designed and explicitly taught skills

Evidence of Effectiveness

A meta-analysis conducted by G. Adams yielded over 350 publications (articles, books, chapters, convention presentations, ERIC documents, thesis, dissertations and unpublished documents) on various forms of studies conducted on Explicit Instruction. Criterion for inclusion limited the analysis to 37 research publications that met four groupings: (a) regular education, (b) special education, (c) the National Follow-Through project, and (d) follow-up studies. Some example findings include:

- In this meta-analysis, Adams found that the mean effect size per study using explicit instruction is more than .75 (effects of .75 and above in education are extraordinary). Accordingly, this confirms that overall effect of explicit instructional practices is substantial. Thirty-two of the 34 studies analyzed had statistically significant positive effect sizes. The authors find the consistent attainment of research with substantial effect sizes is further evidence that explicit instruction is an effective instructional practice for all students. The authors conclude that although Direct Instruction is often described as a program for students in special education, the effect sizes calculated in this meta-analysis are nearly the same thus indicating the teaching strategy is effective for students in general education as well as those identified with disabilities.

- National Follow-Through Project: Students receiving explicit instruction in reading, mathematics, language and spelling achieved well in these basic skills, as well as reading comprehension, problem solving, and math concepts.

- National Follow-Through Project: Student scores were above other treatment conditions in the affective domain as well as the academic. This suggests that competence in school-related skills, enhances self-esteem. "Critics of the model have predicted that the emphasis on tightly controlled instruction might discourage children from freely expressing themselves and thus inhibit the development of self-esteem. In fact, this is not the case." (Abt IVB, p. 73)

- Review of the research on beginning reading using explicit instruction strategies reported that students considered disadvantaged and students with diverse needs, like other students benefit most from early and explicit teaching of word recognition skills, including phonics.

- Carnine and colleagues empirically evaluated effective delivery components essential to explicit instruction to validate each in relation to student outcomes for a range of students by ability and by age.

Links to Learn More About Explicit Instruction

An Educator's Guide to School Wide Reform
http:/www.aasa.org/reform/approach/direct.htm
This guide was prepared for educators and others to use when investigating different approaches to school reform. It reviews the research on twenty-four "whole-school", "comprehensive" or "school-wide" approaches.

University of North Carolina at Wilmington – Department of Special Studies
http://www.uncwil.edu/people/kozloffm/
This is the homepage of Martin Kozloff who is a Watson distinguished professor at UNC, Wilmington. He is committed to improving education and is particularly interested in direct instruction. He has written numerous papers and books on this topic.

National Center to Improve the Tools of Educators
http://idea.uoregon.edu/~ncite/
The purpose of this National Center, NCITE, is to advance the quality and effectiveness of technology, media and materials for individuals with disabilities. NCITE creates a marketplace demand for the selection and appropriate use of research-based technology, media and materials (TMM). They are involved in various education projects.

How Phonics Instruction Teaches Critical Thinking Skills
http://projectpro.com/ICR/Phonics/CriticalThinking.htm
This site provides information on how to effectively teach using phonics and the benefits associated with it. Data from the study resulting from the Project Follow-Through is provided, the site authors illustrate how explicit instruction supports the use of comprehensive, systematic phonics in teaching young children to read.

School Improvement in Maryland – Project BETTER/Thinking and Learning
http://www.mdk12.org/practices/good_instruction/projectbetter/thinkingskills/ts-31-32.html
This Web site illustrates the implementation of explicit instruction in reading. "Teachers who provide students with information about reading skills and strategies through direct explanation and the gradual transfer of responsibility help their students become independent learners because they provide both the means and the motivation for becoming better readers."

References

Adams, G. L., & Engelmann, S. (1996). Research in Direct Instruction: 25 Years Beyond DISTAR. Seattle,WA: Educational Achievement Systems.

Adams and Engelmann present a description of direct instruction and a meta-analysis of research on direct instruction. The authors summarize and report years if research on school implementation data on explicit instruction. This research clearly demonstrates that direct instruction program implementations were successful with the full range of teacher and student populations.

Deshler, D. D., & Schumaker, J. B., (1989). An instructional model for teaching students how to learn. In J.L. Graden, J. E. Zins, & M.J. Curtis (Eds.) Alternative Educational Delivery Systems: Enhancing Instructional outcomes for all students. Pp. 391-411. Bethesda, MD: National Association of School Psychologists.

This book provides a description of how instruction most effectively occurs for all students when teaching strategies. Deshler and colleagues describe the key components and instructional progression to teach the Strategies Intervention Model. The recommendations and strategies described are empirically validated across settings, teachers and students.

Jones, B. F. (l986). Quality and equality through cognitive instruction. *Educational Leadership*, 43, 4-11

The authors of this article provide rationale for direct instruction in cognitive strategies that includes higher-level thinking and provides growth in all levels of thinking for all students.

Kameenui, E. J. & Carnine, D. W. (1998). Effective teaching strategies that accommodate diverse learners. Upper Saddle River, NJ: Prentice-Hall, Inc.

Kameenui and Carnine focus this text on the specifics of teaching, instruction and curricula necessary to provide diverse learners a fighting chance in today's settings, in- as well as out-side the classroom. The authors describe concrete examples of how six key concepts (big ideas) in reading, mathematics, science, social studies and writing are taught, scaffolded, integrated and supported.

Kameenui. E.J., & Simmons, D. C. (1990). Designing instructional strategies: The prevention of academic learning problems. Columbus, OH: Merrill Publishing Co.

This text is designed for those who are teaching students who are at-risk for academic failure, students with learning disabilities, cognitive disabilities, or are emotionally disturbed. It is about the design and delivery components essential to effective instruction in special and general education settings. The authors provide information based on the premise that the technology of instruction is available to make positive differences for children's academic performance.

Kameenui, E. J. & Simmons, D.C. (1999). Toward successful inclusion of students with disabilities: The architecture of instruction. Vol. 1: An overview of Materials adaptations. Reston, VA: Council for Exceptional Children.

The authors have written this booklet as a part of the ERIC/OSEP Mini-Library and designed to assist educators engaged in curriculum adaptations for learners of all abilities in today's schools. This is the first of three volumes and it provides an overview regarding fundamental principles of curriculum adaptations.

Madigan, Hall, & Glang (1997). Effective assessment and instructional practices for students with ABI. In A. Glang, G H.S. Singer, & B. Todis (Eds.) *Students with Acquired Brain Injury: The School's Response.* Pp. 123-184.Baltimore, MD: Brookes Publishing Co.

The focus of this book is on educational issues relating to students with acquired brain injury (ABI), and describes approaches that have been effective in improving the school experiences for students with ABI. The chapter by Madigan, Hall, and Glang provides the reader with a description and case study examples regarding planning and carrying out instruction for students with ABI using explicit teaching procedures for the design and delivery of instruction.

Paris, S. G. (l986). Teaching children to guide their reading and learning. In T.E. Raphael (Ed.), *The contexts of school-based literacy*, Pp. ll5-l30. New York: Random House.

This chapter provides a rationale for direct instruction in reading strategies and describes a program (Informed Strategies for Learning) to provide direct instruction in comprehension that includes declarative, procedural, and conditional information about strategies.

Pearson, P.D., & Dole, J. A. (1987). Explicit comprehension instruction: A review of research and new conceptualization of instruction. *Elementary School Journal, 88* (2)

This article is a synthesis of research on three explicit instruction applications to comprehension instruction, reciprocal teaching, process training, and inference training. The authors conclude that we teach comprehension more effectively when using these explicit instructional approaches than by following the traditional basal reading paradigm of mentioning, practicing and assessing.

Roehler, L. R., Duffy, G. G., and Meloth, M. S. (l984). What to be direct about in direct instruction in reading: Content-only versus process-into-content. In Raphael, T. E. (Ed.), *The contexts of school-based literacy,* Pp. 79-95. New York: Random House

The authors argue for explicit instruction in reading processes and provide examples with particular references to low-aptitude students.

Rosenshine, B. (1997). Advances in research on instruction. In J.W. Lloyd, E.J. Kameenui and D. Chard (Eds.) Issues in educating students with disabilities Pp. 197-221. Mahway, N. J.: Lawrence Earlbaum

In this chapter, Rosenshine presents research-based instructional advancements from three bodies of research including (a) cognitive processing, (b) teacher effectiveness, and (c) cognitive strategies as applied to student learning. This research allows educators to articulate and implement a major goal of education; "helping students develop well-organized knowledge structures" (p. 217).

Tarver, S. G., (1996). Direct Instruction. In (W. Stainback and S. Stainback (Eds.) *Controversial Issues Confronting Special Education: Divergent Perspectives* (Second Ed.) Pp. 143-165. Boston: Allyn Bacon.

In this book chapter, Sara Tarver provides a clear and systematic explanation of direct instruction by means of a comparison to the constructivist/holistic approach. Here the author makes the case that effective instruction must incorporate principles from both behaviorism and holism.

Peer-Mediated Instruction and Intervention

By Tracey Hall, Ph.D., Senior Research Scientist, NCAC, and Andrea Stegila, RAS

Introduction

Teachers in general and special education classrooms are continually faced with instructional challenges as the diversity of students in classrooms widens. Researchers and practitioners are interested in implementing best practices that improve educational outcomes for all learners. One solution to overcoming these challenges is the implementation of Peer-Mediated Instruction and Intervention (PMII). Peer-mediated instruction is a widely applied and researched educational intervention in both general and special education settings. Peer-mediated instructional situations are flexible and may utilize many configurations. Several variations of empirically validated PMII implementations are summarized below. Numerous positive effects have been found in research conducted on varying forms of peer-mediated instruction. Four characteristics are common across all forms of PMII, these include: (a) assignment and training of students to roles in the PMII configuration, (b) students instruct one another, (c) teachers monitor and facilitate all PMII groups in the classroom, and (d) structures are designed to increase academic as well as social goals for all students.

Definition

Peer-Mediated Instruction and Intervention is an alternative classroom arrangement in which students take an instructional role with classmates or other students. Many approaches have been developed in which students work in pairs (dyads) or small cooperative learning groups. To be most effective, students must be taught roles in the instructional episode; to be systematic, elicit responses, and provide feedback. Research supports the use of these approaches as alternative practice activities, however, does not condone the use of peers for providing instruction in "new" instructional content.

Identifying Components/Features

Peer-Mediated Instruction and Intervention (PMII) provides alternatives to traditional classroom arrangements of lecture, demonstrations, independent study, etc. Students are taught roles by their teacher and, through these roles, systematically instruct other students. During this process, the teacher monitors and facilitates pupils' progress. The most frequently cited and researched goals of PMII are to build academic and social skills (e.g., Fuchs, Fuchs, Thompson, Svenson, Yen, Otaiba, Yang, McMaster, Prentice, Kazdan & Saenz, 2001; Greenwood, Arreaga-Mayer, Utley, Gavin, & Terry, 2001; Johnson, & Johnson, 1986; Locke, & Fuchs, 1995; Madden, & Slavin, 1983).

Peer Mediated Instruction and Intervention

- Students taught roles
- Students instruct
- Teachers monitor/facilitate
- Acadamic and social goals

Cooperative Learning

- Students grouped by teacher
- Students share knowledge in group

PMII Dyads

- Students paired by teacher
- Students take tutor and/or tutee role

Team Cooperative Learning

- Students remain in the same learning group for entire lesson
- Student Teams-Achievement Divisions
  - Cooperative Integrative Reading and Comprehension
  - Teams-Games-Tournaments

Group and Re-Group

- Students are in a specific group for only part of the time
- Group configuration is altered for the remainder of the lesson
  - Jigsaw
  - Team Assisted Individualization
  - Simple Structures; Numbered heads together; Co-op Co-op

Reverse Role

- Older students with disabilities instruct younger students with no disbilities
- Older student's goal: learn tutoring behaviors
- Younger student's goal: learn skills
- Both students benefit from interpersonal interaction

ClassWide Peer Tutoring

- Teams of dyads within the class-room environment
- Highly structured teaching procedures
- Daily point earning/public posting of points
- Direct practice of academic skills

Cross-Age Tutoring

- Older students with disabilities instruct younger similarly diisabled children
- Older student's goal: learn tutoring behaviors
- Younger students goal: learn academic skills
- Both students benefit from one-on-one interpersonal Interaction

Cooperative Learning

In Cooperative Learning, the teacher systematically organizes groups of three to six students to work and learn together. The students are often assigned roles in their group for completing the task. Students depend on each other to learn academic material while developing stronger social skills. Since the students work in a team to accomplish the academic goal, it produces a cooperative environment that can have a positive outcome for children of all abilities. Cooperative reward structures are used as incentive to encourage the pupils to learn the material (McMaster, & Fuchs, 2002; Tateyama-Sniezek, 1990). In other respects, specific Cooperative Learning activities (writing reports, worksheets, or preparing a presentation) differ greatly from each other.

The main difference between types of Cooperative Learning is dependant upon whether the structure of the group remains intact during the PMII sessions. Groups that remain intact for the entire session time are referred to as *Team Cooperative Learning.* For our purposes, groups that do *not* remain intact will be called *Group and Regroup*.

Team Cooperative Learning

A characteristic of Team Cooperative Learning is structural continuity during the learning session. Students are assigned team membership and work in those teams for the entire lesson.

- *Student Teams-Achievement Divisions (STAD)* was developed by researchers at Johns Hopkins University (Slavin, 1990 as cited in Maheady et al., 1991). After the teacher teaches a lesson, the students work in teams to make sure that everyone has mastered the new material. All students take quizzes, and the scores are compared to their previous test scores. If students meet or exceed their previous averages with their quiz scores, they get points that are summed according to team membership. Teams are rewarded based on predetermined criteria (Maheady et al., 1991).

- *Cooperative Integrated Reading and Comprehension (CIRC)* is a comprehensive program for teaching reading and writing in upper elementary grades. Teachers provide instruction to groups using the classroom curriculum. While the teacher works with one reading group, students in the other groups work in pairs with teammates on other reading and composition-related activities. CIRC follows the cycle of the teacher presenting, team practice, individual practice, peer assessment, and individual testing. Stevens, Madden, Slavin, & Farnish, 1987).

- *Teams Games Tournaments (TGT)* was developed by DeVries and Slavin (1978). It follows almost the same practice format as STAD, but instead of taking weekly quizzes, students participate in weekly tournaments. After weekly team practice, students are assigned to three-person tournament tables where they compete against peers of comparable ability. Students earn points for their teams during these tournaments. Student's points at different tables are worth the same amount, so regardless of ability, low and high achievers have equal opportunity for point-earning success (DeVries & Slavin, 1978).

Group and Regroup

This style of PMII is characterized by its structural change during the learning session. In all of these alternative teaching techniques, the students are assigned to a small group of students that they work with for part of the lesson. During the remainder of the time, the teacher lectures or they work in different groups. Therefore, during a learning session, the organization of the learning environment changes.

- *Jigsaw* was developed by Aronson and his colleagues in 1978 (as cited in Maheady et al., 1991), students are placed into three- to six-member heterogeneous learning groups. Each member of the group becomes an "expert" on a section of the lesson. The students are told to read their sections, and then meet in "expert groups" with other group members that read the same section. They discuss the material, identify the most important learning points, and return to their original groups to instruct team members about information in which they become "expert". Group members are responsible to learn all content from one another.

- *Team Assisted Individualization (TAI)* is a combination of cooperative learning and individualized instruction. Students are placed in an individual sequence of the learning material based on test performance. They proceed at their own pace, but their team checks daily practice sheets. Students earn points for their respective teams by passing final tests, completing multiple units, and handing in assignments. Students take their final unit tests individually (Slavin, Leavey, Madden, 1986 as cited in Maheady, Harper & Malette, 1991).

- *Simple Structures*: Kagan (1992) developed over 14 cooperative classroom structures, as opposed to traditional competitive structures. He has argued that competitive classroom structures set students against one another, whereas cooperative structures organize more positive social interactions among students. Some examples are:

    - *Numbered Heads Together (NHT)*: The teacher breaks the students into heterogeneous groups of one high achieving, two average, and one low-achieving student, and gives the students numbers 1-4. Then, the teacher lectures in the traditional format, and asks questions. The students turn to their group, and discuss the question so that every group member knows the answer. The teacher calls out a number, and only the team members with that number can raise their hand to answer the question. The goal of *NHT* is for all students to learn by working together, cooperatively. In addition, the social structure of the groups fosters heterogeneous friendships (Kagan, 1992).

    - *Co-op Co-op:* This structure has two levels to it: team learning and mini-topic learning. The order of tasks the students complete include: (1) Student-centered class discussion, (2) selection of heterogeneous student teams, (3) team building and skill development, (4) team topic selection, (5) mini-topic selection (experts), (6) mini-topic preparation, (7) mini-topic presentation, (8) preparation of team presentations, (9) team presentations, (10) reflection and evaluation. *Co-op Co-op* assumes that children are curious and want to learn, thus, it allows the children to be creative and teach others what they discover. Presently, there is little research to substantiate Kagan's *Simple Structures*, but it is believed that the structure could produce substantial benefits (1998).

PMII Dyads

This is a form of peer mediation in which the teachers organize the students in pairs. The students play the role of the tutor and/or the tutee, depending upon which type of PMII Dyads is being used. There are three methods of institutionalizing PMII Dyads: Reverse-Role Tutoring, Class-Wide Peer Tutoring, and Cross-Age Tutoring.

- ***Reverse-Role Tutoring*** is a form of PMII in which students with disabilities tutor a student who is younger and not disabled. The students' teachers and parents often organize Reverse-Role Tutoring outside of the general classroom environment. The role of tutor for the older student includes: (a) tutoring and interpersonal skills, and (b) provision of often needed practice in an academic area. The younger student, who is not disabled, is provided with the opportunity to practice and obtain mastery with the academic material. Data from research in this area has demonstrated that both students can benefit interpersonally from the one-on-one interaction in a tutoring situation (Top, & Osguthorpe, 1987).

- ***Class-Wide Peer Tutoring (CWPT)*** uses the structure of dyads created by the teacher. The unique feature is that all peer-tutoring groups are orchestrated within the classroom. The students are specifically instructed on how to tutor one another, so that each tutee has the benefit of one-on-one instruction and feedback for half of the time period. After the tutee completes the assigned tasks and earns points for their progress, the students switch roles. The point earnings of the dyads are posted in the classroom. Since the students are rewarded as a pair, the tutor is as invested in the exercise as the tutee. Some researchers that have been working on CWPT are: Johnson & Johnson, (2000) and Maheady, Harper, Sacca, & Greenwood (1998).

- ***Cross-Age Tutoring*** is commonly used outside of the general classroom environment. Teachers and parents typically set up Cross-Age Tutoring. Older students with disabilities instruct younger children with similar disabilities. As in Reverse-Role Tutoring, the tutor role teaches the older student tutoring skills and the tutee role teaches the younger student academic material. The younger and older students benefit socially from the tutoring environment and learn the academic content (Maher, 1984).

Applications to General Education Classroom Settings

Varying forms of Peer Mediated Instruction and Interventions have been conducted in a great range of settings over the decades. Research has been conducted in educational and non-educational environments with positive outcomes in each. While the focus of this paper has included varying forms of application, the major focus has been the educational setting. It is important to note that PMII strategies are not restricted or inclusive to education or special education, but have been found to be effective in each—as well as inclusive classroom settings. The following characteristics have been identified by Kulik & Kulik (1992), as central for successful implementation of Peer Mediated Instruction.

- *Expectations for student learning*. Teachers should establish high expectation levels. No students are expected to fall below the level of learning needed to be successful at the next level of education.

- *Careful orientation to lessons.* Teachers must clearly describe the relationship of a current lesson to previous study. Students are reminded of key concepts or skills previously covered.
- *Clear and focused instructions to participants.*
- *Close teacher monitoring of student progress.* Frequently formal and informal monitoring of student learning by teachers. Teachers must require that students are accountable for their product and learning.
- *Re-teach*. If students show signs of confusion, misinterpretation or misunderstanding, the teacher must be responsible to teach again.
- *Use class time for learning*. Students must pace themselves and should be monitored for task completion.
- *Positive and personal teacher and student interaction.* Cooperative Learning and Peer Tutoring Strategies are instruction methods of choice in many classrooms as they are noted for preventing and alleviating many social problems related to children, adolescents, and young adults.

Evidence of Effectiveness

There is an extensive research literature in the areas of peer mediation and tutoring. In a meta-analysis on PMII, Johnson, Johnson & Stanne (2000) report that over 900 studies on social interdependence were found. Of those, 164 studies evaluated the impact of a PMII procedure on student achievement. Most of these studies were conducted since 1970. However, research is noted to have occurred over the last century.

In total, 194 comparisons of PMII and control methods were identified since some studies compared multiple methods. The widespread base of use is due to three factors, (a) clear theoretical base, (b) solid research-based validation, and (c) clear procedural applications that have made operationalizing the varying types of PMII reasonable for educators. Forms of Peer Mediated Instruction and Intervention are reported to be the instructional method of choice for preventing and alleviating many of the social problems related to children, adolescents, and young adults (Johnson, Johnson, & Stanne, 2000).

The research in PMII is not only extensive but broad-ranged. The characteristics of these studies are large. In relation to age, studies have been conducted at all formal education levels and beyond, including elementary to post secondary (higher education and adult settings). Research has also been conducted across groups, minority, gender and countries. In addition to North America, Johnson et al. cite studies conducted in Southeast Asia, Africa, the Middle East and Europe. Finally, PMII research includes studies focusing on a range of ability—students with mild disabilities, participants with physical and cognitive disabilities, English language learners, and non-disabled learners.

Effectiveness of PMII on the whole has been positive. Researchers have focused on varying outcomes over a range of studies and years. These include achievement, higher-level reasoning, retention, on-task behavior, generalization and transfer of skills knowledge, social and cognitive development, interpersonal interaction, social support, self-esteem, social competencies, internalization of values, and many other outcomes.

Affects on Tutors and Tutees

In 1982, Cohen, Kulik, and Kulik conducted a meta-analysis in which they report on peer and cross-age tutoring research prior to the past decade. Their results showed a moderately beneficial effect on tutees achievement, and a smaller but significant effect on their attitudes toward subject matter. Looking at the effects on tutors, these researchers found a small but significant effect for academic outcomes and for self-concept, and a slightly larger effect for attitudes toward subject matter. Tutees' achievement improved more in more structured programs of shorter duration, and when lower-level skills were taught and tested on locally developed examinations.

Elbaum, B., Moody, S. W., Vaughn, S., Schumm, J. S., & Hughes, M. (2001) reported clear benefits to tutoring when the students with disabilities acted as reciprocal tutors/tutees and, in cases when they were only tutees, in relation to achievement outcomes. Additionally, these researchers reported the benefit of increased student self-esteem when in the teacher role. With regard to cross-aged tutoring, the effects were very high for the tutors, less so for cross-age tutees. Finally, they found that outcomes for students with disabilities varied depending on the particular focus of instruction. Clearly, more research is called for with regard to this question.

Achievement Outcomes

In mathematics, benefits for both tutors and tutees have been shown at the elementary level in skill areas including ratio, proportion, and perspective taking, among others. Significant beneficial effects for students have been noted consistently in an extensive series of studies in language arts. In tutoring structures, significant positive outcomes were noted for tutees and tutors. Areas of Language arts investigated include comprehension strategies, phonemic skills, vocabulary acquisition, story grammar, general decoding skills, fluency practice, and sight word identification (Barbetta et al., 1991; Giesece, et al, 1993; Palincsar & Brown, 1984; Wheldall & Colmar, 1990; and Wheldall & Mettem,1985). Positive achievement outcomes were noted in research studies conducted in other academic areas such as science, health, art, and social studies (Anliker et al., 1993; Maheady, Sacca, & Harper, 1988; Rosenthal, 1994; and Thurston, 1994). Studies in PMII with applications to physical education have also been conducted with positive outcomes (Block, Oberweiser, & Bain, M., 1995).

Ranking of Cooperative Learning Methods

Johnson et al (2000) included a ranking of the most frequently researched cooperative learning methods based on effect sizes. The largest effects were found for Learning Together followed by Constructive Controversy, Teams/Games/Tournaments, and Group Investigation methods. Each of the methods were found to have significantly higher achievement outcomes than did other comparison learning structures. Additionally, the methods were evaluated on five dimensions: (a) ease of learning the method, (b) ease of initial class use, (c) ease of long-term use, (d) applicability to a range of subjects and grades, and (e) ease of adapting the method to conditions. In each ranking the method of Learning Together ranked the highest, the other seven conditions include Teams/Games/Tournaments, Academic Controversy, Jigsaw, Team Assisted Individualization, Cooperative Integrated Reading and Composition, Group Investigation, and Student Teams-Achievement Divisions.

Links to Learn More About Peer Mediated Instruction and Intervention

Cooperative Learning Strategies
www.scps.k12.fl.us/staff_development/index.cfm?fuseaction=coursestrat

This Web site contains information about cooperative learning strategies such as: Jigsaw, Number Heads Review, think/write and pair/share, semantic web, advanced organizers, pair problem solving, and more. There are a total of 14 different strategies to use in the classroom.

The Cooperative Learning Network
http://home.att.net/~clnetwork

This Web site contains teaching resources from the classroom of Laura Candler. This site includes links and information about music, team management ideas, and cooperative learning worksheets that can be viewed from The File Cabinet and printed. Candler's site also links to the Web site of Dr. Spencer Kagan.

Cooperative Learning
http://www.sci.sdsu.edu/BFS/first/coop.html

The NSF funded FIRST project helps faculty develop skills to include more active, field-centered learning in their curricula. This site provides a series of links to sites with definitions, articles, ideas about Cooperative Learning strategies. The site houses information to other agencies, businesses, universities and schools with examples, articles and ideas about cooperative learning strategies

Grouping Practices for Effective Student Achievement
http://ericec.org/osep/newsbriefs/news7.html

The focus of this News Brief is to describe the evidence of effectiveness for instructional grouping formats, especially dyads. Through the ERIC Clearinghouse on Disabilities and Gifted Education (ERIC EC), CEC operates the ERIC/OSEP Special Project. The ERIC/OSEP Special Project tracks and disseminates federally funded special education research for practitioners through various publications and conferences.

J.F.K. Center for Research on Human Development—Vanderbilt University
http://www.vanderbilt.edu/kennedy/topics/peers.html

Researchers Douglas Fuchs and Lynn S. Fuchs, along with the public school systems in Tennessee, have developed the Peer-assisted Learning Strategies (PALS), a version of class-wide peer tutoring. This site provides a description of development, implementation and research of the PALS program. Additionally, teacher and student comments and notes from the field are included.

Jigsaw Lesson
www.public.asu.edu/~ledlow/sledlow/jigsaw.htm

Susan Ledlow the Director, Instructional Innovation Network, Center for Learning and Teaching Excellence at University of Arizona created this Web site. Ledlow provides ideas and information about Jigsaw procedures. She has developed some guidelines and direction about the Jigsaw "cooperative learning" procedure: http//bestpractice.net

Jigsaw Classroom
http://www.jigsaw.org/

This Web site is designed to share some of the results from Professor Elliott Aronson's research on cooperative learning techniques. This site includes a history of the Jigsaw Cooperative Learning technique.

Office of Research, Education Consumer Guides: Cooperative Learning
http://www.ed.gov/pubs/OR/ConsumerGuides/cooplear.html

This Web site provides a summary of information on different types of cooperative learning. The authors describe Cooperative Learning in general and provide the reader with information on specific structures of Cooperative Learning, and a short summary of results in research conducted on Cooperative Learning projects in schools.

Peer Tutoring and Cross-Age Tutoring (2001)
http://www.nwrel.org/scpd/sirs/9/c018.html

The School Improvement Research Series from the Northwest Regional Educational Laboratory provides a series of papers based on education research. The aim of these papers is to assist with the research-to-practice "gap". This paper focuses on Peer and Cross-Age Tutoring structures. The authors provide definitions for each, a comparison of these classroom techniques, as well as the purpose and function in classrooms with evidence from some of the research conducted in peer tutoring. Additionally, the authors identify frequent barriers and procedures to overcome these typical, yet remediable problems. The benefits for both tutors and tutees are clearly described.

Prentice Hall School/Professional Development
www.phschool.com/professional_development/assessment/rub_coop_process.cfm

Pearson Education, Inc., publishing as Prentice Hall author this site. Included are a Cooperative Learning Project Rubric and a Cooperative Learning Project Evaluation Form. The categories covered in these forms are Group Participation, Shared Responsibility, Quality of Interaction, and Roles Within The Group. The rubric describes four performance areas; Exceptional, Admirable, Acceptable, and Amateur. Included in this Web site are links to The Cooperative Learning Center at the University of Minnesota, and to the Pearson Education, Inc. site.

References

Anliker, J.A., Drake, L.T., & Pacholski, J. (1993). Impacts of a multi-layered nutrition program: Teenagers teaching children. *Journal of Nutrition Education, 25,* 140-3.

The focus of this research included nutrition content in a peer tutoring structure in which teenagers were trained to teach younger students. Pre- and post-assessments of nutrition knowledge were conducted on the tutors. Results indicate that these teenagers as tutors made substantial gains in their own nutrition knowledge. However, tutor knowledge gains did not necessarily lead to changes in eating habits. Although attempts were made to collect data from the tutees in pre-and post-assessments, this proved difficult to do and therefore such material was not attained. More research is necessary to examine the impact of this nutrition education program on the teenagers' eating habits, to assess any changes in their self-esteem, and to evaluate the effects of the program on the nutritional knowledge and practices of the younger children.

Barbetta, P.M., Miller, A.D., & Peters, M.T. (1991). Tugmate: A cross-age tutoring program to teach sight vocabulary. *Education and Treatment of Children, 14,* 19-37.

The purpose of this study was to evaluate the effectiveness of Tugmate, a cross-age tutoring program, on the acquisition, generalization, and maintenance of sight vocabulary. Tutor performance and teacher and student perceptions of the cross-age tutoring program were also evaluated. Behaviors measured included (a) number of sight vocabulary words mastered; (b) daily tutee performance during pretesting, tutoring, and maintenance; (c) words read in sentences during all conditions; (d) tutor performance; and (e) tutor, tutee, and staff perceptions of the program. All students acquired and maintained a substantial number of new sight vocabulary words after tutoring and mastery were accomplished in only a few sessions. The results of this study also indicate that training high school students can be successful without requiring too much trainer or tutor time.

Block, M.E., Oberweiser, B., & Bain, M. (1995). Using classwide peer tutoring to facilitate inclusion s with disabilities in regular physical education. *Physical Educator*, *52*, 1, 47-56.

The authors report on classwide peer tutoring (CWPT), a form of peer-mediated instruction, as one teaching style that can solve the problem of heterogenous grouping and inclusion in general physical education classes. They present general CWPT procedures, student training in CWPT, and examples using data collection procedures and exercises with second grade students. The authors found that students were more successful using CWPT than with teacher-mediated approaches, and that students with disabilities were accommodated more appropriately than in traditional physical education.

Cohen, P.A., Kulik, J.A., Kulik, C.C. (1982). Educational outcomes of tutoring: A meta-analysis of findings. *American Educational Research Journal, 19(2),* 237-248.

The authors examined the efficacy of school tutoring programs through a meta-analysis from 65 independent evaluations of school tutoring programs for school-age children.

They concluded that tutoring programs had significant and positive effects on academic performance and attitudes of those who receive tutoring, as well as children who serve as tutors. Neither tutors nor tutees changed dramatically in self-esteem as a result of tutoring programs. Finally, the meta-analysis raised some new questions about tutoring.

DeVries, D.L., & Slavin, R.E. (1978). Teams-Games-Tournaments: Review of ten classroom experiments. *Journal of Research and Development in Education, 12,* 1, 28-38.

In this article, the authors described a classroom program, Teams-Games-Tournaments (TGT), which addressed student values, student diversity, and basic skills and how each may improve learning. The authors provided information about how TGT works, its origins, research conducted to date, implications for teachers and researchers, how TGT is used in the classroom, and new directions for TGT. This program had relatively consistent positive effects on academic achievements, mutual concern, race relations, and peer norms supportive of academic achievement. Teachers can use TGT to enhance learning in any subject by giving students real reasons to master the material.

Elbaum, B., Moody, S. W., Vaughn, S., Schumm, J. S., & Hughes, M (1999). The Effect of Instructional Grouping Format on the Reading Outcomes of Students with Disabilities: A Meta-Analytic Review. www.ncld.org/research/osep_reading.cfm

This is a paper contained on the National Center for Learning Disabilities Web site. The authors have written an executive summary that focuses on reading interventions. Several structures of Peer Mediation and Interventions are noted.

Fuchs, D., Fuchs, L.S., Thompson, A., Svenson, E., Yen, L., Otaiba, S.A., Yang, N., McMaster, K.N., Prentice, K., Kazdan, S. & Saenz, L. (2001). Peer-assisted learning strategies in reading. *Remedial And Special Education, 22*, 1, 15-21.

In this article, the authors describe the rationale for the development of Peer-Assisted Learning Strategies (PALS) and provide a general overview of the program. In addition, they illustrate why additional PALS activities are required in order to address younger and older students' developmental needs. PALS is a modification of ClassWide Peer Tutoring that has been shown to enhance the reading development of low- and average-achieving students, as well as children diagnosed with learning disabilities, when implemented in grades 2-6 mainstream settings.

Giesecke, D.; Cartledge, G.; and Gardner, R. (1993). Low-Achieving Students as Successful Cross-Age Tutors. *Preventing School Failure* 37 (3), 34-43.

Four tutees correctly identified more sight words after a six-week tutoring program than they had before the program. This research, according to the authors, further validates the positive effects of peer tutoring, particularly as they relate to low-achieving students as tutors.

Greenwood, C.R., Arreaga-Mayer, C., Utley, C.A., Gavin, K.M., & Terry, B.J. (2001). Classwide peer tutoring learning management system: Applications with elementary-level English language learners. *Remedial And Special Education, 22*, 1, 34-47.

The authors report on the use of the ClassWide Peer Tutoring Learning Management System (CWPT-LMS), which is a form of intra-class, same-age, reciprocal peer tutoring designed for children. This particular study involved the literacy instruction of elementary English language learners (ELL) with Spanish as the primary language. It included 5 ELL teachers and 117 students in grades one through five in a multiracial/multiethnic urban elementary school. Results indicated that ELL made considerable progress in mastering new English sight vocabulary and spelling words over periods ranging from 15 to 21 weeks. In addition, both the students and teachers report a high level of satisfaction with the ClassWide Peer Tutoring program.

Johnson, D.W., & Johnson, R.T. (1986). Mainstreaming and cooperative learning strategies. *Exceptional Children 52, 6, 552-61.*

Johnson and Johnson found that Cooperative Learning had strategies congruent with the goals of integrating students with disabilities into general education classrooms. The authors identified essential elements of cooperative learning and specific actions for teachers to implement for most effective student results. In their research, they found that when appropriately conducted, students with disabilities in cooperative learning situations developed positive relationships with non-disabled peers during instructional and free time. Additionally, they found increased friendships resulting from cooperative learning experiences.

Johnson, D.W., Johnson, R.T., Stanne, M.B. (2000). Cooperative Learning Methods: A Meta-Analysis http://www.clcrc.com/pages/cl-methods.html

This Web site contains the entire document that is a meta-analysis of the research on cooperative learning methods from the mid-1960s to 1999. Many procedures had a significant positive impact on student achievement. The effectiveness of cooperative learning is illustrated in the results, which showed strong positive effects with consistency across a diversity of the procedures.

Kagan, S. (1994). Cooperative Learning. San Juan Capistrano, CA: Kagan Cooperative Learning.

The authors of this text provide explanations regarding the basic tenets of cooperative learning. The book is divided into sections for cooperative learning methods, lesson designs and learning beyond the classroom. Kagan organized and designed the book as a resource for teachers to incorporate tested cooperative learning strategies and activities into classrooms.

Kulik, J.A., & Kulik, C.C., (1992). Meta-analytic findings on grouping programs. *Gifted Child Quarterly, 36,* 73-77.

The authors conducted a meta-analysis examine the effects of grouping students by ability. Five types of instructional grouping were the focus of the analyses, these included multilevel classes, cross-grade grouping, within-class grouping, enriched classes for the gifted and talented and accelerated classes for the gifted and talented. Results indicate that students of higher ability generally receive the most benefits.

Students in lower ability groups had some benefits, but their gains were not as substantial as those for the students in the higher ability groups. Although grouping did not benefit all ability levels, grouping was not an academic detriment for any students.

Maheady, L., Harper, G.F., & Mallette, B. (1991). Peer-mediated instruction: A review of potential applications for special education. *Reading, Writing, and Learning Disabilities, 7*, 75-103.

In a multiple baseline design research study including students with mild disabilities and their non-disabled peers, the authors found positive outcomes using Classwide Peer Tutoring (CWPT) practices. Implementation of CWPT produced positive academic outcomes, 60A% of the class earned A- grades, and no students obtained a grade below C, including the students with disabilities. The authors include recommendations and discussion about implications of CWPT at the secondary level.

Maheady, L.; Sacca, M. K.; and Harper, G. F. (1988). "Classwide Peer Tutoring With Mildly Handicapped High School Students." *Exceptional Children* 55/1 52-59.

The authors report on the effects of Classwide Peer Tutoring (CWPT) on the academic performance of 14 students with disabilities and 36 non-disabled peers in tenth grade classes. Randomly assigned tutor-tutee pairs quizzed each other verbally using study guides and took written weekly quizzes. Points were rewarded to teams for good quiz scores. Quiz scores progressed from 70 percent during baseline, to approx. 90 percent for students with and without disabilities in this multiple baseline research design.

Maher, C.A. (1984). Handicapped adolescents as cross-age tutors: Program description and evaluation. *Exceptional Children, 51,*1, 56-63.

The author designed a multi-element cross-age tutoring program with implementation in multiple school settings. A program description and outcomes are reported in this article. Maher reports that the program can be effective in enhancing academic performance of both tutors and tutees.

McMaster, K.N., & Fuchs, D. (2002). Effects of cooperative learning on the academic achievement of students with learning disabilities: An update of Tateyama-Sniezek's review. *Learning Disabilities Research & Practice, 17*, 2 107-117.

McMaster and Fuchs reviewed the literature from 1990 to 2000 researching the effects of cooperative learning strategies on the academic performance of students with disabilities. This study was designed as an update to the Tateyama-Sniezek 1990 review. The authors found that achievement outcomes are mixed. However, they did report that cooperative learning strategies that incorporated individual accountability and group rewards are more likely to impact the academic outcomes for students with disabilities. They caution that additional well-designed research is needed for conclusive evidence.

Palincsar, A.S., & Brown, A.L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction*, 2, 117-175.

Palincsar and Brown conducted two experiments that studied whether reciprocal teaching could improve 7th-grade students with poor comprehension skills ability to learn from texts. The first experiment involved 24 poor readers and 13 average readers and compared reciprocal teaching to a typical classroom teaching method. Reciprocal teaching, including the activities of summarizing, questioning, clarifying and predicting, led to improvements in the quality of summaries and questions, gains in criterion tests, reliable maintenance over time, task transfer, and generalization to the classroom setting. The second experiment included 21 students and replicated many of the results as the first. In addition, the second experiment helped the authors to understand the underlying cognitive mechanisms involved in reading and studying.

Rosenthal, S. (1994). Students as Teachers: At-risk high school students teach science to fourth-graders. *Thrust for Educational Leadership,* 23, 36-8.

Rosenthal reviews a unique program developed by two schools, in which at-risk high school students taught science to a class of fourth-grade elementary students. This project gave the high school students an opportunity to take on the full responsibilities of a teacher, including, preparation of all lesson materials, preparing the lessons, meeting with adults, and getting to and from the school. After each lesson, the fourth-grade teacher met with the teenage teachers to reflect on the lesson. This pilot project received positive feedback from both the high school and fourth grade students. It provided the at-risk high school students with responsibility, expectations, and acceptance. In addition, the fourth-grade students produced the highest quality writing they had ever done in their journal entries and letters.

Slavin, R.E. (1983). When does cooperative learning increase student achievement? *Psychological Bulletin, 94*, 3, 429-445.

In this article, Slavin reviews research on the achievement effects of cooperative learning methods, where students work in small groups to learn academic materials. Field experiments lasted two weeks and took place in elementary and secondary schools. The results reported that among cooperative learning methods in which students study the same material together, only methods that provide group rewards based on group members' individual learning consistently increase student achievement. In addition, cooperative learning methods in which each group member had a unique subtask resulted in positive achievement effects only if group rewards were provided. The authors conclude that group rewards and individual accountability are held essential to the instructional effectiveness of cooperative learning methods.

Stevens, R.J., Madden, N.A., Slavin, R.E., & Farnish, A.M. (1987). Cooperative integrated reading and composition: Two field experiments. *Reading Research Quarterly, 22,*433-454.

The authors conducted two studies evaluating a comprehensive cooperative learning approach to elementary reading and writing, known as Cooperative Integrated Reading and Composition (CIRC). Using CIRC, third- and fourth-grade students worked in learning teams for reading, language arts, and writing activities for twelve weeks and six weeks, respectively. The authors found significant effects in favor of the CIRC students in both studies on standardized measures of reading comprehension and

vocabulary, language mechanics, learning expression and spelling. The CIRC students also performed better on writing sample and oral reading measures. The authors conclude that these two field studies demonstrate that when classroom motivation, organization and instruction are integrated in the context of a cooperative learning program, student achievement in reading and writing improves.

Thurston, J.A. (1994). Art partners: A new focus on peer teaching. *School Arts*, 94, 41-2.

Thurston conducted a study entitled 'art partners,' a cross-age tutoring program that provides high school students with the instruction and opportunity to teach art to elementary students. The high school art students worked in cooperation with an elementary art teacher to present lessons on a bi-weekly basis for a year. The lessons included art history, aesthetics, criticism and production components. At the end of the program, the high school students completed evaluation reports and reported a gain in insight and greater understanding of themselves. The elementary teachers' responses to having high school teachers in their art classes were also positive.

Tateyama-Sniezek, K.M. (1990). Cooperative learning: Does it improve the academic achievement of students with handicaps? *Exceptional Children, 55,*5,426-437.

The author provides a review to date of research on the effects of cooperative learning on the academic performance of students with disabilities. A small number of studies met the criterion for inclusion in this study. The author concludes that additional research in this area must be conducted for conclusive evidence.

Top, B.L., & Osguthorpe, R.T. (1987). Reverse-role tutoring: The effects of handicapped students tutoring regular class students. *The Elementary School Journal, 87,* 4, 413-423.

The authors present information regarding the effects of students with disabilities tutoring younger, children without disabilities in reading. Participants in the study included 78 fourth- through sixth-grade students with learning disabilities or behavior disorders and 82 first graders without identified disabilities. All students were individually measured on reading ability prior to, and following twelve weeks of tutoring. Three attitudinal (self-esteem) measures were administered to students with disabilities. The authors reported that tutors self-esteem scores increased in perception of 'general academic' and 'reading/spelling' ability. Results from the tutoring intervention indicate that tutors and tutees scored significantly higher on both criterion and standardized reading measures than students assigned to control groups.

Wheldall, K., & Colmar, S. (1990). Peer tutoring for low-progress readers using 'pause, prompt and praise. In H.C. Foot, M.J. Morgan & R.H. Shute (Eds.) *Children Helping Children. New York: John Wiley & Sons Ltd.*

In this chapter, Wheldall and Colmar review eight different peer-tutoring studies conducted using 'Pause, Prompt and Praise' procedures. To measure the effectiveness of this procedure on reading, both tutor and tutees were compared before, during and after the period of tutoring. The authors were able to draw a number of tentative conclusions. Peer tutors can learn the 'Pause, Prompt and Praise' procedures quickly

and easily, as well as show a gain in reading skill because of their tutoring. In addition, setting up a peer-tutoring program requires some preliminary effort from teachers and provision for continual monitoring of the behavior of both tutors and tutees.

Wheldall, K., & Mettem, P. (1985). Behavioural peer tutoring: Training 16-year-old tutors to employ the 'pause, prompt, and praise' method with 12-year-old remedial readers. Educational Psychology, 5,1, 27-44.

Wheldall and Mettem conducted an experiment in which low-achieving 16-year-olds received training to help the reader to develop self-correction strategies and independence by reinforcing desired behaviors. The effectiveness of training such tutors was investigated through a tutorial program in which these 16-year-old students tutored twelve-year-olds with a low reading ability. The program consisted of 24 tutorial sessions over eight weeks. The tutees took a pre-test, post-test and delayed post-test measuring their reading ability and accuracy. In addition, each tutoring session was tape recorded for review after the program. The test results indicate a significant increase in the tutees reading accuracy by the end of the program. The authors report that the behavioral 'Pause, Prompt and Praise' technique offers a trainable set of tutoring behaviors that are effective and easily monitored.

Additional Resources used to complete this summary

Campbell, B.J., Brady, M.P.,& Linehan, S. (1991). Effects of peer-mediated instruction on the acquisition and generalization of written capitalization skills. *Journal o f Learning Disabilities, 24,* 1, 6-14.

Cook, S.B., Scruggs, T.E., Mastropieri, M.A., & Casto, G.C. (1985). Handicapped students as tutors. *The Journal of Special Education, 19,*4, 483-492.

Cosden, M., Pearl, R., & Bryan, T.H. (1985). The effects of cooperative and individual goal structures on learning disabled and non-disabled students. *Exceptional Children, 52,*2, 103-114.

Cushing, L.S., & Kennedy, C.H. (1997). Academic effects of providing peer support in general education classrooms on students without disabilities. *Journal of Applied Behavior Analysis, 30,* 139-151.

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Fuchs, L.S., Fuchs, D., Hamlett, C.L., Phillips, N.B., Karns, K., & Dutka, S. (1997). Enhancing students' helping behavior during peer-mediated instruction with conceptual mathematical explanations. *The Elementary School Journal, 97,* 3, 223-249.

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Harper, G.F., Mallette, B., & Moore, J. (1991). Peer mediated instruction: Teaching spelling to primary schoolchildren with mild disabilities. *Reading, Writing, and Learning Disabilities, 7*, 137-151.

King-Sears, M.E. (2001). Institutionalizing peer-mediated instruction and interventions in schools: Beyond "train and hope". *Remedial And Special Education, 22*, 2, 89-101.

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Locke, W.R., & Fuchs, L.S. (1995). Effects of peer-mediated reading instruction on the on-task behavior and social interaction of children with behavior disorders. *Journal of Emotional and Behavioral Disorders, 3,* 2, 92-99.

Madden, N.A., & Slavin, R.E. (1983). Effects of cooperative learning on the social acceptance of mainstreamed academically handicapped students. *The Journal of Special Education, 17*, 2, 171-182.

Maheady, L., Harper, G.F., & Mallette, B. (2001). Peer-mediated instruction and interventions and students with mild disabilities. *Remedial and Special Education, 22* (1) 4-14.

Maheady, L., Harper, G.F., & Sacca, M.K. (1988). Peer-mediated instruction: A promising approach to meeting the diverse needs of LD adolescents. *Learning Disabilities Quarterly, 11,* 108-113.

Maheady, L., Sacca, M.K., & Harper, G.F. (1987). Classwide student tutoring teams: The effects of peer-mediated instruction on the academic performance on secondary mainstreamed students. *The Journal of Special Education, 21,*3, 107-121.

Maheady, L., Sacca, M.K., & Harper, G.F. (1988). Classwide peer tutoring with mildly handicapped high school students. *Exceptional Children, 55*(1), 52-59.

Moskowitz, J.M., Malvin, J.H., Schaeffer, G.A., & Schaps, E. (1985). Evolution of jigsaw, a cooperative learning technique. *Contemporary Educational Psychology,10,* 104-112.

Simmons, D.C., Fuchs, L.S., Fuchs, D., Mathes, P., & Hodge, J.P. (1995). Effects of explicit teaching and peer tutoring on the reading achievement of learning-disabled and low-performing students in regular classrooms. *The Elementary School Journal, 95,* 5, 387-408.

Pomerantz, D.J., Windell, I.J., & Smith, M.A. (1994). The effects of class-wide peer tutoring and accommodations on the acquisition of content area knowledge by elementary students with learning disabilities. *Learning Disabilities Forum, 19,* 2, 28-32.

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Vaughn, S., Klingner, J.K., & Bryant, D.P. (2001). Collaborative strategic reading as a means to enhance peer-mediated instruction for reading comprehension and content-area learning. *Remedial And Special Education, 22*, 2, 66-74.

Graphic Organizers

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Introduction

One way to help make a curriculum more supportive of students and teachers is to incorporate graphic organizers. Graphic organizers come in many varieties and have been widely researched for their effectiveness in improving learning outcomes for various students. The following five sections present a definition of graphic organizers, a sampling of different types and their applications, a discussion of the research evidence for their effectiveness, useful Web resources, and a list of referenced research articles. We have focused this overview on applications of graphic organizers to reading instruction, with the intention of later expanding the discussion into other subject areas.

Definition

A graphic organizer is a visual and graphic display that depicts the relationships between facts, terms, and or ideas within a learning task. Graphic organizers are also sometimes referred to as knowledge maps, concept maps, story maps, cognitive organizers, advance organizers, or concept diagrams.

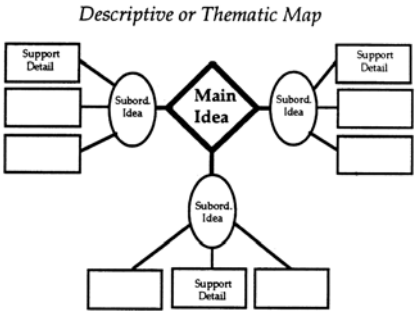
Types of Graphic Organizers

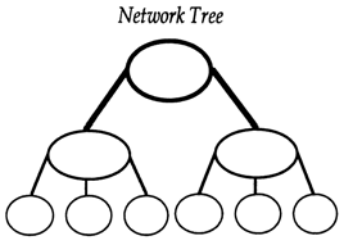
Graphic organizers come in many different forms, each one best suited to organizing a particular type of information. The following examples are merely a sampling of the different types and uses of graphic organizers.

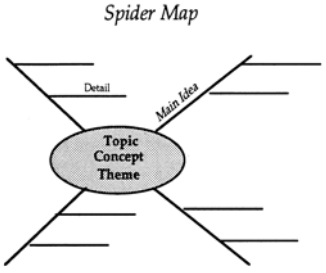
A **Descriptive or Thematic Map** works well for mapping generic information, but particularly well for mapping hierarchical relationships.

Organizing a hierarchical set of information, reflecting superordinate or subordinate elements, is made easier by constructing a **Network Tree.**

When the information relating to a main idea or theme does not fit into a hierarchy, a **Spider Map** can help with organization.





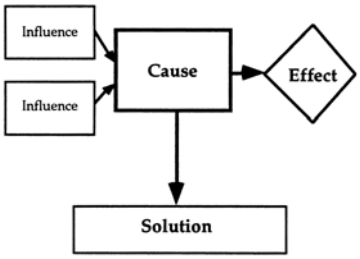


When information contains cause and effect problems and solutions, a **Problem and Solution Map** can be useful for organizing.

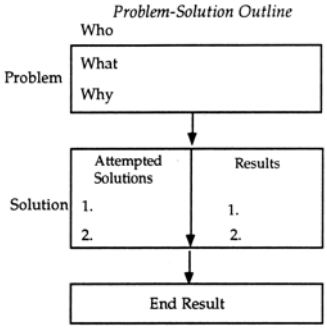
A **Problem-Solution Outline** helps students to compare different solutions to a problem.

A **Sequential Episodic Map** is useful for mapping cause and effect.

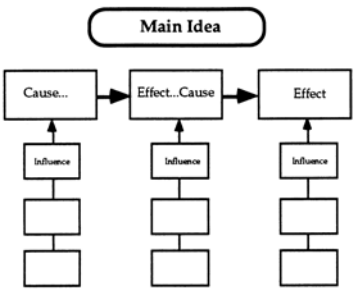
Problem and Solution Map



Problem-Solution Outline



Sequential Episodic Map

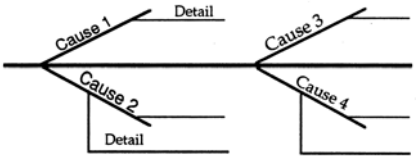


When cause-effect relationships are complex and non-redundant a **Fishbone Map** may be particularly useful.

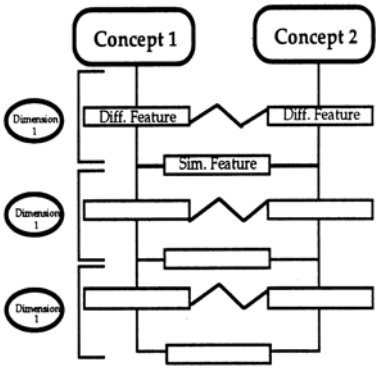
A **Comparative and Contrastive Map** can help students to compare and contrast two concepts according to their features.

Another way to compare concepts' attributes is to construct a **Compare-Contrast Matrix**.

Fishbone Map



Comparative and Contrastive Map

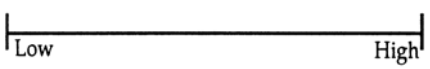


Compare-Contrast Matrix

Attribute 1		
Attribute 2		
Attribute 3		

Continuum Scale is effective for organizing information along a dimension such as less to more, low to high, and few to many.

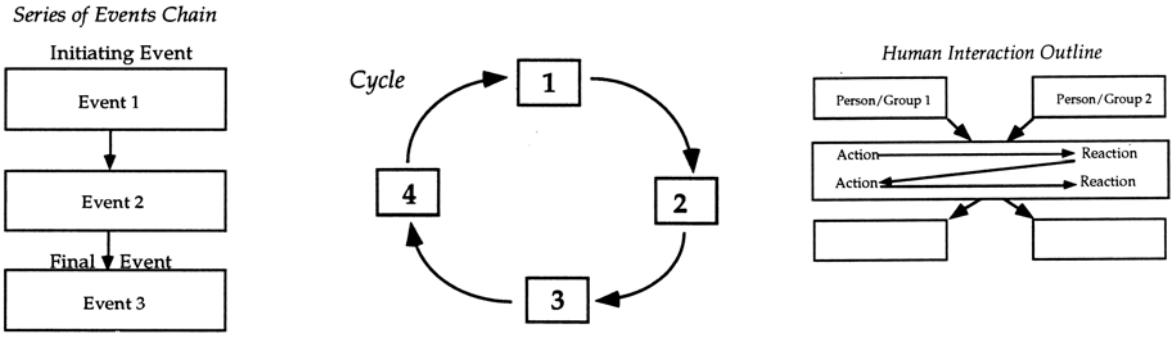
Continuum Scale



A **Series of Events Chain** can help students organize information according to various steps or stages.

A **Cycle Map** is useful for organizing information that is circular or cyclical, with no absolute beginning or ending.

A **Human Interaction Outline** is effective for organizing events in terms of a chain of action and reaction (especially useful in social sciences and humanities).



Applications Across Curriculum Areas

Graphic organizers have been applied across a range of curriculum subject areas. Although reading is by far the most well studied application, science, social studies, language arts, and math are additional content areas that are represented in the research base on graphic organizers. Operations such as mapping cause and effect, note taking, comparing and contrasting concepts, organizing problems and solutions, and relating information to main ideas or themes can be beneficial to many subject areas. The observed benefits in these subject areas go beyond those known to occur in reading comprehension (Bulgren, Schumaker, & Deshler, 1988; Darch, Carnine, & Kammenui, 1986; Herl, O'Neil, Chung, & Schacter, 1999; Willerman & Mac Harg, 1991).

Evidence for Effectiveness

There is solid evidence for the effectiveness of graphic organizers in facilitating learning. Ten of the 12 studies investigating effects of graphic organizer use on learning reviewed here reported some positive learning outcome. We focus this overview on two main areas: comprehension and vocabulary knowledge.

Comprehension

By far the most frequently investigated learning measure in the studies we reviewed is comprehension. Of 15 studies, 7 (Boyle & Weishaar, 1997; Bulgren et al., 1988; Darch et al., 1986; Gardill & Jitendra, 1999; Idol & Croll, 1987; Sinatra, Stahl-Gemake, & Berg, 1984; Willerman & Mac Harg, 1991) reported that graphic organizer use elevated comprehension. Comprehension measures included the Stanford Diagnostic Reading Test (Boyle & Weishaar, 1997), comprehension questions (Alvermann & Boothby, 1986; Boyle & Weishaar, 1997; Darch et al. 1986; Gardill & Jitendra, 1999; Idol & Croll, 1987; Sinatra et al, 1984), a concept acquisition test (Bulgren et al., 1988), teacher-made tests (Bulgren et al., 1988; Willerman & Mac Harg, 1991), written summaries (Gallego et al., 1989), and story grammar tests (Gardill & Jitendra, 1999). The reliability of these improvements in comprehension is further supported by

Moore and Readence's (1984) metaanalysis. When looking across 23 different studies they found a small but consistent effect on comprehension.

Although 3 studies reported no effect of graphic organizer use on comprehension, these findings appear to be attributable to deficiencies in experimental design. Carnes, Lindbeck, & Griffin (1987) reported no effect of advance organizer use relative to non-advance organizer use on the comprehension of microcomputer physics tutorials. However, students in this study were not trained to use the advanced organizers. This same factor may account for the lack of effect in the Clements-Davis & Ley (1991) study, where high school students received no instruction on how to use the thematic pre-organizers that they were given to assist story reading. Alvermann and Boothby (1986) also failed to demonstrate an improvement in comprehension. In this case, the lack of improvement is quite likely due to a ceiling effect – as comprehension scores were quite high even before the intervention. Thus, weighing the collective evidence there still appears to be strong support for the ability of graphic organizers to improve reading comprehension.

Vocabulary Knowledge

Moore and Readence's (1984) meta-analysis suggests that gains in vocabulary knowledge following graphic organizer use may be even greater than gains in comprehension. The average effect size for the 23 studies reviewed was more than twice as large as that reported for comprehension. Thus, graphic organizers appear to be a very effective tool for improving vocabulary knowledge.

Factors Influencing Effectiveness

Research studies have established that successful learning outcomes in the areas described above are contingent on certain factors. Important variables include grade level, point of implementation, instructional context, and ease of implementation. We elaborate the influence of these variables here.

Grade Level

Successful learning outcomes have been demonstrated for students with (Anderson-Inman, Knox-Quinn, & Horney, 1996; Boyle & Weishaar, 1997; Bulgren et al., 1988; Gallego et al., 1989; Gardill & Jitendra, 1999; Idol & Croll, 1987; Newby, Caldwell, & Recht, 1989; Sinatra et al., 1984) and without (Alvermann & Boothby, 1986; Bulgren et al., 1988; Darch et al., 1986; Willerman & Harg, 1991) learning disabilities across a range of grade levels, including elementary, junior high, and high school. However, on average the largest effects of graphic organizers on learning from text have been reported for University populations (Moore & Readence, 1984). There are consistent although more modest effects for elementary populations (Moore & Readence, 1984).

Point of Implementation

Graphic organizers may be introduced as advance organizers, before the learning task, or as post organizers, after encountering the learning material. A review of the research from 1980-1991 (Hudson, Lignugaris-Kraft, & Miller, 1993) concludes that visual displays can be successfully implemented at several phases of the instructional cycle. Indeed, positive outcomes have been reported when graphic organizers are used as both advance (Boyle & Weishaar, 1997; Gallego et al., 1989) and post organizers (Alvermann & Boothby, 1986; Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; Idol & Croll, 1987; Newby et al., 1989; Sinatra et al., 1984; Willerman & Mac Harg, 1991).

However, the precise point of implementation does appear to influence the degree of graphic organizers' effectiveness. In their comprehensive review, Moore and Readence (1984) report that the point of implementation is a crucial factor in determining the magnitude of improvement in learning outcome. When graphic organizers were used as a pre-reading activity, average effect sizes were small. In contrast, graphic organizers used as a follow up to reading yielded somewhat large improvements in learning outcomes. Thus, efforts to improve learning outcomes may be more successful when graphic organizers are introduced after the learning material.

Instructional Context

In reviewing 11 years of research, Hudson et al. (1993) note that positive outcomes for curricular enhancements require the use of effective teaching practices. Merkley & Jefferies (2001) note that "It is important, however, that GO planning extend beyond construction of the visual to the deliberate consideration of the teacher's strategies…to accompany the visual." Thus, instructional context is another determinant of the effectiveness of graphic organizers for improving learning.

Without teacher instruction on how to use them, graphic organizers may not be effective learning tools (Carnes et al. 1987; Clements-Davis & Ley, 1991). Graphic organizers can successfully improve learning when there is a substantive instructional context such as explicit instruction incorporating teacher modeling (Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; Idol & Croll, 1987; Willerman & Mac Harg, 1991) and independent practice with feedback (Boyle & Weishaar, 1997; Gardill & Jitendra, 1999; Idol & Croll, 1987), strategy instruction (Anderson-Inman et al., 1996; Boyle & Weishaar, 1997; Darch et al., 1986; Scanlon, Deshler, & Schumaker, 1996), story mapping (Gardill & Jitendra, 1999; Idol & Croll, 1987), semantic mapping (Gallego et al., 1989), and concept teaching routines (Bulgren et al., 1988). Most successful interventions minimally include a teacher introduction describing the purpose of the graphic organizer and setting the reading purpose.

In the absence of systematic study of the role of instructional context, it is difficult to identify with confidence specific aspects that are tied to success. However, in our review an interactive/collaborative approach involving teacher modeling, student-teacher discussion, and practice with feedback appeared to be consistently correlated with learning improvement (Alvermann & Boothby, 1986; Bulgren et al, 1988; Gardill & Jitendra, 1999; Idol & Croll, 1987; Scanlon et al., 1996). Thus, contexts that provide opportunity for student input and interaction with the teacher and/or one another (Darch et al., 1986; Gallego et al., 1989) may be especially effective.

Also useful are Merkley and Jefferies' (2001) specific suggestions for teaching with graphic organizers. Their guidelines include: verbalizing relationships between the concepts represented within the organizer, providing opportunities for student input, connecting new information to past learning, making reference to upcoming text, and reinforcing decoding and structural analysis.

A relatively new area of research is the investigation of computer-based methods for presenting graphic organizer instruction. Herl et al. (1999) tested the effectiveness of two, computer-based knowledge mapping systems in a population of middle and high school students. Students either worked individually using an artificial Web space to augment and revise knowledge maps or networked with one another across computers to collaboratively construct maps. Knowledge mapping scores (determined by comparison to expert maps) were significantly improved for

individuals working individually to elaborate maps, but not for students involved in collaborative construction. These findings indicate that a computer-based system can be successfully used to instruct students on how to develop concept maps. They also suggest that web searching methods may improve students' abilities to develop sophisticated maps. Student collaborative approaches, however, may be less effective.

Carnes et al. (1987) constructed computerized advanced organizers to help introduce high school physics students to microcomputer physics tutorials but were unable to establish a significant improvement in learning rate, retention, or performance on a teacher made achievement test. However, the lack of effect is likely attributable to the absence of teacher introduction or training with the organizers.

Findings by Anderson-Inman et al. (1996) found substantial variability in the adoption of computer-based graphic organizer study strategies. Some students became quite skilled and independent with these strategies, while others developed only basic skills and remained reluctant in their use. Their finding that differences in adoption level were correlated with reading test and intelligence scores suggests that it may be possible to predict levels of user proficiency.

Successful learning outcomes can be obtained in a variety of classroom settings, including special education classrooms (Anderson-Inman et al., 1996; Boyle & Weishaar, 1999; Gardill & Jitendra, 1999) mainstream classrooms (Alvermann & Boothby, 1986; Bulgren et al., 1988; Darch et al., 1986; Willerman & Mac Harg, 1991) and one-on-one instruction (Idol & Croll, 1987; Newby et al., 1989; Sinatra et al., 1984). However, the relative ease of implementation is an important determinant of this success (Novak, 1980). Some instructional contexts that have been successful in research studies are unfortunately difficult for teachers and or students to implement. For example, Scanlon et al. (1996) developed (collaboratively with teachers) a 5-step strategy and substrategy for helping students in academically diverse classes to process information and put it into a graphic organizer for studying and/or writing. Teachers in the study implemented the prescribed teaching behaviors to much less of a degree than they had promised and expressed dissatisfaction with the lack of fit with their regular teaching routine. Students trained with the strategy performed better than controls on a strategy performance test, but to only a modest degree. They were at best ambivalent about the utility of the strategy for improving learning. Moore and Readence (1984) make similar observations in their meta-analysis, noting frequent reports that students were unable to appreciate the value of graphic organizers to learning and felt that these tools were out of place in the current instructional context. To draw more solid conclusions about the best ways to implement graphic organizers, more systematic investigations of the role of instructional context are needed.

URL

The Graphic Organizer

http://www.graphic.org/index.html

This site is a rich resource for learning about graphic organizers, offering links, lists of references and books about graphic organizers, information about using graphic organizers for writing, guidelines for designing graphic organizers and assisting students in designing them, and samples of student work with graphic organizers.

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